



European Code to good practice for the collection, transport, storage, trading and industrial manufacture of safe feed/food ingredients

# **Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining**

**Version 4.0 (1 May 2021)  
Effective from 1 September 2021**



## Sectors covered by EFISC-GTP

The following specific sector documents have been developed by the respective European sector organizations in cooperation with EFISC:

<b><u>Starch Europe</u></b>	Sector reference document on the manufacturing of safe feed materials from starch processing
<b><u>FEDIOL</u></b>	Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining
<b><u>COCERAL</u></b>	Sector reference document on the collection, storage, transport and trading of feed/food ingredients
<b><u>EBB</u></b>	Sector reference document on the manufacturing of safe feed materials from Biodiesel processing
<b><u>EUROMALT</u></b>	Sector reference document on the manufacturing of safe feed ingredients from malt production

This European Code is open to other manufacturers producing feed materials by the development of a sector specific document.

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## **Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining Version 4.0**

### **1. Introduction**

FEDIOL members crush over 35 million tonnes of oilseeds per year and produce 11 million tonnes of vegetable oils. On top of that, they process 6 million tonnes of imported oils. FEDIOL members also produce 25 million tonnes of meals and are a major player on the EU market, which is the world largest with 57 million tonnes of meal consumption (source Oilworld). Statistics can also be found on: <http://www.fediol.eu/>.

There are some 150 oilseeds processing and vegetable oils and fats production facilities across Europe, employing approximately 20,000 people.

The EU Proteinmeal and Oil Industry processes different kinds of oleaginous seeds, beans, fruits and nuts for the production of vegetable oils — for human consumption but also for animal feeding and for technical purposes — and for the production of oilseed meals which are used as protein rich feeding stuffs. Usually crushing plants have integrated refining facilities that produce fatty products which can be intended for food, feed or technical usages. Sections b and c below provide further detail on the feed materials produced and the processes applied by the sector.

To support companies in delivering safe products, FEDIOL has conducted risk assessment of the chains of feed materials from the main crops processed by its industry (see also section d). These assessments offer a tool to oilseed crushing and oil refining companies for evaluation of their own feed safety management system. They also support these companies in their dialogue on chain control with their customers, suppliers and other stakeholders. The risk assessments will thus help strengthening the safety of the feed chain. FEDIOL stresses that companies remain primarily responsible for providing safe feed and that these assessments cannot replace any of this responsibility. The risk assessments mentioning control measures is a further detailing of the concept of Prerequisite Programmes (PRP's) as mentioned in Chapter 5 of the accompanying Community Guide.

## 2. Listing of feed materials

The main raw materials processed by the EU Protein meal and Oil Industry are rape seeds, soybeans, sunflower seeds, crude palm oil, crude palm kernel oil and crude coconut oil.

Name	Number in <a href="#">Catalogue of Feed Materials 2022/1104</a> <sup>1</sup>  <i>Number in Online Register of Feed Materials</i>	Description
Maize germ meal	1.2.12	Product of oil manufacturing, obtained by extraction of processed maize germ.
Linseed expeller	2.8.2	Product of oil manufacture, obtained by pressing of linseed.
Linseed meal	2.8.3	Product of oil manufacture, obtained by extraction and appropriate heat treatment of linseed expeller. It may be rumen protected.
Linseed expeller feed	2.8.4	Product of oil manufacture, obtained by pressing linseed. Only when produced at an integrated crushing and refining site, the product may contain up to:  – 1 % of the sum of used bleaching earth and filter aid (e.g. diatomaceous earth, amorphous silicates and silica, phyllosilicates and cellulosic or wood fibres)  – 1,3 % of crude lecithins  – 2 % of soap stocks
Linseed meal feed	2.8.5	.  Product of oil manufacture, obtained by extraction and appropriate heat treatment of linseed expeller. Only when produced at an integrated crushing and refining site, the product may contain up to  – 1 % of the sum of used bleaching earth and filter aid (e.g. diatomaceous earth, amorphous silicates and silica, phyllosilicates and cellulosic or wood fibres)  – 1,3 % crude lecithins  – 2 % soap stocks.
Rape seed expeller	2.14.2	Product of oil manufacture, obtained by pressing of seeds of rape.
Rape seed meal	2.14.3	Product of oil manufacture, obtained by extraction and appropriate heat treatment of rape seed expeller.

<sup>1</sup> Catalogue of feed materials of the COMMISSION REGULATION (EU) 2022/1104 amending the Catalogue of the Regulation (EU) No 68/2013.

Rape seed, extruded	2.14.4	Product obtained from whole rape by means of a treatment in humid, warm conditions and under pressure increasing starch gelatinisation.
Rape seed protein concentrates	2.14.5	Product of oil manufacture, obtained by separation of protein fraction of rapeseed expeller or rapeseed.
Rape seed expeller feed	2.14.6	Product of oil manufacture, obtained by pressing seeds of rape. Only when produced at an integrated crushing and refining site, the product may contain up to <ul style="list-style-type: none"> <li>– 1 % of the sum of used bleaching earth and filter aid (e.g. diatomaceous earth, amorphous silicates and silica, phyllosilicates and cellulosic or wood fibres)</li> <li>– 1,3 % crude lecithins</li> <li>– 2 % soap stocks.</li> </ul> It may be rumen protected.
Rape seed meal feed	2.14.7	Product of oil manufacture, obtained by extraction and appropriate heat treatment of rape seed expeller. Only when produced at an integrated crushing and refining site, the product may contain up to <ul style="list-style-type: none"> <li>– 1 % of the sum of used bleaching earth and filter aid (e.g. diatomaceous earth, amorphous silicates and silica, phyllosilicates and cellulosic or wood fibres)</li> <li>– 1,3 % crude lecithins</li> <li>– 2 % soap stocks.</li> </ul> It may be rumen protected.
Sesame seed expeller	2.17.3	Product of oil manufacture, obtained by pressing seeds of the sesame plant (Ash insoluble in HCl: maximum 5%)
Toasted soya beans	2.18.1	Soya beans ( <i>Glycine max.</i> L. Merr.) subjected to an appropriate heat treatment. (Urease activity maximum 0.4 mg N/g × min.).
Soya (bean) expeller	2.18.2	Product of oil manufacture, obtained by pressing the seed of soya
Soya (bean) meal	2.18.3	Product of oil manufacture, obtained from soya beans after extraction and appropriate heat treatment. (Urease activity maximum 0.4 mg N/g × min.).
Soya (bean) meal, dehulled	2.18.4	Product of oil manufacture, obtained from dehulled soya beans after extraction and appropriate heat treatment. (Urease activity maximum 0.5 mg N/g × min.).
Soya (bean) hulls	2.18.5	Product obtained during dehulling of soya beans.
Soya beans extruded	2.18.6	Product obtained from soya beans by means of a treatment in humid, warm conditions and under pressure increasing starch gelatinisation.
Soybean, flakes	2.18.12	Product obtained by steaming or infrared micronizing and rolling dehulled soya beans (Urease activity maximum 0.4 mg N/g × min.).
Soya (bean) meal feed	2.18.13	Product of oil manufacture, obtained from soya beans after extraction and appropriate heat treatment. (Urease activity maximum 0,4 mg N/g × min.). Only when produced at an integrated crushing and refining site, the product

		<p>may contain up to</p> <ul style="list-style-type: none"> <li>– 1 % of the sum of used bleaching earth and filter aid (e.g. diatomaceous earth, amorphous silicates and silica, phyllosilicates and cellulosic or wood fibres)</li> <li>– 1,3 % crude lecithins</li> <li>– 1,5 % soap stocks.</li> </ul>
Soya (bean) meal feed, dehulled	2.18.14	<p>Product of oil manufacture, obtained from dehulled soya beans after extraction and appropriate heat treatment. (Urease activity maximum 0,5 mg N/g × min.). Only when produced at an integrated crushing and refining site, the product may contain up to</p> <ul style="list-style-type: none"> <li>– 1 % of the sum of used bleaching earth and filter aid (e.g. diatomaceous earth, amorphous silicates and silica, phyllosilicates and cellulosic or wood fibres)</li> <li>– 1,3 % crude lecithins</li> <li>– 1,5 % soap stocks.</li> </ul>
Sunflower seed expeller	2.19.2	Product of oil manufacture, obtained by pressing of seeds of the sunflower.
Sunflower seed meal	2.19.3	Product of oil manufacture, obtained by extraction and appropriate heat treatment of sunflower seed expeller.
Sunflower seed meal, dehulled	2.19.4	<p>Product of oil manufacture, obtained by extraction and appropriate heat treatment of expeller of sunflower seeds from which part or all of the husks has been removed.</p> <p>Maximum crude fibre 27.5% in the dry matter</p>
Sunflower seed hulls	2.19.5	Product obtained during dehulling of sunflower seeds.
Sunflower seed meal feed	2.19.6	<p>Product of oil manufacture, obtained by extraction and appropriate heat treatment of sunflower seed expeller. Only when produced at an integrated crushing and refining site, the product may contain up to</p> <ul style="list-style-type: none"> <li>– 1 % of the sum of used bleaching earth and filter aid (e.g. diatomaceous earth, amorphous silicates and silica, phyllosilicates and cellulosic or wood fibres)</li> <li>– 1,3 % crude lecithins</li> <li>– 2 % soap stocks.</li> </ul>
Sunflower seed meal feed, dehulled	2.19.7	<p>Product of oil manufacture, obtained by extraction and appropriate heat treatment of expeller of sunflower seeds from which part or all of the husks has been removed. Only when produced at an integrated crushing and refining site, the product may contain up to</p> <ul style="list-style-type: none"> <li>– 1 % of the sum of used bleaching earth and filter aid (e.g. diatomaceous earth, amorphous silicates and silica, phyllosilicates and cellulosic or wood fibres)</li> <li>– 1,3 % crude lecithins</li> </ul>

		<p>– 2 % soap stocks. Maximum crude fibre: 27,5 % in the dry matter.</p> <p>It may be rumen protected.</p>
Vegetable oil and fat (The name shall be supplemented by the plant species.)	2.20.1	Oil and fat obtained either by pressing and/or extraction from oilseeds or oil fruits (excluding castor oil from the ricinus plant)
Crude lecithins	2.21.1	Product obtained during degumming of crude oil from oilseeds and oil fruits with water. Citric acid, phosphoric acid or sodium hydroxide or enzymes may be added during degumming of the crude oil.
Poppy meal	2.23.2	Product of oil manufacture, obtained by extraction of expeller of poppy seed
Acid oils from chemical refining (The name shall be supplemented by the indication of the botanical or animal origin.)	13.6.1	Product obtained during the deacidification of oils and fats of vegetable or animal origin by means of alkali, followed by an acidulation with subsequent separation of the aqueous phase, containing free fatty acids, oils or fats and natural components of seeds, fruits or animal tissues such as mono-, and diglycerides, lecithin and fibres.
Fatty acid distillates from physical refining	13.6.5	Product obtained during the deacidification of oils and fats of vegetable or animal origin by means of distillation containing free fatty acids, oils or fats and natural components of seeds, fruits or animal tissues such as mono- and diglycerides, sterols and tocopherols.
Pure distilled fatty acids from splitting	13.6.7	Product obtained by the distillation of crude fatty acids produced by fermentation of organic matter, by enzymatic interesterification of oil or by oil/fat splitting potentially plus hydrogenation. By definition it consists of pure distilled fatty acids C4-C24, aliphatic, linear, monocarboxylic, saturated and unsaturated. May contain up to 50 ppm Nickel in case it has undergone hydrogenation
Soapstock from chemical refining	13.6.8	Product obtained during the deacidification of vegetable oils and fats by means of aqueous calcium, magnesium, sodium or potassium hydroxide solution, containing salts of fatty acids, oils or fats and natural components of seeds, fruits or animal tissues such as mono- and diglycerides, lecithin and fibres.
Deodistillates, processed	02202-EN	Product that is obtained by distillation of neutralised oils of vegetable or animal origin and that is subsequently processed, containing oil or fat components.
Mono- and diglycerides of fatty acids esterified with organic acids  The name shall be amended or supplemented to specify the organic acid. / The name shall be supplemented by the words 'from animal tissues' or 'from fermentation', as appropriate.	13.6.9	Mono- and diglycerides of fatty acids with at least 4 carbon atoms esterified with organic acids.



Glycerine, crude	13.8.1	<p>Co-product obtained from:</p> <ul style="list-style-type: none"> <li>- The oleochemical process of oil/fat splitting to obtain fatty acids and sweet water, followed by concentration of the sweet water to get crude glycerol or by transesterification (may contain up to 0.5% methanol) of natural oils/fats to obtain fatty acid methyl esters and sweet water, followed by concentration of the sweet water to get crude glycerol.</li> <li>- The production of biodiesel (methyl or ethyl esters of fatty acids) by transesterification of oils and fats of unspecified vegetable and animal origin. Mineral and organic salts might remain in the glycerine (up to 7.5%). May contain up to 0.5% Methanol and up to 4% of Matter Organic Non Glycerol (MONG) comprising of Fatty Acid Methyl Esters, Fatty Acid Ethyl Esters, Free Fatty Acids and Glycerides.</li> </ul> <p>- Saponifications of oils/fats of vegetable or animal origin, normally with alkali/alkaline earths, to obtain soaps.</p> <p>May contain up to 50 ppm Nickel from hydrogenation</p>
Glycerin	13.8.2	<p>Product obtained from:</p> <ul style="list-style-type: none"> <li>– the oleochemical process of (a) oil/fat splitting followed by concentration of sweet waters and refining by distillation (see part B, glossary of processes, entry 20) or ion-exchange process; (b) transesterification of natural oils/fats to obtain fatty acid methyl esters and crude sweet water, followed by concentration of the sweet water to get crude glycerol and refining by distillation or ion-exchange process;</li> <li>– the production of biodiesel (methyl or ethyl esters of fatty acids) by transesterification of oils and fats of unspecified vegetable and animal origin with subsequent refining of the glycerine. Minimum Glycerol content: 99 % of dry matter;</li> </ul> <p>-saponification of oils/fats of vegetable or animal origin, normally with alkali/alkaline earths, to obtain soaps, followed by refining of crude glycerol and distillation.</p> <p>May contain up to 50 ppm nickel hydro-generation</p>

Soya (beans) and sunflower seeds may be dehulled, resulting in meal with a low fibre and hence high protein content (“hi-pro” versus “low-pro” meal).

Other oilseeds processed include linseed, sesame seeds, maize germs and poppy seeds. Other oils processed include shea, illipe, safflower seed and groundnut oil.

The above list will be amended, if appropriate, in function if industrial developments within the vegetable oil and protein meal industry, or an evolution of the EU legislation on feed materials like e.g. a review of the Catalogue of feed materials.

The above list is not exhaustive. For all products sold as feed materials a risk assessment in line with this Guide needs to be available.

### 3. Overview of main processes

#### 3.1 OILSEED CRUSHING

##### 3.1.1 CLEANING, DRYING AND PREPARATION OF THE SEEDS/BEANS

As a first step the seed/bean is cleaned and dried. Foreign material, such as stones, glass and metal is taken out by sieving and magnets and is disposed of outside the feed chain.

Drying is performed whilst avoiding contact with combustion gasses unless natural gas is used.

Some oilseeds, like soybeans and sunflower seeds, may be dehulled after cleaning. After dehulling, the meal has a lower crude fibre content, and hence a higher protein content. The soya hulls can also be used for feeding purposes, as such or in pelletized form.

##### 3.1.2 CRUSHING AND HEATING

Seeds with high oil content, such as rape seeds and sunflower seeds are usually mechanically pressed after a preheating step. The pressed cake contains up to eighteen percent of oil and is further treated in the extractor. In some cases the pressed cake undergoes deep expelling. This brings oil levels down to below ten percent and results in an expeller sold for feed purposes. Soybeans have a relatively low oil content. They are thermally treated, mechanically crushed into raw materials/flakes that are further extracted.

Sometimes the oil-containing raw material is pressed without heating; such oils are known as cold-pressed oils. Since cold pressing does not extract all the oil, it is practiced only in the production of a few special edible oils, e.g. olive oil.

##### 3.1.3 SOLVENT EXTRACTION

Solvent extraction separates the oil from the seeds/beans. The pre-processed seeds/beans are treated in a multistage counter-current process with solvent until the remaining oil content is reduced to the lowest possible level. **Hexane is commonly used as extraction solvent.**

The miscella is a mixture of oil and solvent. It is separated by distillation into its two components, oil and solvent. The solvent is recycled for re-use in the extraction process.

##### 3.1.4 DESOLVENTISING AND TOASTING

The hexane-containing meal is treated in the desolventiser toaster with the help of indirect heating and steam. The desolventising toasting process serves three purposes. Firstly, to recover the solvent from the meal, secondly to increase the nutritional value of the meal e.g. by reducing the content of glucosinolates or trypsin inhibitors, and thirdly to minimise the risk of biological contamination.

##### 3.1.5 DRYING, COOLING, STORAGE

To obtain a stable and transportable feed material that is fit for storage, the meal is subsequently dried and cooled. In general, oilseed meals are stored in silos. The packing in bags is limited to exceptional cases. In order to avoid the sticking of the meals to the wall of the silo, it is common practice that an anti-caking agent (such as mineral clay) is added). This is particularly necessary when the silos reach considerable heights. The anti-caking agents used are those permitted by EU feed legislation.

## 3.2 REFINING

Crude oils obtained by pressing and/or extraction are sometimes used directly for food and feed purposes. In most cases, however, the crude oils are refined

Crude oil refining entails the removal of gums or crude lecithins and that of free fatty acids (FFA) from the oil to get a neutral taste of the edible oil while maintaining the nutritional value and ensuring the quality and stability of the product.

### 3.2.1 DEGUMMING: CHEMICAL AND PHYSICAL REFINING

Degumming is the first step of refining and involves the removal of the gums/crude lecithins from the oil. To that effect, the crude oil is treated with water, enzymes or food grade acid at elevated temperatures. The hydrated gums are removed at the end of this step or after neutralisation. Gums are a raw material for the production of lecithins.

### 3.2.2 NEUTRALISATION: CHEMICAL REFINING

FFAs are responsible for oil acidity. Chemical refining is the traditional method of oil refining and involves a neutralisation step of these FFA's in the crude oil. During neutralisation, the oil is treated with a food grade alkali solution (caustic soda) that reacts with the FFA to form soap stock.

The soap stock -together with the precipitated gums, if still present- is separated from the oil by centrifugation. Typically, soap stocks contain 40% water and 60% fatty matter (FFA, triglycerides). In facilities that both crush oilseeds and refine the seed oils (integrated crushing and refining), the soap and gums can be added back to the meal or expellers at inclusion levels of around 1.5%.

Soap stock can also be sold to the market as feed material under the denomination "soap stock" or can be split by means of an acid into acid oils.

The production of gums and soaps stock in integrated crushing refining is a process of continuously removing the gums and free fatty acids from the oils and continuously adding these as gums or soap stock to the meal or expellers. The components in the soap stock are part of the natural composition of seeds or beans. This means that only natural components separated from the seeds and beans are returned back into the crushing process. Whether integrated crushing refining plants add soap stocks back to the meal or expellers is determined by the design of the facility. It is not subject to daily management decisions.

In their meeting on 17 and 18 January 2013, the Standing Committee on the Food Chain and Animal Health, section Animal Nutrition confirmed the feed material status of meals and expellers to which soap stocks have been added in integrated crushing and refining plants.

### 3.2.3 BLEACHING: CHEMICAL AND PHYSICAL REFINING

The purpose of bleaching (or decolorising) is to reduce the levels of pigments such as carotenoids and chlorophyll, but this treatment also further removes residues of phosphatides, soaps, traces of metals, oxidation products, and proteins. These trace components interfere with further processing. They reduce the quality of the final product and are removed by adsorption with activated clay or silica. In integrated crushing / refining plants the used bleaching earth may be brought back into the meal. Bleaching earth originating from stand-alone refining plants and / or hardening plants, the latter which can contain nickel is excluded from recycling into feed and is disposed of outside the feed chain. If heavy polycyclic aromatic hydrocarbons are present in crude oil, activated carbon shall be used for their removal. The bleaching clay containing activated carbon is disposed of outside the feed sector.

### **3.2.4 WINTERISATION: OPTIONALLY BOTH CHEMICAL AND PHYSICAL REFINING**

During winterisation waxes are crystallised and removed in a filtering process to avoid clouding of the liquid fraction at cooler temperatures. The filter cake that remains after the filtering process consists of oil, waxes and filter aid. The filter cake can be recycled to the toaster and added to the meal (in an integrated crushing/refining plant) or sold as such as a feed material (refining stand alone). The term winterisation was originally applied decades ago when cottonseed oil was subjected to winter temperatures to accomplish this process. Winterisation processes using temperature to control crystallisation are carried out on sunflower and maize oil. This process is also referred to as dewaxing.

### **3.2.5 DEODORISATION: CHEMICAL REFINING**

Deodorisation is a vacuum steam distillation process that removes the relatively volatile components that give rise to undesirable flavours, colours and odours in fats and oils. This is feasible because of the great differences in volatility between these undesirable substances and the triglycerides.

The purpose of deodorization is to remove odours, off-flavours and other volatile components such as pesticides and light polycyclic aromatic hydrocarbons by stripping. Careful execution of this process will also improve the stability and the colour of the oil, whilst preserving the nutritional value.

Depending on the residence time in the deodoriser, the process is carried out under vacuum (0.5 – 8 mbar) and at temperatures between 180° - 270°C, and using a stripping medium, such as steam or nitrogen, since the substances responsible for odours and flavours are usually volatile. Conditions are adapted within these ranges as appropriate to ensure the removal of specific substances. Further removal of the proteins is achieved at this step.

### **3.2.6 DISTILLATION: PHYSICAL REFINING**

Physical refining removes the FFAs by distillation; the boiling point of the FFA is lower than that of the triglyceride oil. FFA from physical refining are referred to as fatty acid distillates. Stand-alone refineries, ie those that source crude oils and hence don't crush oilseeds often apply physical refining to tropical oils such as palm oil, palm kernel oil and coconut oil. Integrated crushing and refining plants may also apply physical refining to seed oils such as rape seed, sunflower seed and soybean oil. Physical refining does not involve a neutralisation step of the crude oil and hence no soap stock production.

### **3.3 MODIFICATIONS ON OILS AND FATS**

#### **3.3.1 HYDROGENATION**

During hydrogenation hydrogen reacts with the points of unsaturation in the fatty acids. The purpose of hydrogenation is to obtain oils and fats with specific melting profiles or oxidative stability by reducing unsaturated double bonds in the oil or fat. Hydrogenation is accomplished by reacting oil with hydrogen gas and in the presence of heat and metal catalysts, e.g. nickel.

#### **3.3.2 INTERESTERIFICATION**

A better melting profile of oil/fat system can also be achieved via interesterification, which is defined as the interchange of fatty acids from different fats/oils on the glycerol backbone.

There are two types of interesterification processes: chemical and enzymatic.

Chemical interesterification in the presence of basic catalysts, e.g. sodium methoxide, results in non-selective or random rearrangements of fatty acids. Interesterification using immobilised lipases is more commonly done in the industry due to its selective modification of position of fatty acids in the triglycerides.

After interesterification, the output product is bleached (if necessary) and (re-) deodorised.

#### **3.3.3 FRACTIONATION**

The chain length of a triglyceride defines its melting point. Fractionation entails controlled crystallization. Solids are removed by means of solvents or winterization or pressing. Pressing happens with hydraulic pressure or vacuum filtration.

Fractionation is used to produce specialty fats from palm and palm kernel oil.

#### **3.3.4 SPLITTING**

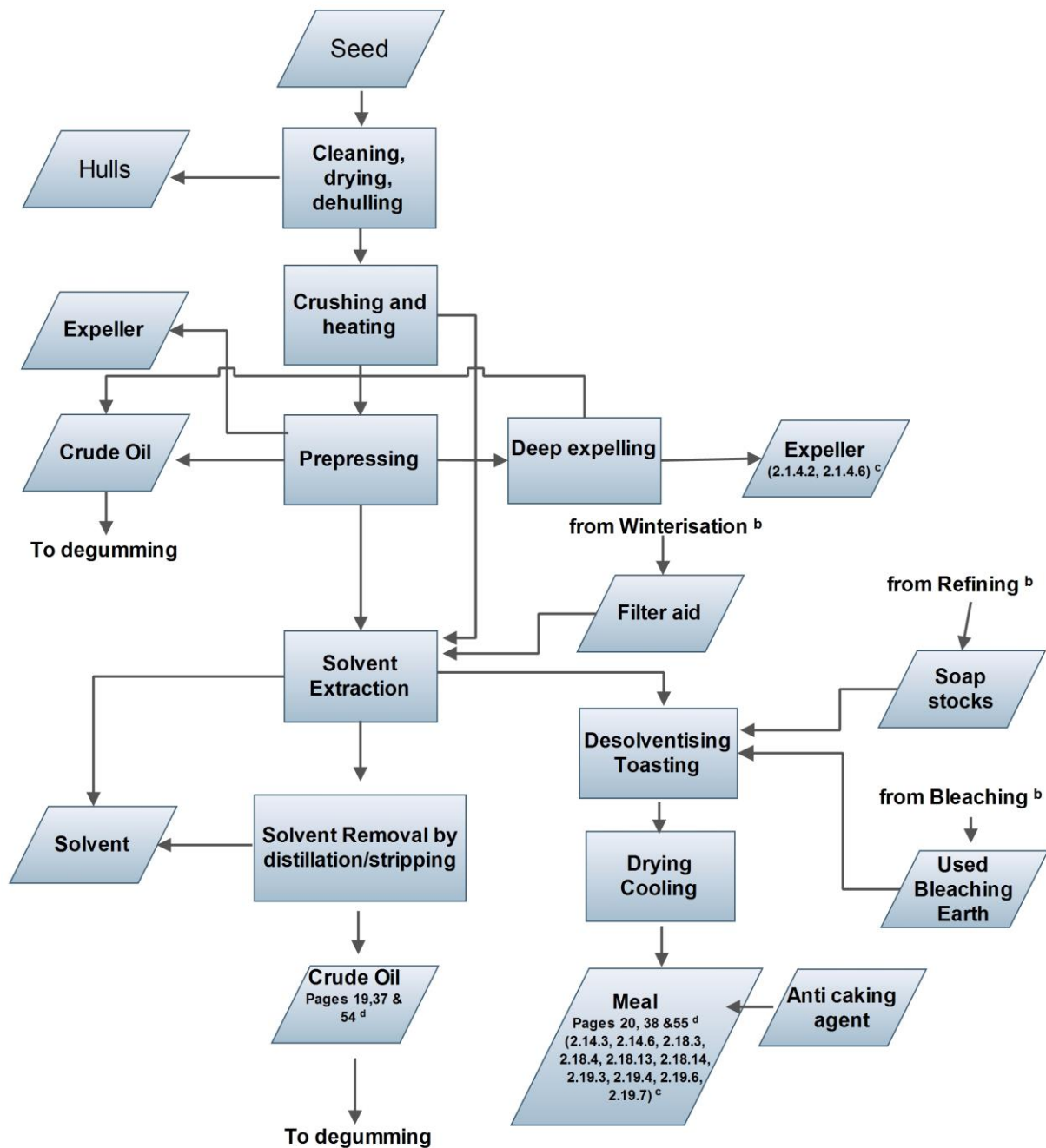
Splitting by means of water under high pressure of the ester bonds of triglycerides renders fatty acids and glycerol molecules. The glycerol is separated with the water.

The flow charts below represent the following main processes applied:

- Crushing of oilseeds
- Chemical refining of oil
- Physical refining of oil
- Downstream processing of refined oil

### 3.4 FLOW CHART CRUSHING

Flow chart Oilseed Crushing <sup>a</sup>

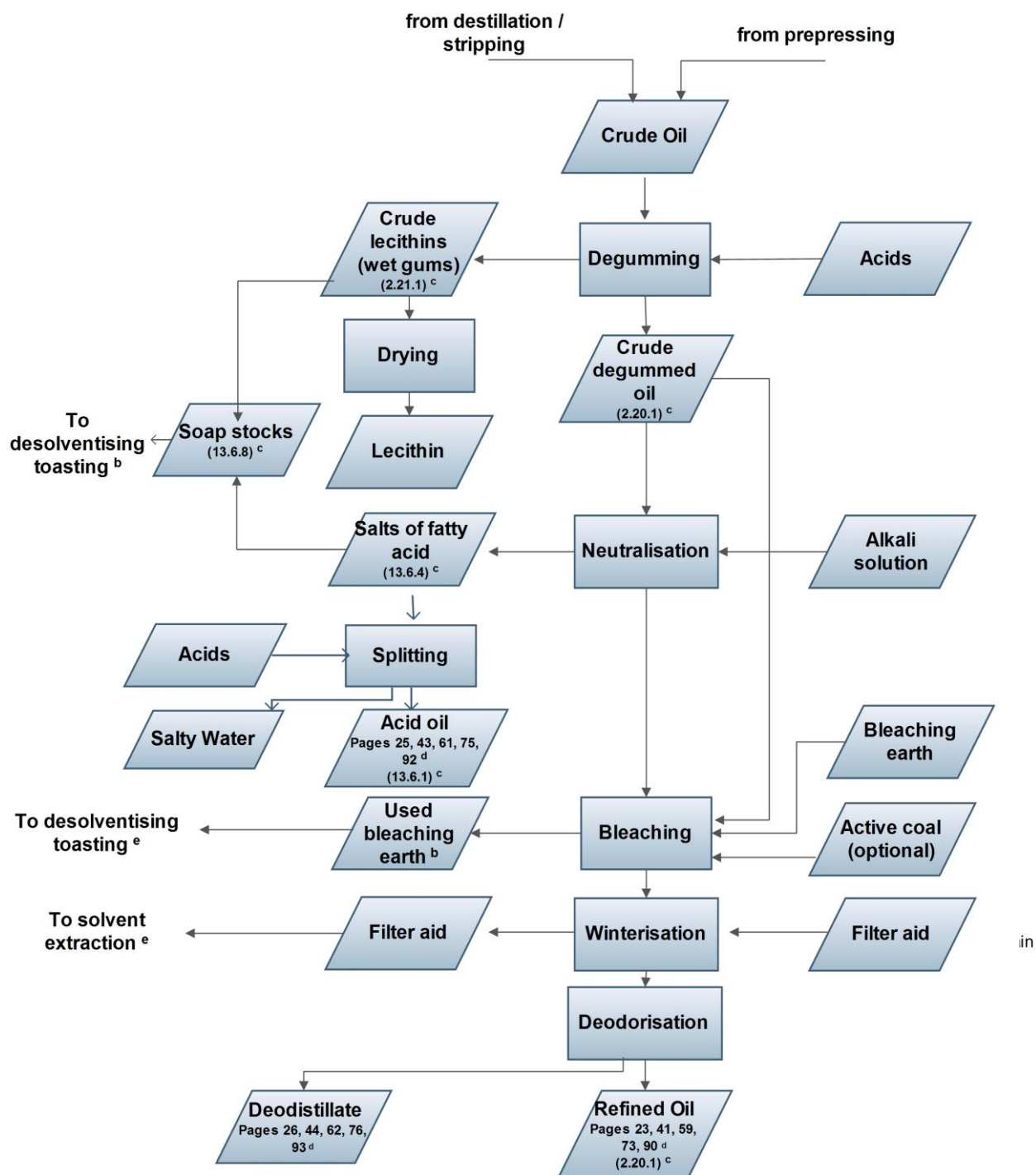


<sup>a</sup> Typical flow chart; the order of the process steps may vary amongst production plants  
<sup>b</sup> The number refers to that in the Catalogue of Feed Materials - Commission Regulation 68/2013  
<sup>c</sup> Only applies to integrated crushing and refining  
<sup>d</sup> These page numbers refer to safety evaluations in this appendix

### 3.5 FLOW CHART CHEMICAL REFINING

### 3.6 FLOW CHART PHYSICAL REFINING

Flow chart Refining Chemical Refining <sup>a</sup>

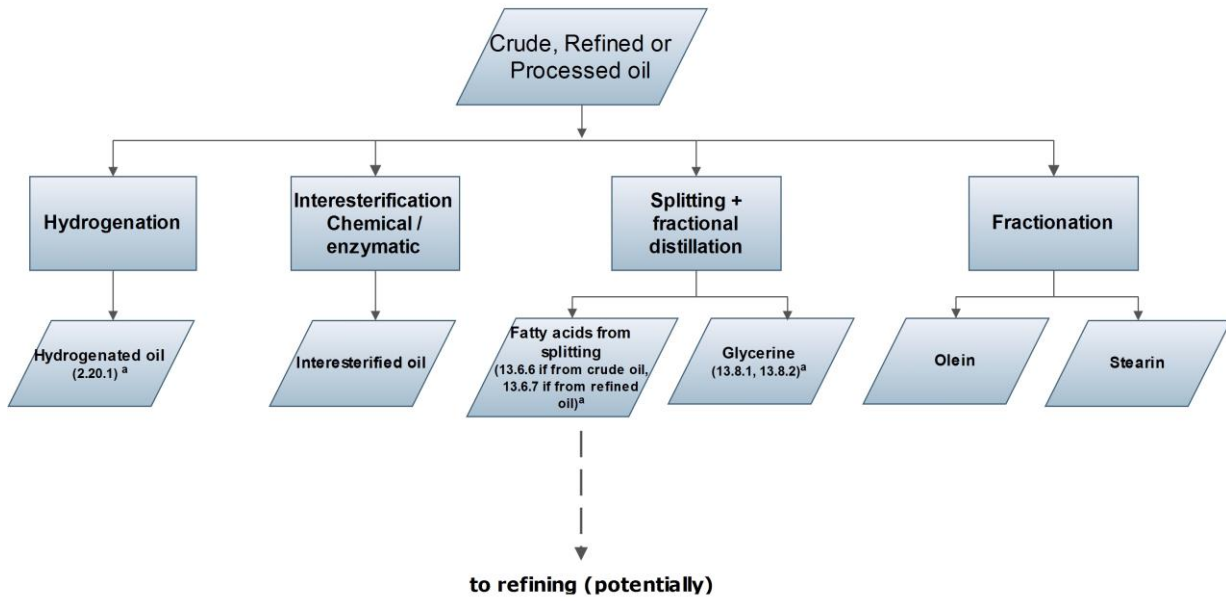


<sup>a</sup> Typical flow chart; the order of the process steps may vary amongst production plants  
<sup>b</sup> Used bleaching earth with active coal is not fed back to meal at integrated crushing and refining and is disposed of outside of the feed chain  
<sup>c</sup> The number refers to that in the Catalogue of Feed Materials - Commission Regulation 68/2013  
<sup>d</sup> These page numbers refer to safety evaluations in this appendix  
<sup>e</sup> Only applies to integrated crushing and refining



### 3.7 FLOW CHART DOWN-STREAM PROCESSING

Flow chart downstream processing



<sup>a</sup> The number refers to that in the Catalogue of Feed Materials - Commission Regulation 68/2013



## 4. Methodology of the FEDIOL food and feed safety chain risk assessments

### 4.1 OVERVIEW ON CROPS SUBJECT TO FEED SAFETY CHAIN RISK ASSESSMENT

- rape seed
- soybean
- sunflower seed
- palm fruit and palm kernel
- coconut

### 4.2 HOW FEDIOL CONDUCTED THE CHAIN RISK ASSESSMENTS

FEDIOL followed the methodology as described in the Guide- chapter 6- HACCP.

- 1.1. Per oil containing crop, FEDIOL constructed a flow chart covering the following chain elements: the cultivation of the crop, the storage and transport of the harvested oilseed or oil fruit, the processing of these into various oil and protein rich products, and the storage and the final transport of these to the food/feed industry. The feed materials palm kernel meal and copra fall outside the scope of these assessments as they are produced by companies that are not a member of FEDIOL.
- 1.2. Per chain element, FEDIOL described the food/feed safety hazards that can reasonably be expected to occur at that point in the chain, provided no safety measures are in place. For the processing steps (crushing and/or refining and further processing) utilities-related hazards were commonly described. A safety hazard is a biological (B), chemical (C) or physical agents (P) in, or condition of, a product that makes it injurious to human or animal health.
- 1.3. In the elements of the chain that cover agricultural activities such as the cultivation of crops, the transport and storage of the harvested oil seeds or oil fruits and the drying of the oil seeds and the crushing of the oil fruits, the control of hazards is the responsibility of the operators active in that part of the chain. This is why the hazards occurring there were only identified, but their risks were not further assessed (no chance and seriousness assessment). The hazards appearing in the FEDIOL risk assessments, however, will allow the local operator to take the necessary measures. FEDIOL members are to verify this when they are active in these chains. Control measures for these hazards can eventually be taken at the level of crushing or refining as well.
- 1.4. Those risk assessments may differ amongst vegetable oil and protein meal producers for example based on the origin of the raw materials and the individual and specific processing conditions of the operator.  
  
Moreover, in these tables, no operational prerequisite programme (OPRP) or critical control point (CCP) is listed due to the fact that the decision leading to the establishment of such OPRP or CCP should be consistent with the reality of each plant or processing line.
- 1.5. FEDIOL justified the risk assessment.
- 1.6. FEDIOL checked whether EU legislation or trade standards such as those of FEDIOL and FOSFA or NOFOTA set limits for the respective hazard, and if so, listed them.

1.7. The packing of goods is outside the scope of this methodology for assessing chain risk analyses. Transport of ex-works deliveries is outside the scope of this methodology as well.

The safety risk assessment of the food and feed chains of soybeans, rapeseeds, sunflower seeds, palm/palm kernel oil and coconut oil are attached below and they are also available on the FEDIOL website: <http://www.fediol.eu>.

As described above, each risk assessment is made up of the following sections:

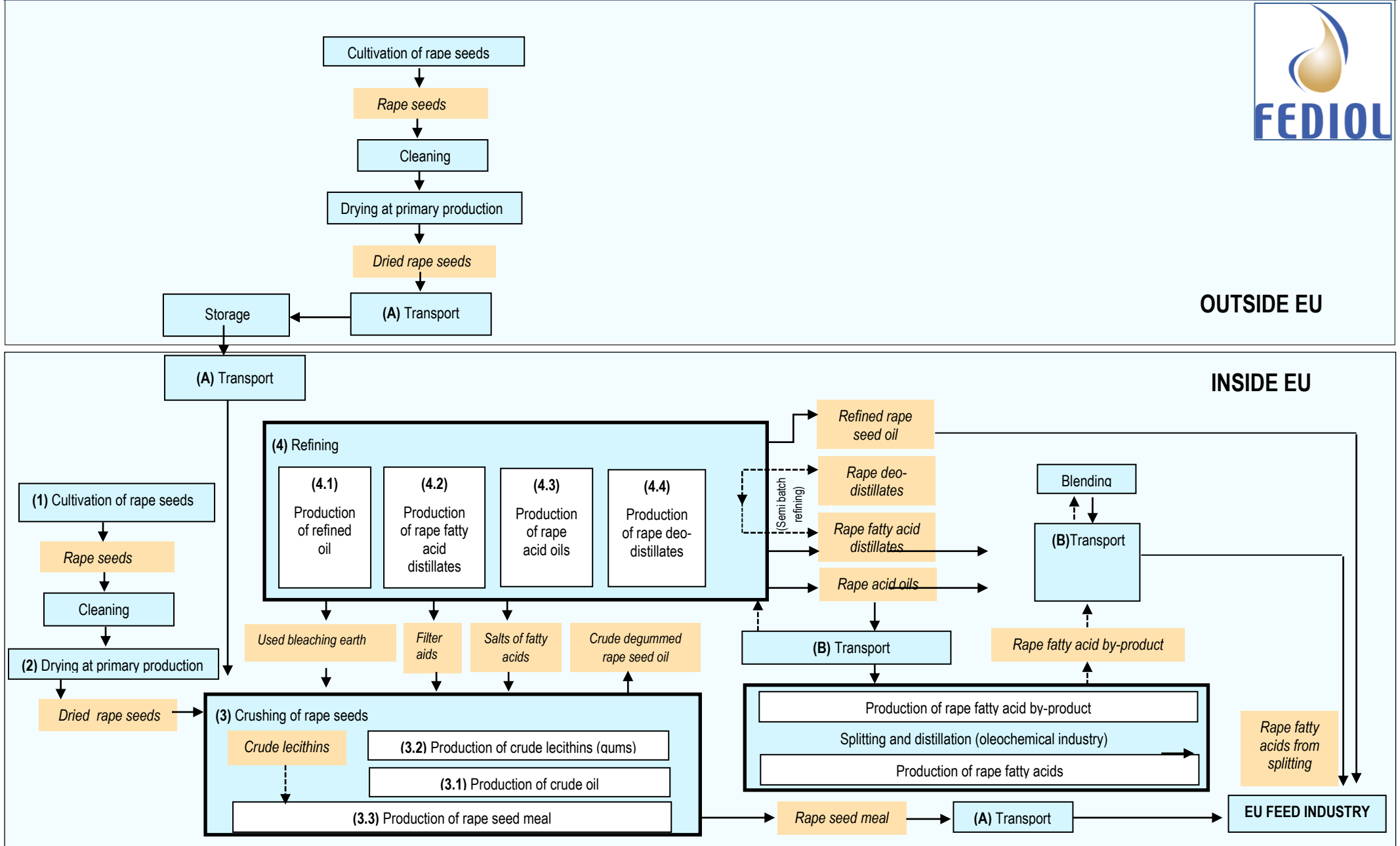
- a flow chart depicting the full supply chain
- sheets discussing risks per step in the supply chain, ie cultivation, drying, crushing, refining, storage and transport.

For the storage and transport sheets of the sunflower, rapeseed, palm (/kernel) and coconut chains, please refer to those of soybeans.

**FEDIOL will evaluate the food and feed safety assessments of the chains of oilseed and oil fruit products every two years.**

\* \* \*

# Flow chart of the production chain of rape seed oil products for feed application in the EU



## 5. Risk assessment of the chain of rapeseed meal and oil products

			1. Cultivation of rape seeds*					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C				<p>Third countries of export of rape seeds work with positive lists for the use of pesticides during cultivation which, for some substances, may conflict with European pesticide residue legislation.</p> <p>In rape seeds originating from wet areas the level of fungicides may be high.</p>	<p>Regulation (EC) 396/2005 prohibits putting into circulation commodities that do not comply with the MRLs set in the annexes. EC Regulation No. 178/2006 establishes Annex I that lists the food and feed products for which pesticide residue limits apply. Regulation 149/2008 establishes Annexes II, III and IV that sets the MRLs for the products listed in Annex I.</p> <p><a href="#">FEDIOL specifications for purchasing rape seeds from non-EU origin contain MRLs for certain pesticide residues (11SPEC098).</a></p>		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.
Non-EU-authorized GMOs	B				Different pace of approval of new GMOs between EU and third countries from which oilseeds are imported. Risk of traces of non-EU-authorized GMOs ending up in EU imported oilseeds.			This is an issue of legal compliance, rather than one of food safety.
Phytotoxins	C				Rape seeds may contain weeds.	Directive 2002/32/EC limits the content of toxic weed seeds.		Visual inspection of rape seeds.

\* Assessment of risks outside the EU is out of the scope of this document. For more information, see section d) Methodology of the FEDIOL food and feed chain risk assessments of the Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining.

## 2. Drying of rape seeds at primary production\*

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants caused by drying  - dioxin	C				Burning of waste may result in dioxin formation. Up to now the crushers have found dioxin levels in crude rape seed oil to be lower than detection limit.	Code of Practice for the prevention and reduction of dioxin and dioxin-like PCB contamination in foods and feeds (Codex CAC/RCP 62-2006).		<p>Good Manufacturing Practices recommend using fuels which are not generating dioxins and dioxin-like compounds and other harmful contaminants.</p> <p>In case of direct heating, proper burners should be used. Monitoring is regarded necessary to ensure that drying or heating processes do not result in elevated levels of dioxins and dioxin-like PCBs. No use of waste products as a fuel for direct drying.</p> <p>Feed materials derived from rape seeds have to comply with the limits for dioxin and dioxin-like PCBs of the Directive 2002/32/EC.</p>

\* Assessment of risks outside the EU is out of the scope of this document. See also the footnote on the previous page.

## Utilities: rape seeds crushing, oil refining and processing

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Hydraulic oils or lubricants from equipment	C	Low	High	3	Hydraulic oils and lubricants may contain toxic compounds.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341 rev.1).</a>	The prerequisite programme should assure that the contamination of product with non-food grade hydraulic oils or lubricants is avoided and that the risk of contamination of the product with hydraulic oils and lubricants that are suitable for incidental contact with food is minimised. The prerequisite programme could involve recording of the quantities used. Equipment in requires proper lubrication to operate at optimum performance and reliability. In specific cases where no H1 lubricant could meet the particular lubrication requirements of the equipment, a specific assessment of the lubricant to be used should be performed, including consideration as regards the absence of mineral oil hydrocarbons (MOAH).	
Contaminants in water such as PFOS and PFOA	C	Low	Medium	2	Water is used in the crushing and refining process.	Regulation 183/2005/EC is addressing water use.		
Cleaning agents and boiler chemicals	C	Medium	Medium	3	Cleaning agents and steam (using boiler chemicals) come into contact with the product.		Cleaning agents used in the production system should be flushed. Cleaning agents and boiler chemicals must be suitable for use in the food industry.	

<b>Thermal heating fluids (THF) from equipment</b>	C	Medium	igh	4	THF may still be used by non-FEDIOL members.	According to the <a href="#">FEDIOL Code of Practice on the Heating of Edible Oils during Processing</a> the use of THF is not allowed.	Use hot water or steam heating. Otherwise, a control measure should assure that the contamination of product with thermal heating fluids is avoided.	
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			3. Crushing of rape seeds					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Toxins from pest control materials	C	Low	High	3	Poisoned grain from open boxes could end up in the food chain.		A pest control programme must be applied that is suitable for use in the food chain.	
Toxic compounds from hexane such as benzene	C	Low	High	3	Industrial hexane may contain toxic compounds.	Directive 2009/32/EC and its amendments sets purity criteria for the use of hexane during the crush of oilseeds.	Food grade hexane must be used. An extraction solvent is considered as being used in compliance with good manufacturing practice if its use results only in the presence of residues or derivatives in technically unavoidable quantities presenting no danger to human health.	
Foreign material like glass, wood, metals, etc.	P	Medium	Medium	3	Foreign material may be present		A system should be in place that removes foreign material.	
Contaminants from viable seeds and weeds	B	medium	low	2	Viable seeds from weeds growing in the operator premises or coming from spillage of containers/bags could end up in the food/feed chain			No control needed for food safety reasons, but control needed for environmental reasons.  The prerequisite programme should assure that the contamination of product with viable seeds (during the receipt, storage, production, delivery and transport activity) is avoided and the risk of contamination is minimized. The prerequisite programme should include weed seed control.  Would any volume of seeds be lost and/or spilled on the



									premises of the crushing plant (unlikely), this volume should be collected and stored in closed containers/bags. Abnormal effects during weed eradication should be reported to FEDIOL.
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### 3.1 Production of crude oil

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants from filter aids	C	Low	High	3	The crude oil can potentially wash contaminants out of the filter aid.	<a href="#">FEDIOL Code of Practice and quality assurance agreement on the purchase and use conditions of fresh bleaching earth and filter aids for vegetable oils and fats refineries and integrated plants (Ref. 16COD137)</a>	Use of filter aids that are suitable for the feed industry.  Monitoring, establishment of quality and safety criteria for the purchase of filter aids.	
Mineral oils from a failing recovery system	C	Medium	Medium	3	Low-medium viscosity mineral oils are used for hexane recovery. It is in the interest of the crusher to recover as much hexane as possible, and to thus maintain the recovery system well and thus to avoid that a possible contamination of the mineral oil is washed out and carried to the vegetable oil by hexane.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341 rev.1).</a>	Mineral oil of the recovery system must be suitable for incidental contact with food and must be free from mineral oil aromatic hydrocarbons (MOAH). The prerequisite programme should assure that the contamination of product with such oils is avoided and that the risk of contamination of the product is minimised. The prerequisite programme could involve recording of the quantities used.	The GMP+ International limit for MOSH C(10-40) in oils is 400 mg/kg.
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on rape seeds shows that residue levels remain within legal limits.	Regulation EC No. 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, provided food safety is assured. <a href="#">The FEDIOL position (11SAF181)</a> concludes that based on the average oil content in rape seeds, ranging from 40%-45%, a processing factor of 2.5 should be used to establish the MRL of fat soluble pesticides residues in rape seed oil.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.

Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude rape seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
Hexane that resides in the crude oil after recovery	C	High	little	3	After hexane extraction of the oil and subsequent hexane recovery from the oil, traces of hexane will reside in the crude oil.	Feed Marketing Regulation EC No 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and from processing aids, unless a maximum content is fixed in the Catalogue. The Catalogue of Feed Materials, Regulation (EU) 2022/1104 introduces a threshold for the setting of max contents for these chemical impurities of 0.1% (1000 ppm).		Toxicological assessments show that crude rape seed oil with hexane levels of up to 1000 ppm is feed safe. FOSFA has a flash point limit at 121°C, which is related to transport and storage safety.

## 3.2 Production of crude lecithins

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Mineral oils from a failing recovery system</b>	C	Medium	Medium	3	Low-medium viscosity mineral oils are used for hexane recovery. It is in the interest of the crusher to recover as much hexane as possible, and to thus maintain the recovery system well.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341 rev.1).</a>	Mineral oil of the recovery system must be suitable for incidental contact with food. The prerequisite programme should assure that the contamination of product with such oils is avoided and that the risk of contamination of the product is minimised. The prerequisite programme could involve recording of the quantities used.	The GMP+ International limit for MOSH C(10-40) in oils is 400 mg/kg.
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on rape seeds shows that residue levels remain within legal limits.	Regulation EC No 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing food safety is assured.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.  Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude rape seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
<b>Hexane that resides in the crude lecithins after recovery</b>	C	High	Little	3	After hexane extraction of the oil and subsequent hexane recovery from the oil, traces of hexane will reside in the crude oil.	Feed Marketing Regulation EC No 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and		Toxicological assessments show that feed materials with hexane levels of up to 1000 ppm is feed safe. FOSFA has a flash point limit at 121° C,

						from processing aids, unless a maximum content is fixed in the Catalogue. The Catalogue of Feed Materials, Regulation (EU) 2022/1104 introduces a threshold for the setting of max contents for these chemical impurities of 0.1% (1000 ppm).		which is related to transport and storage safety.
<b>Pathogenes</b>	B	Low	Medium	2	Microbiological growth as a result of condensation of water evaporated from the crude lecithins.			

### 3.3 Production of rape seed expeller and meal

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin from anti-caking agent	C	Low	High	3	Anti-caking agent is of mineral origin and may contain dioxin by nature. Dioxin is toxic to humans and animals.	Regulation 2439/1999/EC sets quality criteria for anti-caking agents.	Purchase anti-caking agent of feed grade quality.	
Salmonella	B	High	High	4	Salmonella is the major hazard for microbiological contamination of feed. Salmonella are widespread in the environment and each link in the food chain, from the producers up to and including the consumers has a role to play in reducing the risk of Salmonella harming animals or humans. FEDIOL together with three other associations representing the suppliers and consumers of feed, ie FEFAC, COCERAL and COPA-COGECA have accepted responsibility for issuing guidance for industry to help it control Salmonella and have published the "Common principles for the management of the Salmonella risk in the feed chain" in June 2011. The European Guide to good practice for the industrial manufacture of safe feed materials has been amended so as to comply with these principles.	FEDIOL, FEFAC, COCERAL, COPA-COGECA Common principles for the management of the Salmonella risk in the feed chain.  <a href="#">FEDIOL Recommendation on moisture content for rape/colza seed meal and sunflower seed meal.</a>	The operator's PRP programme is to cover the following measures:  a) Preserving feed materials from contamination during processing and storage eg by closed systems, hygiene practices, or by separating the premises into hygienic zones as appropriate.  b) Applying time and temperature control on the Desolventiser Toaster (DT).  c) Apply moisture control of the meals/expellers. FEDIOL is recommending a moisture content of rape seed meal of max 12.5%.  If the monitoring system indicates that Salmonella is found in the finished feed material, the following actions shall be considered:  o Carry out serotyping and traceability to identify the source of contamination; o Review processing conditions	The operator shall introduce line monitoring with samples to be taken from the whole line, from where the product leaves the DT, from when it enters the storage silo up to and including the load out area.  The operator is to set realistic targets for reduction of the incidence of Salmonella contamination of his meals/expellers basis historic data.

							<ul style="list-style-type: none"> <li>and relevant pre-requisite programs</li> <li>○Additional cleaning of storage and vehicles (where appropriate);</li> <li>○Additional cleaning of plant and equipment;</li> <li>○Review previous monitoring results</li> <li>○Consider additional training or changes in process or procedures</li> <li>○Applying chemical treatment with the aim to reduce Salmonella to acceptable levels.</li> </ul>	
<b>Dioxin from used bleaching earth</b>	C	Low	High	3	Bleaching clay is of mineral origin and may contain dioxin by nature. Dioxin is toxic to humans and animals.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (<a href="#">16COD137</a>).</p>	The risk only applies to integrated crushing and refining plants.
<b>Hexane residue</b>	C	High	little	3	Hexane residue is present in oilseed meals.	Feed Marketing Regulation EC No 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and from processing aids, unless a maximum content is fixed in the Catalogue. The Catalogue of Feed Materials, Regulation 2022/1104 introduces a threshold for the		Toxicological assessments show that oilseed meals with hexane levels of up to 1000 ppm are feed safe. OVID in Germany has a safety data sheet referring to a max 300 ppm hexane in rape seed meal for explosion prevention during barge transport.

						setting of max contents for these chemical impurities of 0.1% (1000 ppm).		
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on rape seeds shows that residue levels remain within legal limits.	Regulation EC No. 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, provided food safety is assured.		<p>Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities such as rape seeds into compliant food or feed products under the control of the authorities.</p> <p>Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.</p>



			4. Refining					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants in processing aids (such as mercury in caustic soda).	C	Low	High	3	Processing aids come into contact with the product.		Processing aids that directly come into contact with the oil must be for food use or of food grade quality.	

			4.1 Production of refined rape seed oil					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin and dioxin-like PCBs	C	Low	High	3	A potential source of dioxin contamination for the oil is drying of rape seeds and bleaching earth. Nevertheless, the dosage level of bleaching earth during refining is only 1-3%. Dioxin partly evaporates during distillation.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining</a> (16COD137), which includes a max limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	Source fresh bleaching earth from suppliers that fulfil the FEDIOL specifications on fresh bleaching earth.	
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on rape seeds shows that residue levels remain within legal limits.	Regulation EC No. 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing food safety is assured.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.

<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude rape seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
<b>Microbiological contamination</b>	B	Low	Medium	2	Moisture content (i.e. water activity) in refined oils is too low for bacteria to grow.			
<b>Foreign materials like glass, wood, metals, etc.</b>	P	Medium	Medium	3			Apply hygienic practices (eg closed systems) and filter before loading.	

## 4.2 Physical refining: production of rape fatty acid distillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Dioxin</b>	C	Low	High	3	A potential source of dioxin contamination during refining of the oil is bleaching earth. However, the dosage level of bleaching earth during refining is only 1-3%.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>According to Regulation 2015/1905 amending the Feed Hygiene Regulation EC No 1831/2003 100% of the batches of fatty acid distillates for feed shall be tested on the</p>	Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.	

						sum of dioxins and dioxin-like PCBs.  FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining</a> , which includes a max limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value (16COD137).		
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on rape seeds shows that residue levels remain within legal limits.	Regulation EC No 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.		.Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Low	High	3	Some of the banned pesticides may be present in the environment. The chance of finding them in crude rape seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.	Non-complying product should not be applied to feed.	

### 4.3 Chemical refining: production of (salts of) rape soap stocks and rape acid oils

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on rape seeds shows that residue levels remain within legal limits.	Regulation EC No 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.		Footnote 1 of Annex I of Regulation 396/2005 EC No says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude rape seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
Dioxin	C	Very low	High	2	The level of oil soluble contaminants in soap stocks mirrors that of crude oils.	<a href="#">FEDIOL factsheet on feed grade soap stocks from integrated crushing and refining (16SAF214).</a>  <a href="#">FEDIOL factsheet on acid oils from chemical refining for feed (16SAF215).</a>		In integrated crushing and refining plants, soap stocks can safely be put back on the meal.

## 4.4 Chemical refining: production of rape deodistillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Dioxin</b>	C	Medium	High	4	A potential source of dioxin contamination during refining of the oil is bleaching earth. During chemical refining, dioxins concentrate into the deodistillates.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>According to Regulation 2015/1905 amending the Feed Hygiene Regulation EC No 183/2005 100% of the batches of deodistillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that dioxin levels are matching limits of the Undesirable Substances Directive 2002/32 (<a href="#">see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216</a>).</p> <p>Fatty products obtained from batch refining processes combining physical and chemical refining steps in one and the same equipment may be used for feed purposes, provided that there is analytical proof showing that limits for dioxin and pesticide residues are respected.</p> <p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137).</p>	
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on rape seeds shows that residue levels remain within legal limits	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows to use a transfer factor for authorised pesticides into processed products, providing feed safety is assured.		Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.

<p><b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b></p>	<p>C</p>	<p>Medium</p>	<p>High</p>	<p>4</p>	<p>Some of the banned pesticides may be present in the environment. The chance of finding them in crude rape seed oil, however, is very low, but they will concentrate into the distillates during refining.</p>	<p>Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.</p>	<p>Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that pesticide residue levels are matching limits of the Undesirable Substances Directive 2002/32 (see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216).</p>	
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## 5. Hydrogenation of rape seed oil

			5. Hydrogenation of rape seed oil					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Nickel	C	Low	High	3	Nickel is used as a catalyst with hydrogenation (hardening) of oil.		<p>Processing aids that directly come into contact with the oil must be for food use or of food grade quality.</p> <p>Filter the hardened oil.</p>	The nickel content of hardened oils from FEDIOL members is well below 20 ppm.

## A. Storage and transport of rape seeds and rape seed meal

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Toxins from pest control materials</b>	C	Low	High	3	Poisoned grain from open boxes could end up in the food chain.		A pest control programme must be applied that is suitable for use in the food chain.	
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Medium	Medium	3	Post-harvest use of pesticides on oilseeds is critical due to the limited time that is available for the pesticides to break down. The countries of export of oilseeds work with positive lists for the use of pesticides which, for some substances, may conflict with European legislation, particularly in the case of soft seeds such as those of sunflowers. Pesticide used on previous loads during storage and transport can contaminate rape seeds.		Transport and storage companies must use pesticides correctly and document this. Otherwise they must verify that the levels of the residues of the pesticides used during transport and storage comply with EU legislation.	Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Contamination by the previous cargo during the transport by farm cart, truck or barge or ocean going vessel</b>	C	Low	High	3	Transport of oilseeds and oilseed meals usually does not take place in means of transport that are dedicated to the transport of food or feed.		Transport companies must clean farm carts, trucks, barges and ocean-going-vessels before loading. Inspection on cleanliness before loading.	
<b>Contamination by the previous cargo during storage</b>	C	Low	High	3	Oilseeds and oilseed meals may be contaminated with mycotoxin containing previous loads.		Storage companies must clean sites before use and must inspect them on cleanliness before use.	



			<b>B. Transport of rape seed oil and derived products for feed application by tank car, rail tank, barge or coaster (excluding ocean going vessel).</b>					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contamination by previous cargo								
- Tank cars, rail tanks and barges	C	Medium	High	4	Tank cars and barges may have been used for non food or non feed compatible products such as petrochemicals.		Tank cars and barges that are not dedicated to the transport of foodstuff or feeding stuff should have undergone a validated cleaning procedure.	
- Tank cars, tank containers, rail tanks and barges following EU standards for the transport of food stuffs	C	Low	High	3	Transport of most of the vegetable oils is by means of transport that is dedicated to food stuffs.	The Food Hygiene Regulation EC No. 852/2004 requires the transport of liquid food stuffs by tank cars, rail tanks and barges to be dedicated to that of food stuffs.  <a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter A).</a>	Make sure a means of transport is marked "for foodstuffs only".	
- Tank coasters following EU standards for the transport of food stuffs	C	Low	High	3	Tank coasters carrying oils and fats during short sea voyages in the EU must have as an absolute minimum as the immediate previous cargo a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Regulation EU no 579/2014.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	Check previous cargoes via FEDIOL practical guide to previous cargo(es) for means of transport and tank lining (Ref 14COD153). FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent. FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's	

							owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Contamination by cleaning agents</b>								
- Tank cars, rail tanks and barges	C	Medium	Medium	3	Increased risk at cleaning stations that clean both feed and chemical tanks on one site.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter A).</a>	Apply good practices for cleaning of tanks.	
- Tank coasters	C	Medium	Medium	3	Increased risk in case coaster is not dedicated to feed- or foodstuff.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent.  FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Heating or cooling fluids from equipment</b>								
- Tank cars	C	Low	High	3	Stainless steel tanks are used which are heated with cooling water from the motor through a system of double walls (and not coils).	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref. 14COD152 chapter A).</a>	Use of thermal heating fluids in direct heating systems is forbidden.	
- Rail tanks, tank barges	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref</a>	Heating coils of rail tanks must be of stainless steel.  If thermal heating fluids have	The use of hot water or steam heating is recommended.

					of thermal heating fluids into the product is low.	<a href="#">14COD152 chapter A).</a>	been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	
- Tank coasters	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref. 14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	
<b>Foreign bodies</b>	P	Medium	Medium	3			A quality plan should require the loading of tank cars with refined oils under a roof.	

## C. Storage of crude and refined rape seed oil

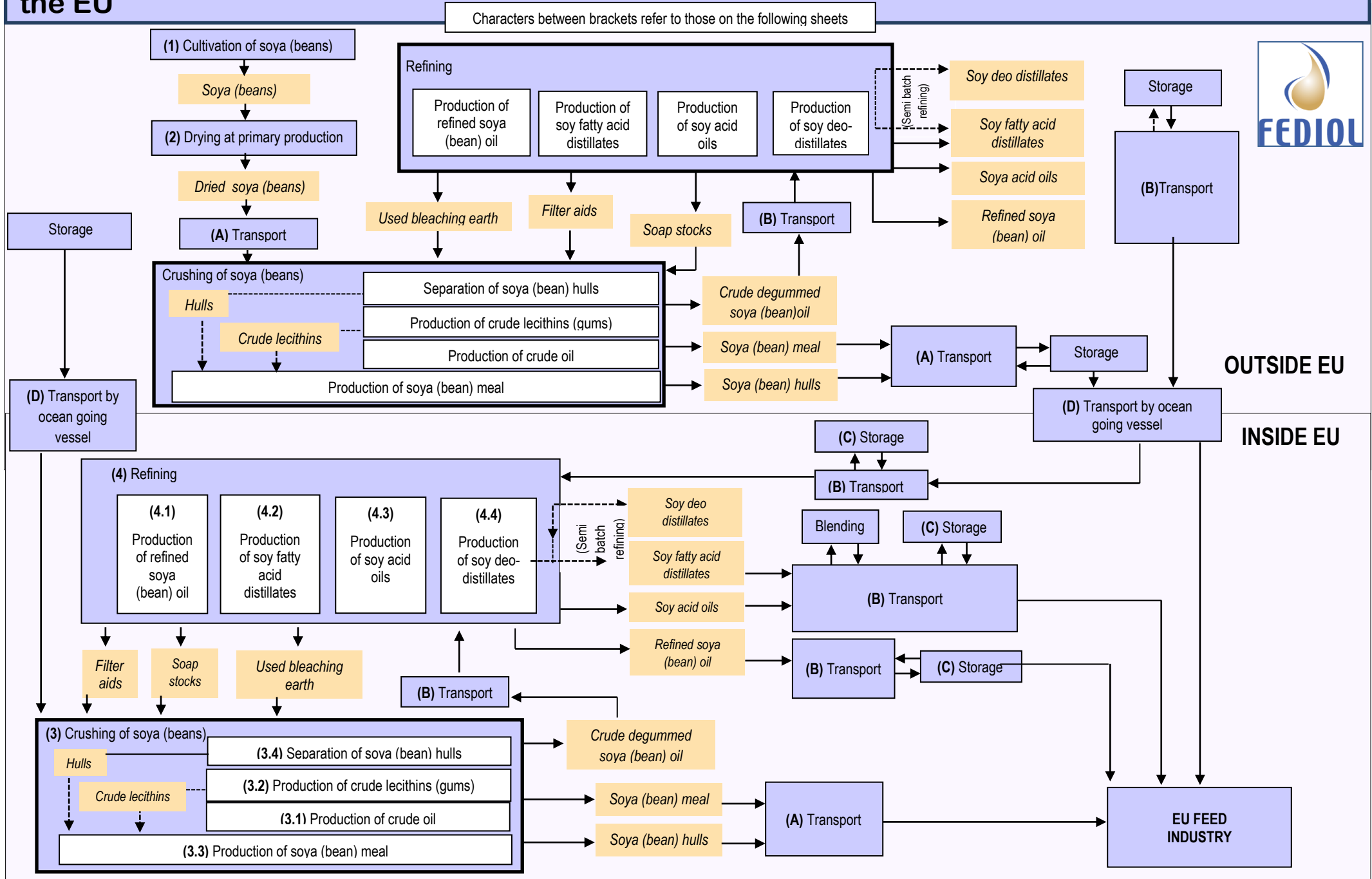
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Contamination due to lack of segregation</b> (contamination from previous cargoes, use of incorrect joinings, shared equipment)	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. Less risk is involved when the tank terminal applies the EU list of acceptable previous cargoes during sea transport to the storage of vegetable oils. Least risk is involved when the vegetable oils are stored in tanks that are dedicated to the storage of foodstuffs.	Terminals in the EU that store oils and fats for food application are obliged to apply HACCP (Regulation EC No. 852/2004)	Food or feed dedication of storage tanks. Otherwise, storage tanks must at least adhere to the EU rules on previous cargoes that have been set up for sea transport in Regulation EU No 579/2014 as amended by Commission Regulation 2016/238.	
<b>Contamination by cleaning agents</b>	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. They may abstain from using cleaning agents that are suitable for use in the food industry. For tank terminals in the EU that apply HACCP and that keep the storage of vegetable oils and chemicals separated, the chance of using the wrong cleaning agents is very low.		Cleaning agents must be suitable for use in the food industry.	
<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Use stainless steel tanks or in case of use of tanks with virgin coating, or do not sell the fatty acid distillate as feed	
<b>Thermal heating fluids from failing equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during storage, the chance of leakage of thermal heating fluids into the product is low.		If thermal heating fluids have been used, the storage company must provide for documentation on net losses and analyse accordingly, if necessary.	The use of water and steam heating is recommended.
<b>Misuse of additives</b>	C	Low	Medium	2	Additives allowed for food oil applied to oil going to feed –or vice versa- for which use they may not have been approved.			

## D. Transport of rape seed oil by ocean going vessel

HAZARD	CAT.	CHANCE	SERIOUSNES S	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Transport contamination								
- Contamination by previous cargoes present in tanks or pipes	C	Medium	Medium	3	Ocean going vessels carrying oils and fats for edible use into the EU must have as an absolute minimum that the immediate previous cargoes is a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Directive 96/3/EC.	<p>Regulation EU No 579/2014 as amended by Commission Regulation 2016/238 (Derogation to Regulation EC No. 852/2004) requires that previous loads have to be checked.</p> <p>FOSFA contracts oblige the seller to inform the buyer what the three preceding cargoes have been during the sea transport of oils and fats.</p> <p><a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).</p> <p>The EU has not regulated the sea transport of oils and fats for feed application.</p>	<p>FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent. FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.</p> <p>The use of dedicated pipe lines at loading and unloading.</p>	
- Contamination by cleaning agents	C	Low	Little	1	Usually maritime business sticks to good practice and cleans tanks with sea water.			

<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Do proper analyses on maiden voyages oil before accepting and monitor refining or do not feed the fatty acid distillate.	
<b>Thermal heating fluids (THF) from equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref. 14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	The use of water and steam heating is recommended.
<b>Hydraulic oils from portable pumps</b>	C	Low	High	3	Hydraulic oils from portable pumps may be toxic.		The use of portable pumps with clear separation of hydraulic motor from pump. If not, hydraulic oils of food grade quality must be used.	Hydraulic motors that are directly linked to the pump allow for unwanted leakages of hydraulic oil into the vegetable oil in case of seal failure.

# Flow chart of the production chain of soya (bean) meal and oil products for feed application in the EU



## 6. Risk assessment of the chain of soybean meal and oil products

### 1. Cultivation of soya (beans)\*

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C				The countries of export of soya (beans) (USA, Brazil, Argentina and Paraguay) work with positive lists for the use of pesticides during cultivation which, for some substances, may conflict with European pesticide residue legislation. Regular monitoring of pesticides on soya (beans) shows that residue levels remain within legal limits.	EC Regulation 396/2005 prohibits putting into circulation commodities that do not comply with the MRLs set in the annexes. EC Regulation No. 178/2006 establishes Annex I that lists the food and feed products for which pesticide residue limits apply. Regulation 149/2008 establishes Annexes II, III and IV that sets the MRLs for the products listed in Annex I.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.
Non-EU-authorized GMOs	B				Different pace of approval of new GMOs between EU and third countries from which oilseeds are imported. Risk of traces of non-EU-authorized GMOs ending up in EU imported oilseeds.			This is an issue of legal compliance, rather than one of food safety.
Phytotoxins	C				Soya (beans) may contain weeds.	Directive 2002/32/EC limits the content of toxic weed seeds.		Visual inspection of soya (beans) is recommended as a control measure.

\* Assessment of risks outside the EU is out of the scope of this document. For more information, see section d) of the Methodology of the FEDIOL food and feed chain risk assessments of the Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining.



			2. Drying of soya (beans) at primary production*					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Contaminants caused by drying</b>								
- dioxin	C				Burning of waste may result in dioxin formation. Up to now the crushers have found dioxin levels in crude soya (bean) oil to be lower than detection limit.	Code of Practice for the prevention and reduction of dioxin and dioxin-like PCB contamination in foods and feeds (Codex CAC/RCP 62-2006).		<p>Good Manufacturing Practices recommend using fuels which are not generating dioxins and dioxin-like compounds and other harmful contaminants.</p> <p>In case of direct heating, proper burners should be used. Monitoring is regarded necessary to ensure that drying or heating processes do not result in elevated levels of dioxins and dioxin-like PCBs. No use of waste products as a fuel for direct drying.</p> <p>Feed materials derived from soya (beans) have to comply with the limits for dioxin and dioxin-like PCBs of the Directive 2002/32/EC.</p>

\* Assessment of risks outside the EU is out of the scope of this document. See also the footnote on the previous page.

			Utilities: soya (beans) crushing, oil refining and processing					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Hydraulic oils or lubricants from equipment	C	Low	High	3	Hydraulic oils and lubricants may contain toxic compounds.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341).</a>	The prerequisite programme should assure that the contamination of product with non-food grade hydraulic oils or lubricants is avoided and that the risk of contamination of the product with hydraulic oils and lubricants that are suitable for incidental contact with food is minimised. The prerequisite programme could involve recording of the quantities used. Equipment requires proper lubrication to operate at optimum performance and reliability. In specific cases where no H1 lubricant could meet the particular lubrication requirements of the equipment, a specific assessment of the lubricant to be used should be performed, including consideration as regards the absence of mineral oil hydrocarbons (MOAH).	
Contaminants in water such as PFOS and PFOA	C	Low	Medium	2	Water is used in the crushing and refining process.	Regulation 183/2005/EC is addressing water use.		
Cleaning agents and boiler chemicals	C	Medium	Medium	3	Cleaning agents and steam (using boiler chemicals) come into contact with the product.		Cleaning agents used in the production system should be flushed. Cleaning agents and boiler chemicals must be suitable for use in the food industry.	

Thermal heating fluids (THF) from equipment	C	Medium	High	4	THF may still be used by non-FEDIOL members.	According to the <a href="#">FEDIOL Code of Practice on the Heating of Edible Oils during Processing</a> , the use of THF is not allowed.	Use hot water or steam heating. Otherwise, a control measure should assure that the contamination of product with thermal heating fluids is avoided.	
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3. Crushing of soya (beans)								
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Toxins from pest control materials	C	Low	High	3	Poisoned grain from open boxes could end up in the food chain.		A pest control programme must be applied that is suitable for use in the food chain.	
Toxic compounds from hexane such as benzene	C	Low	High	3	Industrial hexane may contain toxic compounds.	Directive 2009/32/EC and its amendments sets purity criteria for the use of hexane during the crush of oilseeds.	Food grade hexane must be used. An extraction solvent is considered as being used in compliance with good manufacturing practice if its use results only in the presence of residues or derivatives in technically unavoidable quantities presenting no danger to human health.	
Foreign material like glass, wood, metals, etc.	P	Medium	Medium	3	Foreign material may be present.		A system should be in place that removes foreign material.	
Contaminants from viable seeds and weeds	B	Medium	low	2	Viable seeds from weeds growing in the operator premises or coming from spillage of containers/bags could end up in the food/feed chain			No control needed for food safety reasons, but control needed for environmental reasons.  The prerequisite programme should assure that the

								<p>contamination of product with viable seeds (during the receipt, storage, production, delivery and transport activity) is avoided and the risk of contamination is minimized. The prerequisite programme should include weed seed control.</p> <p>Would any volume of seeds be lost and/or spilled on the premises of the crushing plant (unlikely), this volume should be collected and stored in closed containers/bags. Abnormal effects during weed eradication should be reported to FEDIOL.</p>
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			3.1 Production of crude oil					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants from filter aids	C	Low	High	3	The crude oil can potentially wash contaminants out of the filter aid.	<a href="#">FEDIOL Code of Practice and quality assurance agreement on the purchase and use conditions of fresh bleaching earth and filter aids for vegetable oils and fats refineries and integrated plants (Ref. 16COD137).</a>	Use of filter aids that are suitable for the feed industry.  Monitoring, establishment of quality and safety criteria for the purchase of filter aids.	
Mineral oils from a failing recovery system	C	Medium	Medium	3	Low-medium viscosity mineral oils are used for hexane recovery. It is in the interest of the crusher to recover as much hexane as possible, and to thus maintain the recovery system well and thus to avoid that a possible contamination of the mineral oil is washed out and carried to the vegetable oil by hexane.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341).</a>	Mineral oil of the recovery system must be suitable for incidental contact with food and must be free from mineral oil aromatic hydrocarbons (MOAH). The prerequisite programme should assure that the contamination of product with such oils is avoided and that the risk of contamination of the product with food grade oils is minimised. The prerequisite programme could involve recording of the quantities used.	The limit of GMP+ International for MOSH C (10-40) in oils is 400 mg/kg.
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on soya (beans) shows that residue levels remain within legal limits.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/  concentration factor for pesticides into processed products, provided food safety is assured.  <a href="#">The FEDIOL position (11SAF181)</a> concludes that based on the average oil content in soybeans ranging from 18%-21%, a processing factor of 5 should be used to establish the		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.

						MRL of fat soluble pesticide residues in soybean oil.		
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude soya (bean) oil, however, is very low. The use of endosulfan is allowed on soya (beans). Monitoring data show that its residue in crude oil remains within the legal limit.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
<b>Hexane that resides in the crude oil after recovery</b>	C	High	little	3	After hexane extraction of the oil and subsequent hexane recovery from the oil, traces of hexane will reside in the crude oil.	Feed Marketing Regulation 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and from processing aids, unless a maximum content is fixed in the Catalogue. The Catalogue of Feed Materials, Regulation 2022/1104 introduces a threshold for the setting of max contents for these chemical impurities of 0.1% (1000 ppm).		Toxicological assessments show that crude soya oil with hexane levels of up to 1000 ppm is feed safe. FOSFA has a flash point limit at 121 °C, which is related to transport and storage safety.

## 3.2 Production of crude lecithins

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Mineral oils from a failing recovery system</b>	C	Medium	Medium	3	Low-medium viscosity mineral oils are used for hexane recovery. It is in the interest of the crusher to recover as much hexane as possible, and to thus maintain the recovery system well.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341).</a>	Mineral oil of the recovery system must be suitable for incidental contact with food. The prerequisite programme should assure that the contamination of product with such oils is avoided and that the risk of contamination of the product with food grade oils is minimised. The prerequisite programme could involve recording of the quantities used.	The GMP+ International limit for MOSH C (10-40) in oils is 400 mg/kg.
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on soya (beans) shows that residue levels may exceed legal limits.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing food safety is assured.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.  Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable</b>	C	very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude soya (bean) oil, however, is very low. The use of	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding		

substances in feeding stuff					endosulfan is allowed on soya (beans). Monitoring data show that its residue in crude oil remains within the legal limit.	stuff.		
Hexane that resides in the crude lecithins after recovery	C	High	little	3	After hexane extraction of the oil and subsequent hexane recovery from the oil, traces of hexane will reside in the crude oil.	Feed Marketing Regulation 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and from processing aids, unless a maximum content is fixed in the Catalogue. The Catalogue of Feed Materials, Regulation 2022/1104 introduces a threshold for the setting of max contents for these chemical impurities of 0.1% (1000 ppm).		Toxicological assessments show that feed materials with hexane levels of up to 1000 ppm are feed safe. FOSFA has a flash point limit at 121 °C, which is related to transport and storage safety.
Pathogens	B	Low	Medium	2	Microbiological growth as a result of condensation of water evaporated from the wet gums.			



			3.3 Production of soya (bean) expeller and meal					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin from anti-caking agent	C	Low	High	3	Anti-caking agent is of mineral origin and may contain dioxin by nature. Dioxin is toxic to humans and animals.	Regulation 2439/1999/EC sets quality criteria for anti-caking agents.	Purchase anti-caking agent of feed grade quality.	
Salmonella	B	High	High	4	Salmonella is the major hazard for microbiological contamination of feed. Salmonella are widespread in the environment and each link in the food chain, from the producers up to and including the consumers has a role to play in reducing the risk of Salmonella harming animals or humans. FEDIOL together with three other associations representing the suppliers and consumers of feed, ie FEFAC, COCERAL and COPA-COGECA have accepted responsibility for issuing guidance for industry to help it control Salmonella and have published the "Common principles for the management of the Salmonella risk in the feed chain" in June 2011. The European Guide to good practice for the industrial manufacture of safe feed materials has been amended so as to comply with these principles.	FEDIOL, FEFAC, COCERAL, COPA-COGECA Common principles for the management of the Salmonella risk in the feed chain.	<p>The operator's PRP programme is to cover the following measures:</p> <p>a) Preserving feed materials from contamination during processing and storage eg by closed systems, hygiene practices, or by separating the premises into hygienic zones as appropriate.</p> <p>b) Applying time and temperature control on the Desolventiser Toaster (DT).</p> <p>c) Apply moisture control of the meals/expellers.</p> <p>If the monitoring system indicates that Salmonella is found in the finished feed material, the following actions shall be considered:</p> <p>Carry out serotyping and traceability to identify the source of contamination;</p> <p>Review processing conditions and relevant pre-requisite programs;</p> <p>Additional cleaning of storage and vehicles (where</p>	<p>The operator shall introduce line monitoring with samples to be taken from the whole line, from where the product leaves the DT, from when it enters the storage silo up to and including the load out area.</p> <p>The operator is to set realistic targets for reduction of the incidence of Salmonella contamination of his meals/expellers basis historic data.</p>

							<p>appropriate);</p> <p>Additional cleaning of plant and equipment;</p> <p>Review previous monitoring results;</p> <p>Consider additional training or changes in process or procedures;</p> <p>Applying chemical treatment with the aim to reduce Salmonella to acceptable levels.</p>	
<b>Dioxin from used bleaching earth</b>	C	Low	High	3	<p>Bleaching clay is of mineral origin and may contain dioxin by nature. Dioxin is toxic to humans and animals.</p>	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1,5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1,5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (<a href="#">16COD137</a>).</p>	<p>The risk only applies to integrated crushing and refining plants.</p>
<b>Hexane residue</b>	C	High	Little	3	<p>Hexane residue is present in oilseed meals.</p>	<p>Feed Marketing Regulation 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and from processing aids, unless a maximum content is fixed in the</p>		<p>Toxicological assessments show that oilseed meals with hexane levels of up to 1000 ppm are feed safe. Germany has contractual specifications of max 300 ppm hexane in soybean</p>

						Catalogue. The Catalogue of Feed Materials, Regulation 2022/1104 introduces a threshold for the setting of max contents for these chemical impurities of 0.1% (1000 ppm).		meal for explosion prevention during barge transport.
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on soybeans shows that residue levels remain within legal limits.	Regulation EC No. 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, provided food safety is assured.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities such as soya beans into compliant food or feed products under the control of the authorities.  Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
Cadmium	C	Low	Medium	2	Depending on origin soybeans can contain elevated levels of Cd as a result of fertiliser basis Cd contaminated phosphorus.			This risk is applying to certain geographical origins.

### 3.4 Separation of soya (bean) hulls

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Salmonella	B	High	High	4	Salmonella is the major hazard for microbiological contamination of feed. Salmonella are widespread in the environment and each link in the food chain, from the producers up to and including the consumers have a role to play in reducing the risk of Salmonella harming animals or humans. FEDIOL together with three other associations representing the suppliers and consumers of feed, ie FEFAC, COCERAL and COPA-COGECA have taken their responsibility and have published the "Common principles for the management of the Salmonella risk in the feed chain" in June 2011. The European Guide to good practice for the industrial manufacture of safe feed materials has been amended so as to comply with these principles.	FEDIOL, FEFAC, COCERAL, COPA-COGECA Common principles for the management of the Salmonella risk in the feed chain.	<p>The operator's PRP programme is to cover the following measures:</p> <p>a) Preserving feed materials from contamination during processing and storage eg by closed systems, hygiene practices, or by separating the premises into hygienic zones as appropriate.</p> <p>b) Apply moisture control</p> <p>If the monitoring system indicates that Salmonella is found in the finished feed material, the following actions shall be considered:</p> <p>Carry out serotyping and traceability to identify the source of contamination;</p> <p>Review processing conditions and relevant pre-requisite programs</p> <p>Additional cleaning of storage and vehicles (where appropriate);</p> <p>Additional cleaning of plant and equipment;</p> <p>Review previous monitoring results</p> <p>Consider additional training or changes in process or procedures</p> <p>Applying chemical treatment with the aim to reduce Salmonella to acceptable levels.</p>	
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides,	C	Low	Medium	2	Regular monitoring of pesticide residues on soybeans shows that residue levels	EC Regulation No. 396/2005 sets limits for residues of		Footnote 1 of Annex I of Regulation EC No 396/2005 says that

<p>fungicides or rodenticides above the EU MRL.</p>					<p>remain within legal limits.  MRL policy in third countries differs from EU MRL policy.</p>	<p>pesticides.</p>		<p>MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.</p>
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## 4. Refining

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants in processing aids such as mercury in caustic soda.	C	Low	High	3	Processing aids come into contact with the product.		Processing aids that directly come into contact with the oil must be for food use or of food grade quality.	

			4.1 Production of refined soya (bean) oil					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin and dioxin-like PCBs	C	Low	High	3	A potential source of dioxin contamination for the oil is drying of soybeans and bleaching earth. However, the dosage level of bleaching earth during refining is only 1-3%. Dioxin partly evaporates during distillation.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.	
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on soya (beans) shows that residue levels may exceed legal limits. However, the experience is that pesticide residues are removed during refining.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.		<p>Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.</p> <p>Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.</p>
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude soya (bean) oil, however, is very low. The use of endosulfan is allowed on soya (beans).	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		

					Monitoring data show that its residue in crude oil remains within the legal limit.			
Foreign materials like glass, wood, metals, etc.	P	Medium	Medium	3	Foreign materials may be present.		Apply hygienic practices (eg closed systems). Filter before loading.	

4.2 Physical refining: production of soy fatty acid distillates								
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin	C	Low	High	3	A potential source of dioxin contamination during refining of the oil is bleaching earth. However, the dosage level of bleaching earth during refining is only 1-3%.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>According to Regulation 2015/1905 amending the Feed Hygiene Regulation 183/2005 100% of the batches of fatty acid distillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value</p>	Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.	



						(16COD137).		
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on soya (beans) shows that residue levels may exceed legal limits. During refining pesticide residues move from the oil to the fatty acid distillate.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows to use a processing/concentration factor for pesticides into processed products, providing feed safety is assured.	Check incoming soybeans or the fatty acid distillates. In case of a pesticide residue level exceeding the limit, a feed safety assessment should be carried out.	Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Low	High	3	Some of the banned pesticides may be present in the environment. The chance of finding them in crude soya (bean) oil, however, is very low. The use of endosulfan is allowed on soya (beans). Monitoring data show that its residue in crude oil remains within the legal limit.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.	Non-complying product should not be applied to feed.	

			4.3 Chemical refining: production of soy soap stocks and soy acid oils					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on soya (beans) shows that residue levels remain within legal limits. Level of pesticide residues in acid oil will mirror that in crude oil.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for authorised pesticides into processed products, providing feed safety is assured.	Check incoming beans or the soap stock and acid oil. In case of a pesticide residue level exceeding the limit, a feed safety assessment should be carried out.	Footnote 1 of Annex I of Regulation 396/2005 EC No says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude soya (bean) oil, however, is very low. The use of endosulfan is allowed on soya (beans). Monitoring data show that its residue in crude oil remains within the legal limit.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
Dioxin	C	Very low	High	2	The level of oil soluble contaminants in soap stocks mirrors that of crude oils.	<a href="#">FEDIOL factsheet on feed grade soap stocks from integrated crushing and refining (16SAF214)</a> . <a href="#">FEDIOL factsheet on acid oils from chemical refining for feed (16SAF215)</a> .		In integrated crushing and refining plants, soap stocks can be safely put back on the meal.

## 4.4 Chemical refining: production of soy deodistillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Dioxin</b>	C	Medium	High	4	A potential source of dioxin contamination during refining of the oil is bleaching earth. During chemical refining, dioxins concentrate into the deodistillates.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>According to Regulation 2015/2019 amending the Feed Hygiene Regulation 183/2005 100% of the batches of deodistillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p><a href="#">FEDIOL has developed a Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that dioxin levels are matching limits of the Undesirable Substances Directive 2002/32 (see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216).</p> <p>Fatty products obtained from batch refining processes combining physical and chemical refining steps in one and the same equipment may be used for feed purposes, provided that there is analytical proof showing that limits for dioxin and pesticide residues are respected.</p> <p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (1COD137).</p>	
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on soya (beans) shows that residue levels remain within legal limits. During chemical refining, pesticide residues concentrate into the	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a transfer factor for authorised pesticides into processed products, providing feed safety is		Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products

above the EU MRL.					deodistillates.	assured.		used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Medium	High	4	Some of the banned pesticides may be present in the environment. The chance of finding them in crude soya (bean) oil, however, is very low. During refining, endosulfan may partly end up in the distillate.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.	Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that pesticide residue levels are matching limits of the Undesirable Substances Directive 2002/32 ( <a href="#">see also the FEDIOL factsheet on safe feed application of deodistillates, Ref 16SAF216</a> ).	
<b>Mineral oil</b>	C	Medium	Medium	3	Mineral oil used as anti-dusting agent on soybeans will concentrate in the deodistillate.		Check incoming soybeans or deodistillate.	

5. Hydrogenation of soybean oil								
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Nickel</b>	C	Low	High	3	Nickel is used as a catalyst with hydrogenation (hardening) of oil.		Processing aids that directly come into contact with the oil must be for food use or of food grade quality.  Filter the hardened oil.	The nickel content of hardened oils from FEDIOL members is well below 20 ppm.

			<b>A. Storage and transport of soybeans and soybean meal and hulls</b>					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Toxins from pest control materials</b>	C	Low	High	3	Poisoned grain from open boxes could end up in the food chain.		A pest control programme must be applied that is suitable for use in the food chain.	
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Medium	Medium	3	Post-harvest use of pesticides on oilseeds is critical due to the limited time that is available for the pesticides to break down. The countries of export of oilseeds work with positive lists for the use of pesticides which, for some substances, may conflict with European legislation, particularly in the case of soft seeds such as those of sunflowers.		Transport and storage companies must use pesticides correctly and document this. Otherwise they must verify that the levels of the residues of the pesticides used during transport and storage comply with EU legislation.	Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Contamination by the previous cargo during the transport by farm cart, truck or barge or ocean going vessel</b>	C	Low	High	3	Transport of oilseeds and oilseed meals usually does not take place in means of transport that are dedicated to the transport of food or feed.		Transport companies must clean farm carts, trucks, barges and ocean-going-vessels before loading. Inspection on cleanliness before loading.	
<b>Contamination by the previous cargo during storage</b>	C	Low	High	3	Oilseeds and oilseed meals may be contaminated with mycotoxin containing previous loads.		Storage companies must clean sites before use and must inspect them on cleanliness before use.	
<b>Anti dusting agent on soya (beans)</b>	C	Medium	Medium	3	For dust prevention, the USA allows the spraying of white oils (paraffins) on soya (beans) at levels of up to 200 ppm. In South America soya (bean) oil is used.		Check incoming soybeans from the USA.	

## B. Transport of soybean oil and derived products for feed application by tank car, rail tank, barge or coaster (excluding ocean going vessel).

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contamination by previous cargo								
- Tank cars, rail tanks and barges	C	Medium	High	4	Tank cars and barges may have been used for non food or non feed compatible products such as petrochemicals.		Tank cars and barges that are not dedicated to the transport of foodstuff or feeding stuff should have undergone a validated cleaning procedure.	
- Tank cars, tank containers, rail tanks and barges following EU standards for the transport of food stuffs	C	Low	High	3	Transport of most of the vegetable oils is by means of transport that is dedicated to food stuffs.	The Food Hygiene Regulation No. EC/852/2004 requires the transport of liquid food stuffs by tank cars, rail tanks and barges to be dedicated to that of food stuffs.  <a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter A).</a>	Make sure a means of transport is marked "for foodstuffs only".	
- Tank coasters following EU standards for the transport of food stuffs	C	Low	High	3	Tank coasters carrying oils and fats during short sea voyages in the EU must have as an absolute minimum as the immediate previous cargo a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Regulation EU	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	Check previous cargoes via FEDIOL practical guide to previous cargo(es) for means of transport and tank lining (Ref 14COD153), FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member	

					no 579/2014.		Superintendent. FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Contamination by cleaning agents</b>								
- Tank cars, rail tanks and barges	C	Medium	Medium	3	Increased risk at cleaning stations that clean both feed and chemical tanks on one site.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter A).</a>	Apply good practices for cleaning of tanks.	
- Tank coasters	C	Medium	Medium	3	Increased risk in case coaster is not dedicated to feed- or foodstuff.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent.  FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Heating or cooling fluids from equipment</b>								
- Tank cars	C	Low	High	3	Stainless steel tanks are used which are heated with cooling water from the motor through a system of double walls	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152</a>	Use of thermal heating fluids in direct heating systems is forbidden.	

					(and not coils).	<a href="#">chapter A</a> .		
- Rail tanks, tank barges	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter A)</a> .	Heating coils of rail tanks must be of stainless steel .  If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	The use of hot water or steam heating is recommended.
- Tank coasters	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	
<b>Foreign bodies</b>	P	Medium	Medium	3			A quality plan should require the loading of tank cars with refined oils under a roof.	



			C. Storage of crude and refined soybean oil					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Contamination due to lack of segregation</b> (contamination from previous cargoes, use of incorrect joining, shared equipment)	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. Less risk is involved when the tank terminal applies the EU list of acceptable previous cargoes during sea transport to the storage of vegetable oils. Least risk is involved when the vegetable oils are stored in tanks that are dedicated to the storage of foodstuffs.	Terminals in the EU that store oils and fats for food application are obliged to apply HACCP (Regulation EC No. 852/2004)	Food or feed dedication of storage tanks. Otherwise, storage tanks must at least adhere to the EU rules on previous cargoes that have been set up for sea transport in Regulation EU No 579/2014 as amended by Commission Regulation 2016/238.	
<b>Contamination by cleaning agents</b>	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. They may abstain from using cleaning agents that are suitable for use in the food industry. For tank terminals in the EU that apply HACCP and that keep the storage of vegetable oils and chemicals separated, the chance of using the wrong cleaning agents is very low.		Cleaning agents must be suitable for use in the food industry.	
<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Use stainless steel tanks or in case of use of tanks with virgin coating, or do not sell the fatty acid distillate as feed..	
<b>Thermal heating fluids from failing equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during storage, the chance of leakage of thermal heating fluids into the product is low.		If thermal heating fluids have been used, the storage company must provide for documentation on net losses and analyse accordingly, if necessary.	The use of water and steam heating is recommended.
<b>Misuse of additives</b>	C	Low	Medium	2	Additives allowed for food oil applied to oil for feed –or vice versa- for which use they			

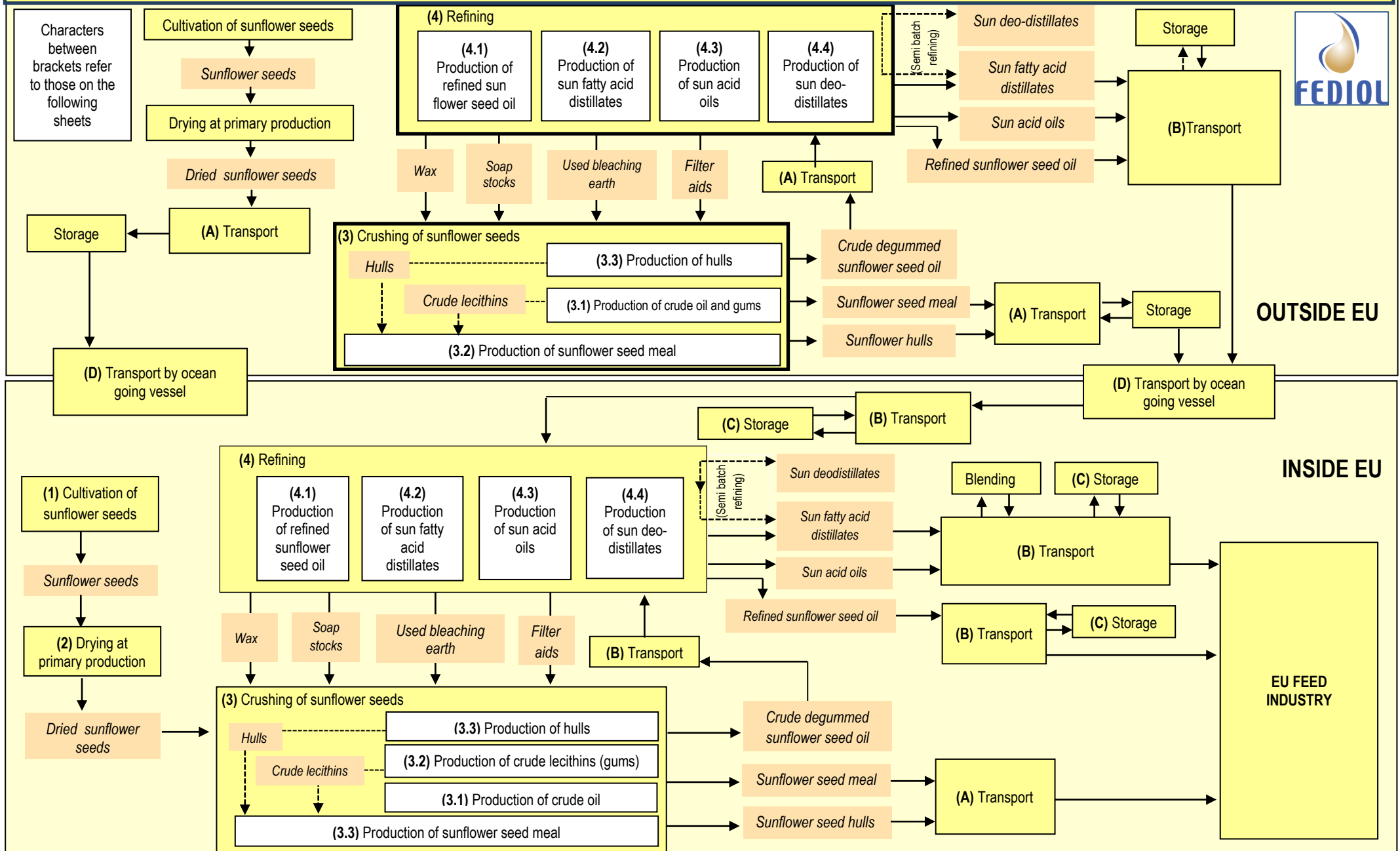
					may not have been approved.			
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## D. Transport of soybean oil by ocean going vessel

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Transport contamination</b>								
- Contamination by previous cargoes present in tanks or pipes	C	Medium	Medium	3	Ocean going vessels carrying oils and fats for edible use into the EU must have as an absolute minimum that the immediate previous cargoes is a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Directive 96/3/EC.	<p>Regulation EU No 579/2014 as amended by Commission Regulation 2016/238 (Derogation to EC Regulation No. 852/2004) requires that previous loads have to be checked.</p> <p>FOSFA contracts oblige the seller to inform the buyer what the three preceding cargoes have been during the sea transport of oils and fats.</p> <p><a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).</p> <p>The EU has not regulated the sea transport of oils and fats for feed application.</p>	<p>FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent. FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.</p> <p>The use of dedicated pipe lines at loading and unloading.</p>	
- Contamination by cleaning agents	C	Low	Low	1	Usually maritime business sticks to good practice and cleans tanks with sea water.			
<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Do proper analyses on maiden voyages oil before accepting and monitor refining or do not feed the fatty acid distillate..	
<b>Thermal heating fluids (THF) from equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if	The use of water and steam heating is recommended.

					low.		necessary.	
<b>Hydraulic oils from portable pumps</b>	C	Low	High	3	Hydraulic oils from portable pumps may be toxic.		The use of portable pumps with clear separation of hydraulic motor from pump. If not, hydraulic oils of food grade quality must be used.	Hydraulic motors that are directly linked to the pump allow for unwanted leakages of hydraulic oil into the vegetable oil in case of seal failure.

# Flow chart of the production chain of sunflower seed oil products for feed application in the EU



## 7. Risk assessment of the chain of sunflower seed meal and oil products

			1. Cultivation of sunflower seeds*					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C				Third countries of export of sunflower seeds (Argentina, Hungary, etc) work with positive lists for the use of pesticides during cultivation which, for some substances, may conflict with European pesticide residue legislation. With sunflower seeds, post-harvest use of pesticides appears to be more critical than pre-harvest use of pesticides.	EC Regulation No. 396/2005 prohibits putting into circulation commodities that do not comply with the MRLs set in the annexes. EC Regulation 178/2006 establishes Annex I that lists the food and feed products for which pesticide residue limits apply. Regulation 149/2008 establishes Annexes II, III and IV that sets the MRLs for the products listed in Annex I.  <a href="#">FEDIOL specifications for purchasing sun seeds from non-EU origin contain MRLs for certain pesticide residues (11SPEC097).</a>		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.
Phytotoxins	C				Sunflower seeds may contain the weed seed Datura Stramonium. This is particularly the case for France.			Visual inspection of sunflower seeds is recommended as a control measure.

\* Assessment of risks outside the EU is out of the scope of this document. For more information, see section d) Methodology of the FEDIOL food and feed chain risk assessments of the Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining

			2. Drying of sunflower seeds at primary production*					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants caused by drying								
- dioxin	C				Burning of waste may result in dioxin formation. Up to now the crushers have found dioxin levels in crude sunflower seed oil to be lower than detection limit.	Code of Practice for the prevention and reduction of dioxin and dioxin-like PCB contamination in foods and feeds (Codex CAC/RCP 62-2006).		<p>Good Manufacturing Practices recommend using fuels which are not generating dioxins and dioxin-like compounds and other harmful contaminants.</p> <p>In case of direct heating, proper burners should be used. Monitoring is regarded necessary to ensure that drying or heating processes do not result in elevated levels of dioxins and dioxin-like PCBs. No use of waste products as a fuel for direct drying.</p> <p>Feed materials derived from sunflower seeds have to comply with the limits for dioxin and dioxin-like PCBs of the Directive 2002/32/EC.</p>

\* Assessment of risks outside the EU is out of the scope of this document. See also the footnote on the previous page.

			Utilities: sunflower seeds crushing, oil refining and processing					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Hydraulic oils or lubricants from equipment	C	Low	High	3	Hydraulic oils and lubricants may contain toxic compounds.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341)</a> .	The prerequisite programme should assure that the contamination of product with non-food grade hydraulic oils or lubricants is avoided and that the risk of contamination of the product with hydraulic oils and lubricants that are suitable for incidental contact with food is minimised. The prerequisite programme could involve recording of the quantities used. Equipment in requires proper lubrication to operate at optimum performance and reliability. In specific cases where no H1 lubricant could meet the particular lubrication requirements of the equipment, a specific assessment of the lubricant to be used should be performed, including consideration as regards the absence of mineral oil hydrocarbons (MOAH).	
Contaminants in water such as PFOS and PFOA	C	Low	Medium	2	Water is used in the crushing and refining process.	Regulation 183/2005/EC is addressing water use.		
Cleaning agents and boiler chemicals	C	Medium	Medium	3	Cleaning agents and steam (using boiler chemicals) come into contact with the product.		Cleaning agents used in the production system should be flushed. Cleaning agents and boiler chemicals must be suitable for use in the food industry.	
Thermal heating fluids (THF) from equipment	C	Medium	High	4	THF may still be used by non-FEDIOL members.	According to the <a href="#">FEDIOL Code of Practice on the Heating of Edible Oils during Processing</a> , the use of THF is not allowed.	Use hot water or steam heating. Otherwise, a control measure should assure that the contamination of product with thermal heating fluids is avoided.	



			3. Crushing of sunflower seeds					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Toxins from pest control materials	C	Low	High	3	Poisoned grain from open boxes could end up in the food chain.		A pest control programme must be applied that is suitable for use in the food chain.	
Toxic compounds from hexane such as benzene	C	Low	High	3	Industrial hexane may contain toxic compounds.	Directive 2009/32/EC and its amendments sets purity criteria for the use of hexane during the crush of oilseeds.	Food grade hexane must be used. An extraction solvent is considered as being used in compliance with good manufacturing practice if its use results only in the presence of residues or derivatives in technically unavoidable quantities presenting no danger to human health.	
Foreign material like glass, wood, metals, etc.	P	Medium	Medium	3	Foreign material may be present		A system should be in place that removes foreign material.	
Contaminants from viable seeds and weeds	B	medium	low	2	Viable seeds from weeds growing in the operator premises or coming from spillage of containers/bags could end up in the food/feed chain			<p>No control needed for food safety reasons, but control needed for environmental reasons.</p> <p>The prerequisite programme should assure that the contamination of product with viable seeds (during the receipt, storage, production, delivery and transport activity) is avoided and the risk of contamination is minimized. The prerequisite programme should include weed seed control.</p> <p>Would any volume of seeds be lost and/or spilled on the premises of the crushing plant</p>

								(unlikely), this volume should be collected and stored in closed containers/bags. Abnormal effects during weed eradication should be reported to FEDIOL.
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			3.1 Production of crude oil					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants from filter aids	C	Low	High	3	The crude oil can potentially wash contaminants out of the filter aid.	<a href="#">FEDIOL Code of Practice and quality assurance agreement on the purchase and use conditions of fresh bleaching earth and filter aids for vegetable oils and fats refineries and integrated plants (Ref. 16COD137).</a>	Use of filter aids that are suitable for the food industry.  Monitoring, establishment of quality and safety criteria for the purchase of filter aids	
Mineral oils from a failing recovery system	C	Medium	Medium	3	Low-medium viscosity mineral oils are used for hexane recovery It is in the interest of the crusher to recover as much hexane as possible, and to thus maintain the recovery system well and thus to avoid that a possible contamination of the mineral oil is washed out and carried to the vegetable oil by hexane.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341).</a>	Mineral oil of the recovery system must be suitable for incidental contact with food and must be free from mineral oil aromatic hydrocarbons (MOAH).. The prerequisite programme should assure that the contamination of product with non-food grade oils is avoided and that the risk of contamination of the product with such oils is minimised. The prerequisite programme could involve recording of the quantities used.	The GMP+ International standard limits the content of MOSH C(10-40) in sunflower seed oils and by-products of refining to 1000 mg/kg.
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on sunflower seeds shows that residue levels remain within legal limits.  MRL policy in third countries differs from EU MRL policy.	EC Regulation No. 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, provided food safety is assured.  <a href="#">The FEDIOL position (11SAF181)</a> concludes that		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.

						based on the average oil content in sunflower seeds, ranging from 40%-45%, a processing factor of 2.5 should be used to establish the MRL of fat soluble pesticide residues in sunflower seed oil.		
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude sunflower seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
<b>Hexane that resides in the crude oil after recovery</b>	C	High	Little	3	After hexane extraction of the oil and subsequent hexane recovery from the oil, traces of hexane will reside in the crude oil.	Feed Marketing Regulation 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and from processing aids, unless a maximum content is fixed in the Catalogue. The Catalogue of Feed Materials, Regulation 2022/1104 introduces a threshold for the setting of max contents for these chemical impurities of 0.1% (1000 ppm).		Toxicological assessments show that crude oil with hexane levels of up to 1000 ppm is safe. FOSFA has a flash point limit at 121° C which is related to transport and storage safety.

			3.2 Production of crude lecithins					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Mineral oils from a failing recovery system	C	Medium	High	3	Low-medium viscosity mineral oils are used for hexane recovery It is in the interest of the crusher to recover as much hexane as possible, and to thus maintain the recovery system well.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341).</a>	Mineral oil of the recovery system must be suitable for incidental contact with food. The prerequisite programme should assure that the contamination of product with non-food grade oils is avoided and that the risk of contamination of the product with food grade oils is minimised. The prerequisite programme could involve recording of the quantities used.	The Dutch GMP standard limits the content of MOSH C(10-40) in sunflower seed oils and by-products of refining to 1000 mg/kg.
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on sunflower seeds shows that residue levels remain within legal limits.  MRL policy in third countries differs from EU MRL policy.	EC Regulation No. 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing food safety is assured.  FEDIOL contract for purchasing sun seeds from the Black Sea area (contains a clause on compliance with EU MRL legislation).		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.  Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude sunflower seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		

<b>Hexane that resides in the crude oil after recovery</b>	C	High	Little	3	After hexane extraction of the oil and subsequent hexane recovery from the oil, traces of hexane will reside in the crude oil.	Feed Marketing Regulation 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and from processing aids, unless a maximum content is fixed in the Catalogue. The Catalogue of Feed Materials, Regulation 2022/1104 introduces a threshold for the setting of max contents for these chemical impurities of 0.1% (1000 ppm).		Toxicological assessments show that feed materials with hexane levels of up to 1000 ppm are safe. FOSFA has a flash point limit at 121° C, which is related to transport and storage safety.
<b>Pathogens</b>	B	Low	Medium	2	Microbiological growth as a result of condensation of water evaporated from the crude lecithins.			

			3.3 Production of sunflower seed expeller and meal					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin from anti-caking agent	C	Low	High	3	Anti-caking agent is of mineral origin and may contain dioxin by nature. Dioxin is toxic to humans and animals.	Regulation 2439/1999/EC sets quality criteria for anti-caking agents.	Purchase anti-caking agent of feed grade quality.	
Salmonella	B	High	High	4	Salmonella is the major hazard for microbiological contamination of feed. Salmonella are widespread in the environment and each link in the food chain, from the producers up to and including the consumers has a role to play in reducing the risk of Salmonella harming animals or humans. FEDIOL together with three other associations representing the suppliers and consumers of feed, ie FEFAC, COCERAL and COPA-COGECA have accepted responsibility for issuing guidance for industry to help it control Salmonella and have published the "Common principles for the management of the Salmonella risk in the feed chain" in June 2011. The European Guide to good practice for the industrial manufacture of safe feed materials has been amended so as to comply with these principles.	FEDIOL, FEFAC, COCERAL, COPA-COGECA Common principles for the management of the Salmonella risk in the feed chain.  FEDIOL Recommendation on moisture content for rape/colza seed meal and sunflower seed meal.	The operator's PRP programme is to cover the following measures:  a) Preserving feed materials from contamination during processing and storage eg by closed systems, hygiene practices, or by separating the premises into hygienic zones as appropriate.  b) Applying time and temperature control on the Desolventiser Toaster (DT).  c) Apply moisture control of the meals/expellers. FEDIOL is recommending a moisture content of sunflower seed meal of max 12.5%.  If the monitoring system indicates that Salmonella is found in the finished feed material, the following actions shall be considered:  o Carry out serotyping and traceability to identify the source of contamination;	The operator shall introduce line monitoring with samples to be taken from the whole line, from where the product leaves the DT, from when it enters the storage silo up to and including the load out area.  The operator is to set realistic targets for reduction of the incidence of Salmonella contamination of his meals/expellers basis historic data.

							<ul style="list-style-type: none"> <li>○Review processing conditions and relevant prerequisite programs</li> <li>○Additional cleaning of storage and vehicles (where appropriate);</li> <li>○Additional cleaning of plant and equipment;</li> <li>○Review previous monitoring results</li> <li>○Consider additional training or changes in process or procedures</li> </ul> Applying chemical treatment with the aim to reduce Salmonella to acceptable levels.	
<b>Dioxin from used bleaching earth</b>	C	Low	High	3	<p>Bleaching clay is of mineral origin and may contain dioxin by nature. Dioxin is toxic to humans and animals.</p>	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137).</p>	<p>The risk only applies to integrated crushing and refining plants.</p>
<b>Mycotoxins</b>	C	Low	High	3	<p>Result of insufficient drying of sunflower seeds</p>		<p>Control the mycotoxin level of the sunflower seed meal.</p>	
<b>Cadmium</b>	C	Medium*	High	4	<p>Cadmium concentrates into the meal during crushing. Depending on the geographical origin sunflower</p>	<p>Directive 2002/32/EC limits the presence of cadmium in feed materials of vegetable</p>	<p>Depending on the origin of the seeds, batch-wise control on</p>	<p>*This chance is applying to certain geographical origins.</p>



					seeds run the risk of having cadmium levels leading to levels exceeding the limit in the meal. Fertiliser on the basis of low quality phosphorus can contain high cadmium levels.	origin to 1 ppm.	incoming sunflower.	
<b>Hexane residue</b>	C	High	little	3	Hexane residue is present in oilseed meals.	Feed Marketing Regulation 767/2009 stipulates that feed materials shall be free from chemical impurities resulting from the manufacturing process and from processing aids, unless a maximum content is fixed in the Catalogue. The Catalogue of Feed Materials, Regulation 2022/1104 introduces a threshold for the setting of max contents for these chemical impurities of 0.1% (1000 ppm).		Toxicological assessments show that oilseed meals with hexane levels of up to 1000 ppm are feed safe. OVID in Germany has a safety data sheet referring to a max 300 ppm hexane in sunflower seed meal for explosion prevention during barge transport.
<b>Arsenic</b>	C	Low	Medium	2	Arsenic contamination of sunflower seeds has been observed in Spain.			
<b>Datura Stramonium</b>	B	Low*	Medium	2		Directive 2002/32/EC limits the maximum content of Datura Stramonium in feed materials to 1000 ppm.		*Certain origins of sunflower seeds can have a medium chance of exceeding the max limit for Datura Stramonium in sunflower seed meal.
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on sunflower seeds shows that residue levels remain within legal limits.  MRL policy in third countries differs from EU MRL policy.	EC Regulation No. 396/2005 sets limits for residues of pesticides.  FEDIOL contract for purchasing sun seeds from the Black Sea area (contains a clause on compliance with EU MRL legislation).		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities such as sunflower seeds into compliant food or feed products under the control of the authorities.  Footnote 1 of Annex I of Regulation EC No 396/2005

								says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
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### 3.4 Separation of sunflower seed hulls

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Salmonella	B	High	High	4	Salmonella is the major hazard for microbiological contamination of feed. Salmonella are widespread in the environment and each link in the food chain, from the producers up to and including the consumers has a role to play in reducing the risk of Salmonella harming animals or humans. FEDIOL together with three other associations representing the suppliers and consumers of feed, ie FEFAC, COCERAL and COPA-COGECA have taken their responsibility and have published the "Common principles for the management of the Salmonella risk in the feed chain" in June 2011. The European Guide to good practice for the industrial manufacture of safe feed materials has been amended so as to comply with these principles	FEDIOL, FEFAC, COCERAL, COPA-COGECA Common principles for the management of the Salmonella risk in the feed chain.	<p>The operator's PRP programme is to cover the following measures:</p> <p>a) Preserving feed materials from contamination during processing and storage eg by closed systems, hygiene practices, or by separating the premises into hygienic zones as appropriate.</p> <p>b) Apply moisture control</p> <p>If the monitoring system indicates that Salmonella is found in the finished feed material, the following actions shall be considered:</p> <ul style="list-style-type: none"> <li>o Carry out serotyping and traceability to identify the source of contamination;</li> <li>o Review processing conditions and relevant pre-requisite programs</li> <li>o Additional cleaning of storage and vehicles (where appropriate);</li> <li>o Additional cleaning of plant and equipment;</li> <li>o Review previous monitoring results</li> <li>o Consider additional training or changes in process or procedures</li> </ul> <p>Applying chemical treatment with the aim to reduce Salmonella to acceptable</p>	

							levels.	
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on sunflower seeds shows that residue levels remain within legal limits.  MRL policy in third countries differs from EU MRL policy.	EC Regulation No. 396/2005 sets limits for residues of pesticides.		Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.

			4. Refining					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants in processing aids  (alkali solution, acids) such as mercury in caustic soda.	C	Low	High	3	Processing aids come into contact with the product.		Processing aids that directly come into contact with the oil must be for food use or of food grade quality.	

			4.1 Production of refined sunflower seed oil					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin and dioxin-like PCBs	C	Low	High	3	A potential source of dioxin contamination during for the oil is drying of sunflower seeds and bleaching earth. However, the dosage level of bleaching earth during refining is only 1-3%. Dioxin partly evaporates during distillation.	Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ). FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a> , which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.	Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.	
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on sunflower seeds shows that residue levels remain within legal limits. However, post-harvest use of pesticides is critical, which can result in sunflower seeds and by-products of refining not respecting MRLs, unless residues are fully removed during refining of the crude oil.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude sunflower seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		

<b>Microbiological contamination</b>	B	Low	Medium	2	Moisture content (i.e. water activity) in refined oils is too low for bacteria to grow.			
<b>Foreign materials like glass, wood, metals, etc.</b>	P	Medium	Medium	3	Foreign materials may be present.		Apply hygienic practices (eg closed systems). Filter before loading.	

			4.2 Physical refining: production of sun fatty acid distillates					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin	C	Low	High	3	A potential source of dioxin contamination during refining of the oil is bleaching earth. However, the dosage level of bleaching earth during refining is only 1-3%.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1,5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>According to Regulation 2015/2019 amending the Feed Hygiene Regulation 183/2005 100% of the batches of fatty acid distillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1,5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.	
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on sunflower seeds shows that residue levels remain within legal limits. However, post-harvest use of pesticides is critical, which can result in sunflower seeds and by-products of refining not respecting MRLs.	<p>Regulation 396/2005 sets limits for residues of pesticides. This regulation allows to use a processing/</p> <p>concentration factor for pesticides into processed products, providing feed safety is assured.</p>		Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be



								applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Low	High	3	Some banned pesticides may be present in the environment. The chance of finding them in crude sunflower seed oil, however, is very low; they will concentrate into the fatty acid distillates during refining.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.	Non-complying product should not be applied to feed.	

### 4.3 Chemical refining: production of sun soap stocks and sun acid oils

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues on sunflower seeds shows that residue levels remain within legal limits. However, post-harvest use of pesticides is critical, which can result in sunflower seeds and by-products of refining not respecting MRLs.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows to use a processing/concentration factor for pesticides into processed products, providing feed safety is assured.		Footnote 1 of Annex I of Regulation 396/2005 EC No says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude sunflower seed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
Dioxin	C	Very low	High	2	The level of oil soluble contaminants in soap stocks mirrors that of crude oils.	<a href="#">FEDIOL factsheet on feed grade soap stocks from integrated crushing and refining (16SAF214).</a> <a href="#">FEDIOL factsheet on acid oils from chemical refining for feed (16SAF215).</a>		In integrated crushing and refining plants, soap stocks can be safely put back on the meal.

## 4.4 Chemical refining: production of sun deodistillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Dioxin</b>	C	Medium	High	4	A potential source of dioxin contamination during refining of the oil is bleaching earth. During chemical refining, dioxins concentrate into the deodistillates.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>According to Regulation 2015/1905 amending the Feed Hygiene Regulation 1831/2003 100% of the batches of deodistillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>FEDIOL has developed <a href="#">a Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that dioxin levels are matching limits of the Undesirable Substances Directive 2002/32 (see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216)..</p> <p>Fatty products obtained from batch refining processes combining physical and chemical refining steps in one and the same equipment may be used for feed purposes, provided that there is analytical proof showing that limits for dioxin and pesticide residues are respected.</p> <p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.</p>	
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Low	Medium	2	Regular monitoring of pesticide residues on sunflower seeds shows that residue levels remain within legal limits. However, during chemical refining, dioxins concentrate into the distillates.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a transfer factor for authorised pesticides into processed products, providing feed safety is assured.		Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs

								will be applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Medium	High	4	Some of the banned pesticides may be present in the environment. The chance of finding them in crude sunflower seed oil, however, is very low, but they will concentrate into the fatty acid distillates during refining.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.	Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that pesticide residue levels are matching limits of the Undesirable Substances Directive 2002/32 ((see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216).	

## 5. Hydrogenation of sunflower seed oil

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Nickel	C	Low	High	3	Nickel is used as a catalyst with hydrogenation (hardening) of oil.		Processing aids that directly come into contact with the oil must be for food use or of food grade quality.  Filter the hardened oil.	The nickel content of hardened oils from FEDIOL members is well below 20 ppm.

## A. Storage and transport of sunflower seeds and sunflower seed meal

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Toxins from pest control materials	C	Low	High	3	Poisoned grain from open boxes could end up in the food chain.		A pest control programme must be applied that is suitable for use in the food chain.	

<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Medium	Medium	3	Post-harvest use of pesticides on oilseeds is critical due to the limited time that is available for the pesticides to break down. The countries of export of oilseeds work with positive lists for the use of pesticides which, for some substances, may conflict with European legislation, particularly in the case of soft seeds such as those of sunflowers. Pesticide used on previous loads during storage and transport can contaminate rape seeds.		Transport and storage companies must use pesticides correctly and document this. Otherwise they must verify that the levels of the residues of the pesticides used during transport and storage comply with EU legislation.	Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Contamination by the previous cargo during the transport by farm cart, truck or barge or ocean going vessel</b>	C	Low	High	3	Transport of oilseeds and oilseed meals usually does not take place in means of transport that are dedicated to the transport of food or feed.		Transport companies must clean farm carts, trucks, barges and ocean-going-vessels before loading. Inspection on cleanliness before loading.	
<b>Contamination by the previous cargo during storage</b>	C	Low	High	3	Oilseeds and oilseed meals may be contaminated with mycotoxin containing previous loads.		Storage companies must clean sites before use and must inspect them on cleanliness before use.	
<b>Adulteration with melamine</b>	C	Low	Medium	2	Analytically, melamine mimics proteins	Regulation 2002/32 sets a limit of 2.5 mg/kg for melamine in feed-materials.		

## B. Transport of sunflower seed oil and derived products for feed application by tank car, rail tank, barge or coaster (excluding ocean going vessel).

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contamination by previous cargo								
- Tank cars, rail tanks and barges	C	Medium	High	4	Tank cars and barges may have been used for non food or non feed compatible products such as petrochemicals.		Tank cars and barges that are not dedicated to the transport of foodstuff or feeding stuff should have undergone a validated cleaning procedure.	
- Tank cars, tank containers, rail tanks and barges following EU standards for the transport of food stuffs	C	Low	High	3	Transport of most of the vegetable oils is by means of transport that is dedicated to food stuffs.	The Food Hygiene Regulation No. EC/852/2004 requires the transport of liquid food stuffs by tank cars, rail tanks and barges to be dedicated to that of food stuffs.  <a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter A).</a>	Make sure a means of transport is marked "for foodstuffs only".	
- Tank coasters following EU standards for the transport of food stuffs	C	Low	High	3	Tank coasters carrying oils and fats during short sea voyages in the EU must have as an absolute minimum as the immediate previous cargo a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Regulation EU no 579/2014.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	Check previous cargoes via FEDIOL practical guide to previous cargo(es) for means of transport and tank lining (Ref 14COD153). FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent. FOSFA	

							combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Contamination by cleaning agents</b>								
- Tank cars, rail tanks and barges	C	Medium	Medium	3	Increased risk at cleaning stations that clean both feed and chemical tanks on one site.	FEDIOL code of working practice for bulk road and tank container transport of fats and oils for direct food use (Ref 07COD138 chapter A).	Apply good practices for cleaning of tanks.	
- Tank coasters	C	Medium	Medium	3	Increased risk in case coaster is not dedicated to feed- or foodstuff.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent.  FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Heating or cooling fluids from equipment</b>								
- Tank cars	C	Low	High	3	Stainless steel tanks are used which are heated with cooling water from the motor through a system of double walls (and not coils).	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter A)</a> .	Use of thermal heating fluids in direct heating systems is forbidden.	

- Rail tanks, tank barges	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter A).</a>	Heating coils of rail tanks must be of stainless steel .  If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	The use of hot water or steam heating is recommended.
- Tank coasters	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	
<b>Foreign bodies</b>	P	Medium	Medium	3			A quality plan should require the loading of tank cars with refined oils under a roof.	

C. Storage of crude and refined sunflower seed oil								
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Contamination due to lack of segregation</b> (contamination from previous	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. Less risk is	Terminals in the EU that store oils and fats for food application are obliged to	Food or feed dedication of storage tanks. Otherwise, storage tanks must at least	

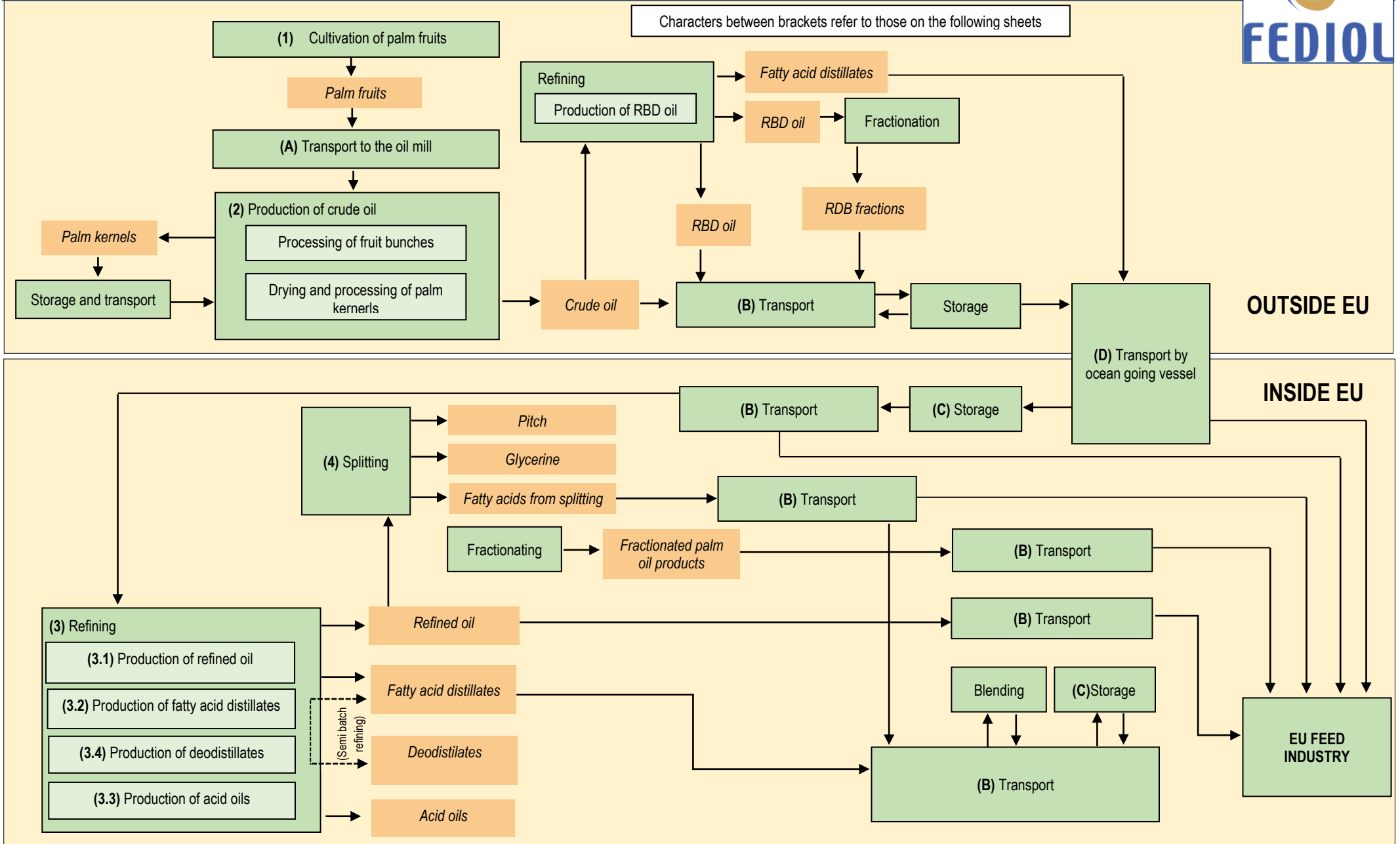


cargoes, use of incorrect joining, shared equipment)					involved when the tank terminal applies the EU list of acceptable previous cargoes during sea transport to the storage of vegetable oils. Least risk is involved when the vegetable oils are stored in tanks that are dedicated to the storage of foodstuffs.	apply HACCP (EC Regulation No. 852/2004)	adhere to the EU rules on previous cargoes that have been set up for sea transport in Regulation EU No 579/2104 as amended by Commission Regulation 2016/238.	
<b>Contamination by cleaning agents</b>	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. They may abstain from using cleaning agents that are suitable for use in the food industry. For tank terminals in the EU that apply HACCP and that keep the storage of vegetable oils and chemicals separated, the chance of using the wrong cleaning agents is very low.		Cleaning agents must be suitable for use in the food industry.	
<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Use stainless steel tanks or in case of use of tanks with virgin coating, or do not sell the fatty acid distillate as feed.	
<b>Thermal heating fluids from failing equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during storage, the chance of leakage of thermal heating fluids into the product is low.		If thermal heating fluids have been used, the storage company must provide for documentation on net losses and analyse accordingly, if necessary.	The use of water and steam heating is recommended.
<b>Misuse of additives</b>	C	Low	Medium	2	Additives allowed for food oil applied to oil going to feed –or vice versa– for which use they may not have been approved.			

			<b>D. Transport of sunflower seed oil by ocean going vessel</b>					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Transport contamination</b>								
- Contamination by previous cargoes present in tanks or pipes	C	Medium	Medium	3	Ocean going vessels carrying oils and fats for edible use into the EU must have as an absolute minimum that the immediate previous cargoes is a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Directive 96/3/EC.	Regulation EU No 579/2014 as amended by Commission Regulation 2016/238 (Derogation to EC Regulation No. 852/2004) requires that previous loads have to be checked.  FOSFA contracts oblige the seller to inform the buyer what the three preceding cargoes have been during the sea transport of oils and fats.  <a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref. 14COD152 chapter B)</a> (including FOSFA operational procedures).  The EU has not regulated the sea transport of oils and fats for feed application.	FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent. FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.  The use of dedicated pipe lines at loading and unloading.	
- Contamination by cleaning agents	C	Low	Little	1	Usually maritime business sticks to good practice and cleans with sea water.			
<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Do proper analyses on maiden voyages oil before accepting and monitor refining, or do not feed the fatty acid distillate.	
<b>Thermal heating fluids (THF) from equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref. 14COD152 chapter B)</a> (including	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible	The use of water and steam heating is recommended.

					of leakage of thermal heating fluids into the product is low.	FOSFA operational procedures).	net losses and analyse accordingly if necessary.	
<b>Hydraulic oils from portable pumps</b>	C	Low	High	3	Hydraulic oils from portable pumps may be toxic.		The use of portable pumps with clear separation of hydraulic motor from pump. If not, hydraulic oils of food grade quality must be used.	Hydraulic motors that are directly linked to the pump allow for unwanted leakages of hydraulic oil into the vegetable oil in case of seal failure.

# Flow chart of the production chain of palm oil and palm kernel oil products for feed applications



## 8. Risk assessment of the chain of palm and palm kernel oil products

			1. Cultivation of palm fruits*					
HAZARD	CAT.	CHANCE	SERIOUSNESS*	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C				The countries of export of palm oil (Indonesia, Malaysia and others such as South America and Africa) work with positive lists for the use of pesticides during cultivation which, for some substances, may conflict with European pesticide residue legislation. Hitherto no residues of pesticides have been detected in palm and palm kernel oil.	EC Regulation 396/2005 prohibits putting into circulation commodities that do not comply with the MRLs set in the annexes. EC Regulation No. 178/2006 establishes Annex I lists the food and feed products for which pesticide residue limits apply. Regulation 149/2008 establishes Annexes II, III and IV that sets the MRLs for the products listed in Annex I.		

\* Assessment of risks outside the EU is out of the scope of this document. For more information, see section d) Methodology of the FEDIOL food and feed chain risk assessments of the Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining.

## 2. Production of crude palm oil and crude palm kernel oil\*

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Boiler chemicals	C				Increased risk at plants without good manufacturing practices.			Steam (using boiler chemicals) that directly comes into contact with the product must be suitable for use in the food industry.
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C				Regular monitoring of pesticide residues shows that these residues seldom occur in crude palm oil and if present are always within legal limits.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing food safety is assured. <a href="#">The FEDIOL position (11SAF181)</a> concludes that based on the average oil content in palm fruits, ranging from 50%-55%, and in palm kernels, of 45 %, processing factors of 2 should be used to establish the MRL of fat soluble pesticide residues in palm oil and palm kernel oil.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C				Some of the banned pesticides may be present in the environment. The chance of finding them in crude palm or palm kernel oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
Recycling of contaminated fat from fat traps in effluent water.	C				Effluent water may be chemically contaminated.			Fat from fat traps in effluent water must not be recycled for food or feed application.
Hydraulic oil or lubricants from equipment	C				Hydraulic oils and lubricants may contain toxic compounds.			The prerequisite programme should assure that the contamination of the product with non-food grade hydraulic oils or lubricants is avoided and that the risk of contamination of the product with hydraulic oils and

								<p>lubricants that are suitable for incidental contact with food is minimised. The prerequisite programme could involve recording of the quantities used.</p> <p>The GMP+ International -limit for MOSH C (10-40) in oils is 400 mg/kg when measured with GC-FID. The GMP+ International limit for C (10-40) is 25 mg/kg when assessed as diesel oil and measured with GC-MS.</p>
<b>Foreign bodies</b>	P				Foreign bodies may be present.			A system should be in place that removes any foreign material.

\* Assessment of risks outside the EU is out of the scope of this document. See the footnote on the previous sheet.

## Utilities: palm and palm kernel oil refining and processing

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Hydraulic oils or lubricants from equipment	C	Low	High	3	Hydraulic oils and lubricants may contain toxic compounds.		<p>The prerequisite programme should assure that the contamination of product with non-food grade hydraulic oils or lubricants is avoided and that the risk of contamination of the product with hydraulic oils and lubricants that are suitable for incidental contact with food is minimised. The prerequisite programme could involve recording of the quantities used.</p> <p>Equipment requires proper lubrication to operate at optimum performance and reliability. In specific cases where no H1 lubricant could meet the particular lubrication requirements of the equipment, a specific assessment of the lubricant to be used should be performed, including consideration as regards the absence of mineral oil hydrocarbons (MOAH).</p>	
Contaminants in water such as Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA)	C	Low	Medium	2	Water is used in the crushing and refining process.	Regulation 183/2005/EC is addressing water use.		



<b>Cleaning agents and boiler chemicals</b>	C	Medium	Medium	3	Cleaning agents and steam (using boiler chemicals) come into contact with the product.		Cleaning agents used in the production system should be flushed. Cleaning agents and boiler chemicals must be suitable for use in the food industry.	
<b>Thermal heating fluids (THF) from equipment</b>	C	Medium	High	4	THF may still be used by non-FEDIOL members.	According to the <a href="#">FEDIOL Code of Practice on the Heating of Edible Oils during Processing</a> , the use of THF is not allowed.	Use hot water or steam heating. Otherwise, a control measure should assure that the contamination of product with thermal heating fluids is avoided.	

### 3. Refining

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Contaminants in processing aids such as mercury in caustic soda.</b>	C	Low	High	3	Processing aids come into contact with the product.		Processing aids that directly come into contact with the oil must be of food grade quality or for food use.	

### 3.1 Production of refined palm and palm kernel oil

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin from bleaching earth	C	Low	High	3	A potential source of dioxin contamination during refining of the oil is bleaching earth. However, the dosage level of bleaching earth during refining is only 1-3%. Dioxin partly evaporates during distillation.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a max limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.	
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues shows that these residues seldom occur in crude palm oil and if present are always within legal limits.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude palm or palm kernel oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
Microbiological contamination	B	Low	Medium	2	Moisture content (i.e. water activity) in refined oils is too low			

					for bacteria to grow.			
Foreign materials like glass, wood, metals, etc.	P	Medium	Medium	3			Apply hygienic practices (eg closed systems) and filter before loading.	

### 3.2 Physical refining: production of palm and palm kernel fatty acid distillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin	C	Medium	High	4	A potential source of dioxin contamination is environmental deposition and bleaching earth. This dioxin may move to the fatty acid distillates during physical refining.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>According to Regulation 225/2012 amending the Feed Hygiene Regulation 183/2005 100% of the batches of fatty acid distillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>This risk may be managed by:</p> <ul style="list-style-type: none"> <li>- positive release of a batch or</li> <li>- active coal treatment to filter dioxin.</li> </ul> <p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.</p>	
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues shows that these residues seldom occur in crude palm oil and if present are always within legal limits.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/ concentration factor for pesticides into processed products, providing feed safety is assured.		Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.

Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Low	High	3	Some of the banned pesticides may be present in the environment. The chance of finding them in crude rapeseed oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.	Non-complying product should not be applied to feed.	
PAH in palm kernel fatty acid distillates	C	High	Medium	4	Light PAHs will concentrate into the fatty acid distillate during deodorisation. In case active coal have been added, heavy PAHs are removed.		Non-complying product should not be applied to feeding stuff.	For palm kernel oil GMP+ International has a limit for the four PAHs benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene and chrysene of 400 microgram/kg.  OVOCOM (GMP) has a limit for BaP of 50 microgram/kg for feed fats.

### 3.3 Chemical refining: Production of palm or palm kernel soap stocks and acid oils

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Low	Medium	2	Regular monitoring of pesticide residues shows that these residues seldom occur in crude palm oil and if present are always within legal limits.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.		Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude palm or palm kernel oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
Dioxin	C	Very low	High	2	The level of oil soluble contaminants in soap stocks mirrors that of crude oils.	<a href="#">FEDIOL factsheet on feed grade soap stocks from integrated crushing and refining (16SAF214)</a> , <a href="#">FEDIOL factsheet on acid oils from chemical refining for feed (16SAF215)</a> .		

### 3.4 Chemical refining: production of palm and palm kernel deodistillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin	C	High	High	4	A potential source of dioxin contamination during refining of the oil is bleaching earth. During chemical refining, dioxins concentrate into the deodistillates.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>According to Regulation 2015/1905 amending the Feed Hygiene Regulation 183/2005 100% of the batches of deodistillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that dioxin levels are matching limits of the Undesirable Substances Directive 2002/32 (see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216).</p> <p>Fatty products obtained from batch refining processes combining physical and chemical refining steps in one and the same equipment may be used for feed purposes, provided that there is analytical proof showing that limits for dioxin and pesticide residues are respected.</p> <p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.</p>	
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides,	C	Low	Medium	2	Regular monitoring of pesticide residues shows that these residues seldom occur	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a rocessing/concentration		Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs

fungicides or rodenticides above the EU MRL.					in crude palm oil and if present are always within legal limits.	factor for pesticides into processed products, providing feed safety is assured.		do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Medium	High	4	Some of the banned pesticides may be present in the environment. The chance of finding them in crude palm or palm kernel oil, however, is very low, but they will concentrate into the distillates during refining.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.	Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that pesticide residue levels are matching limits of the Undesirable Substances Directive 2002/32 (see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216).	
PAH for palm kernel deodistillates	C	High	Medium	4	Light PAHs will concentrate into the deodistillates during deodorisation. In case active coal have been added, heavy PAHs are removed.		Non-complying product should not be applied to feeding stuff.	For palm kernel oil GMP+ International has a limit for the four PAHs benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene and chrysene of 400 microgram/kg. OVOCOM (GMP) has a limit for BaP of 50 microgr/kg for feed fats.



## Splitting of crude and refined oil with water, heat and 4. pressure and subsequent fractional distillation to produce pure fatty acids and glycerine\*

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Dioxin from bleaching earth	C				A potential source of dioxin contamination during refining of the oil is bleaching earth. However, the dosage level of bleaching earth during refining is only 1-3%.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>According to Regulation 225/2012 amending the Feed Hygiene Regulation 183/2005 100% of the batches of pure fatty acids from crude oil for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>		Non-complying product should not be applied to feeding stuff.
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C				Regular monitoring of pesticide residues shows that these residues seldom occur in crude palm oil and if present are always within legal limits.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.		Regulation (EC) 882/2004 allows for the processing of EU imported, non-compliant agricultural commodities into compliant food or feed products under the control of the authorities.
Pesticides residues as listed in EU Directive	C				Some of the banned pesticides may be present in	Directive 2002/32/EC sets limits for a number of pesticides residues in		

2002/32 for undesirable substances in feeding stuff					the environment. The chance of finding them in crude palm or palm kernel oil, however, is very low.	feeding stuff.		
Thermal heating fluids (THF) from equipment	C				THF may still be used by non-FEDIOL members.	According to the <a href="#">FEDIOL Code of Practice on the Heating of Edible Oils during Processing</a> , the use of THF is not allowed.		Use hot water or steam heating. Otherwise, a control measure should assure that the contamination of product with thermal heating fluids is avoided.

\* Assessment of risks outside the EU is out of the scope of this document. See the footnote on the sheet 1 Cultivation of palm fruits..

## 5. Hydrogenation of palm fatty acid distillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Nickel	C	Low	High	3	Nickel is used as a catalyst with hydrogenation (hardening) of oil products.		Processing aids that directly come into contact with the oil must be for food use or of food grade quality.  Filter the hardened product.	The nickel content of hardened oil products from FEDIOL members is well below 20 ppm.
Dioxin congeners turned to ones with a higher toxicity	C	Medium	High	4	Hydrogenation by means of nickel can turn dioxin congeners into more toxic ones.	According to Regulation 2015/1905 amending the Feed Hygiene Regulation 183/2005 100% of the batches of hydrogenated palm fatty acid distillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.		

			<b>A. Transport of fruit bunches and palm kernels to the oil mill and storage of palm kernels*</b>					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Foreign bodies	P				Foreign bodies such as stones from dirty trucks and glass particles, dead rodents and tree leaves can be present.			Load compartments of means of transport must be free from previous load residues before loading fruit bunches.

\* Assessment of risks outside the EU is out of the scope of this document. See the footnote on the sheet 1 Cultivation of palm fruits.

## B. Transport of palm oil and palm kernel oil and derived products for feed application by tank car, rail tank, barge or coaster (excluding ocean going vessel).

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contamination by previous cargo								
- Tank cars, rail tanks and barges	C	Medium	High	4	Tank cars and barges may have been used for non food or non feed compatible products such as petrochemicals.		Tank cars and barges that are not dedicated to the transport of foodstuff or feeding stuff should have undergone a validated cleaning procedure.	
- Tank cars, tank containers, rail tanks and barges following EU standards for the transport of food stuffs	C	Low	High	3	Transport of most of the vegetable oils is by means of transport that is dedicated to food stuffs.	The Food Hygiene Regulation No. EC/852/2004 requires the transport of liquid food stuffs by tank cars, rail tanks and barges to be dedicated to that of food stuffs.  <a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter A).</a>	Make sure a means of transport is marked "for foodstuffs only".	
- Tank coasters following EU standards for the transport of food stuffs	C	Low	High	3	Tank coasters carrying oils and fats during short sea voyages in the EU must have as an absolute minimum as the immediate previous cargo a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Regulation EU no 579/2014.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	Check previous cargoes via FEDIOL practical guide to previous cargo(es) for means of transport and tank lining (Ref 14COD153). FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent. FOSFA	

							combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Contamination by cleaning agents</b>								
- Tank cars, rail tanks and barges	C	Medium	Medium	3	Increased risk at cleaning stations that clean both feed and chemical tanks on one site.	FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref. 14COD152 chapter A).	Apply good practices for cleaning of tanks.	
- Tank coasters	C	Medium	Medium	3	Increased risk in case coaster is not dedicated to feed- or foodstuff.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref. 14COD152 chapter B)</a> (including FOSFA operational procedures).	FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent.  FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Heating or cooling fluids from equipment</b>								
- Tank cars	C	Low	High	3	Stainless steel tanks are used which are heated with cooling water from the motor through a system of double walls	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the</a>	Use of thermal heating fluids in direct heating systems is	

					(and not coils).	<a href="#">European Union (14COD152 chapter A)</a> .	forbidden.	
- Rail tanks, tank barges	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter A)</a> .	Heating coils of rail tanks must be of stainless steel .  If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	The use of hot water or steam heating is recommended.
- Tank coasters	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	
<b>Foreign bodies</b>	P	Medium	Medium	3			A quality plan should require the loading of tank cars with refined oils under a roof.	

## C. Storage of crude and refined palm oil and palm kernel oil

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Contamination due to lack of segregation</b> (contamination from previous cargoes, use of incorrect joinings, shared equipment)	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. Less risk is involved when the tank terminal applies the EU list of acceptable previous cargoes during sea transport to the storage of vegetable oils. Least risk is involved when the vegetable oils are stored in tanks that are dedicated to the storage of foodstuffs.	Terminals in the EU that store oils and fats for food application are obliged to apply HACCP (EC Regulation No. 852/2004)	Food or feed dedication of storage tanks. Otherwise, storage tanks must at least adhere to the EU rules on previous cargoes that have been set up for sea transport in Regulation EU No 579/2014 as amended by Commission Regulation 2016/238.	
<b>Contamination by cleaning agents</b>	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. They may abstain from using cleaning agents that are suitable for use in the food industry. For tank terminals in the EU that apply HACCP and that keep the storage of vegetable oils and chemicals separated, the chance of using the wrong cleaning agents is very low.		Cleaning agents must be suitable for use in the food industry.	
<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Use stainless steel tanks or in case of use of tanks with virgin coating, or do not sell the fatty acid distillate as feed.	



<b>Thermal heating fluids from failing equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during storage, the chance of leakage of thermal heating fluids into the product is low.		If thermal heating fluids have been used, the storage company must provide for documentation on net losses and analyse accordingly, if necessary.	The use of water and steam heating is recommended.
<b>Misuse of additives</b>	C	Low	Medium	2	Additives allowed for food oil applied to oil going to feed –or vice versa- for which use they may not have been approved.			

## D. Transport of palm oil and palm kernel oil by ocean going vessel

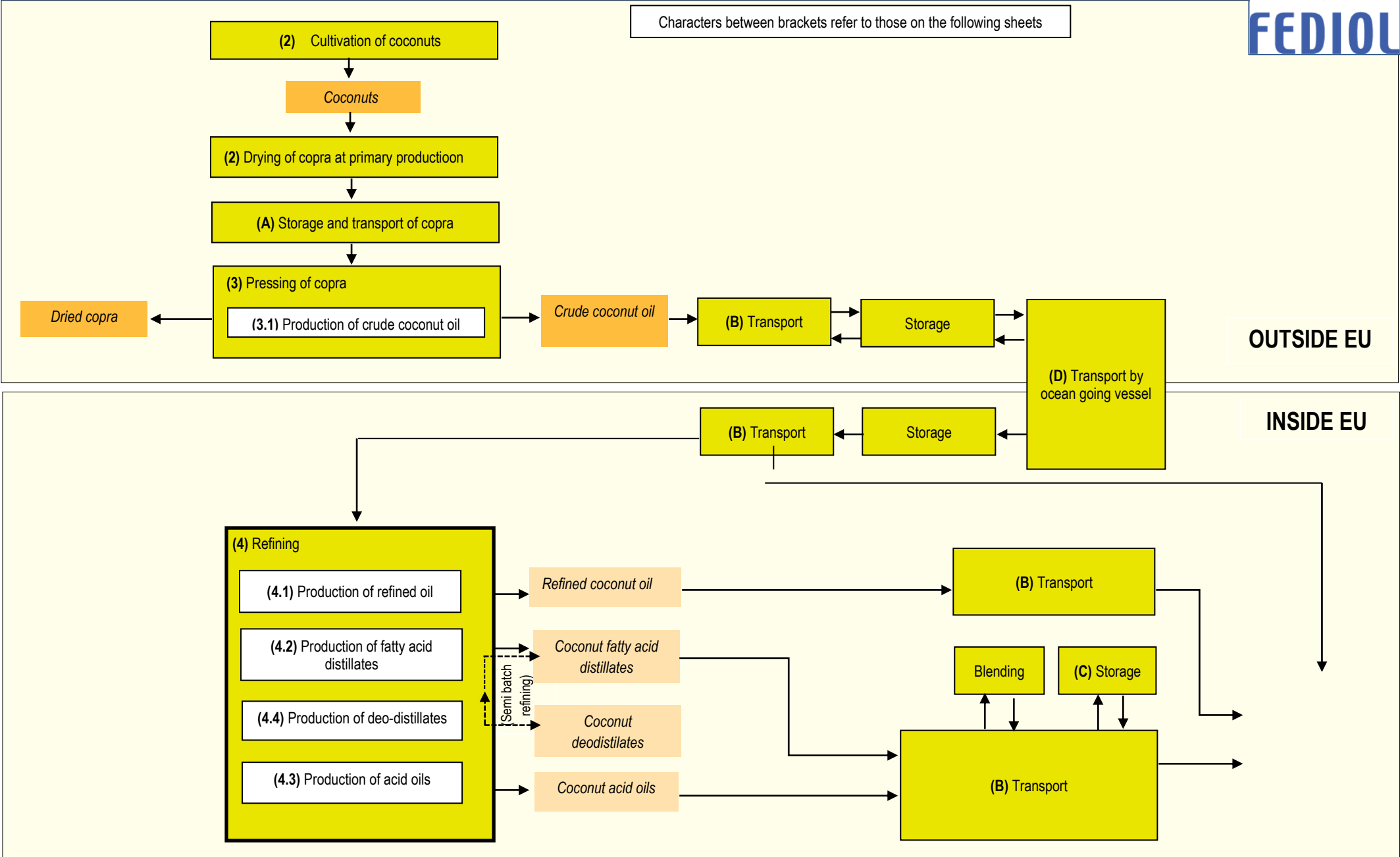
HAZARD	CAT.	CHANCE	SERIOUSNES S	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Transport contamination								
- Contamination by previous cargoes present in tanks or pipes	C	Medium	Medium	3	Ocean going vessels carrying oils and fats for edible use into the EU must have as an absolute minimum that the immediate previous cargoes is a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Directive 96/3/EC.	<p>Regulation EU No 579/2014 as amended by Commission Regulation 2016/238 (Derogation to EC Regulation No. 852/2004) requires that previous loads have to be checked.</p> <p>FOSFA contracts oblige the seller to inform the buyer what the three preceding cargoes have been during the sea transport of oils and fats.</p> <p><a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).</p> <p>The EU has not regulated the sea transport of oils and fats for feed application.</p>	<p>FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent. FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.</p> <p>The use of dedicated pipe lines at loading and unloading.</p>	
- Contamination by cleaning agents	C	Low	Little	3	Usually maritime business sticks to good practice and cleans with sea water.			

<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Do proper analyses on maiden voyages oil before accepting and monitor refining or, or do not feed the fatty acid distillate.	
<b>Thermal heating fluids (THF) from equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref. 14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	The use of water and steam heating is recommended.
<b>Hydraulic oils from portable pumps</b>	C	Low	High	3	Hydraulic oils from portable pumps may be toxic.		The use of portable pumps with clear separation of hydraulic motor from pump. If not, hydraulic oils of food grade quality must be used.	Hydraulic motors that are directly linked to the pump allow for unwanted leakages of hydraulic oil into the vegetable oil in case of seal failure.

# Flow chart of the production chain of coconut oil products for feed application in the E



Characters between brackets refer to those on the following sheets



## 9. Risk assessment of the chain of coconut oil products

1. Cultivation of coconuts*								
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C				The countries of export of coconut oil (Philippines, Indonesia and others) work with positive lists for the use of pesticides during cultivation which, for some substances, may conflict with European pesticide residue legislation. Hitherto no residues of pesticides have been detected in coconut oil.	EC Regulation No. 396/2005 prohibits putting into circulation commodities that do not comply with the MRLs set in the annexes. EC Regulation No. 178/2006 establishes Annex I that lists the food and feed products for which pesticide residue limits apply. Regulation 149/2008 establishes Annexes II, III and IV that sets the MRLs for the products listed in Annex I.		

\* Assessment of risks outside the EU is out of the scope of this document. For more information, see section d) Methodology of the FEDIOL food and feed chain risk assessments of the Sector reference document on the manufacturing of safe feed materials from oilseed crushing and vegetable oil refining.

## 2. Drying of copra at primary production\*

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contaminants caused by drying								
- PAHs	C				Plantations dry copra on open fires, a source of PAH contamination for the copra.			Sun drying or indirect drying with heat exchangers (avoiding contamination of the copra with off-gases) prevents PAH contamination.  JECFA (Joint FAO/WHO Expert Committee on Food Additives) recommends replacing direct drying by indirect drying. In case of direct heating, Good Manufacturing Practices recommend not to use waste products as a fuel for direct drying. Temperature and time should be controlled to avoid PAH formation. The equipment has to be kept clean and well maintained.
- dioxin	C				Plantations dry copra on open fires, a source of dioxin contamination for the copra.	Code of Practice for the prevention and reduction of dioxin and dioxin-like PCB contamination in foods and feeds (Codex CAC/RCP 62-2006).		Waste products must not be used as a fuel for direct drying.
- mineral oil	C				Copra being dried across roads may pick up spilled mineral oil.			
- Aflatoxins	C				Aflatoxins may be formed when copra is not sufficiently dried.	Directive 2002/32/EC limits aflatoxin B1 in copra and products derived to 0.02 mg/kg (based on a product with a moisture content of 12%).		FEDIOL advocates sun drying or (preferably) indirect drying of copra till a moisture content of max 6%.

\* Assessment of risks outside the EU is out of the scope of this document. See the footnote of the previous sheet.

### 3. Pressing or extraction of copra\*

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Toxic compounds from hexane	C				Some coconut oil mills use hexane as an extraction solvent for crude oil. Industrial hexane may contain toxic compounds.	Directive 88/344/EEC sets purity criteria for the use of hexane in the production of foodstuffs.		Hexane for oil extraction must be of food grade quality.
Hydraulic oils or lubricants from failing equipment	C				Hydraulic oils and lubricants may contain toxic compounds.			Contamination of the product with non-food grade hydraulic oils or lubricants have to be strictly avoided, for example by recording of the quantities used.  The risk of contamination of the product with hydraulic oils and lubricants that are suitable for incidental contact with food should be minimised.
Foreign bodies	P				Foreign bodies may be present.			A system should be in place that removes any foreign material.
Recycling of contaminated fat from fat traps in effluent water	C				Effluent water may be chemically contaminated.			Fat from fat traps in effluent water must have a non-food, non-feed destination except in case of dedicated process water fat taps.

\* Assessment of risks outside the EU is out of the scope of this document. See also the footnote of sheet 1. Cultivation of coconuts.

### 3.1. Production of crude coconut oil\*

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
PAHs	C				Concentration of PAHs in crude coconut oil during pressing of the copra.	FOSFA has an optional allowance scheme for crude coconut oil for BaP levels exceeding 50 µg/kg.		For coconut oil GMP+ International has a limit for the four PAHs benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene and chrysene of 400 microgram/kg.  OVOCOM (GMP) has a limit for BaP of 50 microgram/kg for feed fats.
Dioxin	C				A potential source of dioxin contamination is direct drying of the copra.			Monitoring data show that depending on origin crude coconut oil runs the risk of having dioxin levels exceeding the legal limits for this contaminant in feed materials.
Mineral oils	C				Copra being dried across roads may pick up spilled diesel, which will concentrate in the crude oil during the pressing of the oil.			The GMP+ International limits the content of MOSH C(10-40) in oils and fats to 400 mg/kg.
Aflatoxins	C				When improperly dried copra is stored for several days aflatoxin may be formed. Rainfall during storage and transport will accelerate the formation of aflatoxins. Some pick up by crude coconut oil during pressing of the copra.			
Residues of herbicides, insecticides, fungicides or rodenticides above the MRL	C				Pesticides residues have been detected in crude coconut oil.	EC Regulation No. 396/2005 prohibits putting into circulation commodities that do not comply with the MRLs set in the		Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant



						<p>annexes. This regulation allows using a processing/concentration factor for pesticides into processed products, providing food safety is assured. <a href="#">The FEDIOL position (11SAF181)</a> concludes that based on the average oil content in coconuts of 20 %, a processing factor of 5 should be used to establish the MRL in coconut oil.</p>		<p>food or feed products under the control of the authorities.</p>
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\* Assessment of risks outside the EU is out of the scope of this document. See also the footnote of sheet 1. Cultivation of coconuts.

## Utilities: coconut oil refining and processing

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Hydraulic oils or lubricants from equipment	C	Low	High	3	Hydraulic oils and lubricants may contain toxic compounds.	<a href="#">FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses (14COD341).</a>	<p>The prerequisite programme should assure that the contamination of product with non-food grade hydraulic oils or lubricants is avoided and that the risk of contamination of the product with hydraulic oils and lubricants that are suitable for incidental contact with food is minimised. The prerequisite programme could involve recording of the quantities used.</p> <p>Equipment requires proper lubrication to operate at optimum performance and reliability. In specific cases where no H1 lubricant could meet the particular lubrication requirements of the equipment, a specific assessment of the lubricant to be used should be performed, including consideration as regards the absence of mineral oil hydrocarbons (MOAH).</p>	
Contaminants in water such as PFOS and PFOA	C	Low	Medium	2	Water is used in the crushing and refining process.	Regulation 183/2005/EC is addressing water use.		
Cleaning agents and boiler chemicals	C	Medium	Medium	3	Cleaning agents and steam (using boiler chemicals) come into contact with the		Cleaning agents used in the production system should be flushed. Cleaning agents and	

					product.		boiler chemicals must be suitable for use in the food industry.	
<b>Thermal heating fluids (THF) from equipment</b>	C	Medium	High	4	THF may still be used by non-FEDIOL members.	According to the <a href="#">FEDIOL Code of Practice on the Heating of Edible Oils during Processing</a> , the use of THF is not allowed.	Use hot water or steam heating. Otherwise, a control measure should assure that the contamination of product with thermal heating fluids is avoided.	

4. Refining								
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Contaminants in processing aids such as mercury in caustic soda.</b>	C	Low	High	3	Processing aids come into contact with the product.		Processing aids that directly come into contact with the oil must be of food grade quality or for food use.	

## 4.1 Production of refined coconut oil

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>PAHs</b>	C	High	Medium	4	Crude coconut oil may be heavily contaminated with PAHs due to bad drying practices.	EC Regulation No. 1881/2006 sets a 2.0 µg/kg limit for BaP in oils and fats intended for direct human consumption or use as an ingredient in foods.	The amount of active coal added and the intensity of the deodorisation process must be sufficient to remove both heavy and light PAHs.	For coconut oil GMP+ International has a limit for the four PAHs benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene and chrysene of 400 microgram/kg.  OVOCOM (GMP) has a limit for BaP of 50 microgram/kg for feed fats.
<b>Dioxin and dioxin-like PCBs</b>	C	Low	High	3	A potential source of dioxin contamination for the oil is drying of copra and bleaching earth. Crude coconut oil from Papua New Guinea is found to have a high risk of being contaminated with dioxin. The dosage level of bleaching earth during refining is only 1-3%. Dioxin partly evaporates during distillation.	Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).  FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a> , which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.	Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.	
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Medium	Medium	3	Pesticides residues have been detected in coconut oil.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a rocessing/concentration factor for pesticides into processed products, providing feed safety is assured.	Check incoming crude coconut oil or the refined oil.	Regulation (EC) 882/2004 allows for the processing of non-compliant agricultural commodities into compliant food or feed products under the

								control of the authorities.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude coconut oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
<b>Aflatoxins</b>	C	Very low	High	2	Crude coconut oil may be contaminated with traces of aflatoxin.	Directive 2002/32/EC limits aflatoxin B1 in copra and products derived to 0.02 mg/kg (based on a product with a moisture content of 12%).	Validate refining process for aflatoxin removal.	Aflatoxins will disappear under normal refining conditions.
<b>Foreign materials</b>	P	Medium	Medium	3	Foreign materials may be present.		Apply hygienic practices (eg closed systems) and filter before loading.	

## 4.2 Physical refining: production of coconut fatty acid distillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
PAH	C	High	Medium	4	Light PAHs will concentrate into the fatty acid distillate during deodorisation. In case active coal have been added, heavy PAHs are removed.		Non-complying product should not be applied to feeding stuff.	For coconut oil GMP+ International has a limit for the four PAHs benzo(a)pyrene, benzo(a) anthracene, benzo(b) fluoranthene and chrysene of 400 microgram/kg.  OVOCOM (GMP) has a limit for BaP of 50 microgram/kg for feed fats.
Dioxin	C	High	High	4	A potential source of dioxin contamination is drying of the copra and bleaching earth. Crude coconut oil from Papua New Guinea is found to have a high risk of being contaminated with dioxin. The dosage level of bleaching earth during refining is only 1-3%.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>According to Regulation 2015/1905 amending the Feed Hygiene Regulation 183/2005 100% of the batches of fatty acid distillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ) as upperbound value.</p>	<p>Positive release of batches of deodistillates or active coal treatment to filter dioxin.</p> <p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for oil refining.</p>	

<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Medium	Medium	3	Pesticides residues (chlorpyrifos-ethyl, malathion) have been detected in crude coconut oil.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.	Check incoming crude coconut oil or the fatty acid distillate.	Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Low	High	3	Some of the banned pesticides may be present in the environment. The chance of finding them in crude coconut oil, however, is very low, but they will concentrate into the fatty acid distillates during physical refining.	Directive 2002/32/EC sets limits for a number of pesticides residues in feed stuff.	Non-complying product should not be applied to feed.	

### 4.3. Chemical refining: production of coconut soap stocks and acid oils

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
PAHs	C	High	Medium	4	During chemical refining, the PAH content of the fatty acids is expected to be similar to that of the crude coconut oil.		Non-complying product should not be applied to feeding stuff.	For coconut oil GMP+ International has a limit for the four PAHs benzo(a)pyrene, benzo(a) anthracene, benzo(b) fluoranthene and chrysene of 400 microgram/kg.  OVOCOM (GMP) has a limit for BaP of 50 microgram/kg for feed fats.
Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.	C	Medium	Medium	3	Pesticides residues (chlorpyrifos-ethyl, malathion) have been detected in crude coconut oil.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.	Check incoming crude coconut oil or the refining by-product.	Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff	C	Very low	High	2	Some of the banned pesticides may be present in the environment. The chance of finding them in crude coconut oil, however, is very low.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.		
Aflatoxins	C	Low	High	3	Aflatoxins are removed through the treatment of the crude oil with used bleaching earth and activated carbon.  Aflatoxins are water soluble. Otherwise during chemical refining	Directive 2002/32/EC limits aflatoxin B1 in copra and products derived to 0.02 mg/kg (based on a product with a moisture content of 12%).		



					they would move to the soap stock and they may stay with the acid oils.			
<b>Dioxin</b>	C	High	High	4	Presence of dioxin is depending on the origin of the crude coconut oil.		Positive release.	

## 4.4 Chemical refining: production of coconut deodistillates

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
PAH	C	High	Medium	4	Light PAHs will concentrate into the distillates during deodorisation. In case active coal have been added, heavy PAHs are removed.		Non-complying product should not be applied to feeding stuff.	For coconut oil GMP+ International has a limit for the four PAHs benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene and chrysene of 400 microgram/kg.  OVOCOM (GMP) has a limit for BaP of 50 microgram/kg for feed fats.
Dioxin	C	Medium	High	4	A potential source of dioxin contamination during refining of the oil is bleaching earth. During chemical refining, dioxins concentrate into the deodistillates.	<p>Directive 2002/32/EC limits the dioxin content in feed material of vegetable origin to 0.75 ng/kg (WHO-PCDD/F-TEQ) and limits the sum of dioxin and dioxin-like PCBs to 1.5 ng/kg (WHO-PCDD/F-PCB-TEQ).</p> <p>Products intended for animal feed containing a level of undesirable substance that exceeds the legal limit may not be mixed for dilution purposes with the same, or other, products intended for animal feed (Directive 2002/32/EC).</p> <p>According to Regulation 2015/1905 amending the Feed Hygiene Regulation 183/2005 100% of the batches of deodistillates for feed shall be tested on the sum of dioxins and dioxin-like PCBs.</p> <p>FEDIOL has developed a <a href="#">Code of Practice on the purchase conditions of fresh bleaching earth for oil refining (16COD137)</a>, which includes a maximum limit for dioxin and dioxin-like PCBs of 1.5 ng/kg (WHO-PCDD/F-PCB-</p>	<p>Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that dioxin levels are matching limits of the Undesirable Substances Directive 2002/32 (see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216).</p> <p>Fatty products obtained from batch refining processes combining physical and chemical refining steps in one and the same equipment may be used for feed purposes, provided that there is analytical proof showing that limits for dioxin and pesticide residues are respected.</p> <p>Purchase fresh bleaching earth from suppliers that fulfil the FEDIOL specifications as listed in the FEDIOL Code of Practice on the purchase conditions of fresh bleaching earth for</p>	

						TEQ) as upperbound value.	oil refining (16COD137).	
<b>Pesticide residues above the EU MRL, i.e. residues of herbicides, insecticides, fungicides or rodenticides above the EU MRL.</b>	C	Medium	Medium	3	Hitherto residues of pesticides have been detected in crude coconut oil.	Regulation 396/2005 sets limits for residues of pesticides. This regulation allows using a processing/concentration factor for pesticides into processed products, providing feed safety is assured.	Check the crude coconut oil or the deodistillate.	Footnote 1 of Annex I of Regulation EC No 396/2005 says that MRLs do not apply to products used exclusively as ingredients for animal feed, until separate MRLs will be applicable.
<b>Pesticides residues as listed in EU Directive 2002/32 for undesirable substances in feeding stuff</b>	C	Medium	High	4	Some of the banned pesticides may be present in the environment. The chance of finding them in crude coconut oil, however, is very low, but they will concentrate into the distillates during refining.	Directive 2002/32/EC sets limits for a number of pesticides residues in feeding stuff.	Deodistillates from chemical refining are forbidden for use in feed unless they have been treated so as to ensure that pesticide residue levels are matching limits of the Undesirable Substances Directive 2002/32 (see also the FEDIOL factsheet on safe feed application of deodistillates Ref. 16SAF216).	

			<b>A. Storage of copra and transport of copra to the oil mill*</b>					
HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Aflatoxins</b>	C				When improperly dried copra is stored for several days, aflatoxin may be formed.  Rainfall during storage and transport will accelerate the formation of aflatoxins.			Storage and transport companies must protect copra against rainfall and sea water. Aeration during storage.  If copra is processed directly after harvesting, the risk at aflatoxin formation is low.
<b>Foreign bodies</b>	P				Foreign bodies such as stones from dirty trucks and glass particles, dead rodents and tree leaves can be present.			Oil mills must inspect incoming copra and must remove foreign bodies.

\* Assessment of risks outside the EU is out of the scope of this document. See the footnote under sheet 1 Cultivation of coconuts.

## B. Transport of coconut oil and derived products for feed application by tank car, rail tank, barge or coaster (excluding ocean going vessel).

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
Contamination by previous cargo								
- Tank cars, rail tanks and barges	C	Medium	High	4	Tank cars and barges may have been used for non food or non feed compatible products such as petrochemicals.		Tank cars and barges that are not dedicated to the transport of foodstuff or feeding stuff should have undergone a validated cleaning procedure.	
- Tank cars, tank containers, rail tanks and barges following EU standards for the transport of food stuffs	C	Low	High	3	Transport of most of the vegetable oils is by means of transport that is dedicated to food stuffs.	The Food Hygiene Regulation No. EC/852/2004 requires the transport of liquid food stuffs by tank cars, rail tanks and barges to be dedicated to that of food stuffs.  <a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter A).</a>	Make sure a means of transport is marked "for foodstuffs only".	
- Tank coasters following EU standards for the transport of food stuffs	C	Low	High	3	Tank coasters carrying oils and fats during short sea voyages in the EU must have as an absolute minimum as the immediate previous cargo a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Regulation EU no 579/2014.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	Check previous cargoes via FEDIOL practical guide to previous cargo(es) for means of transport and tank lining (Ref 14COD153). FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a	

							FOSFA Member Superintendent. FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Contamination by cleaning agents</b>								
- Tank cars, rail tanks and barges	C	Medium	Medium	3	Increased risk at cleaning stations that clean both feed and chemical tanks on one site.	FEDIOL code of working practice for bulk road and tank container transport of fats and oils for direct food use (Ref 07COD138 chapter A).	Apply good practices for cleaning of tanks.	
- Tank coasters	C	Medium	Medium	3	Increased risk in case coaster is not dedicated to feed- or foodstuff.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).	FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent.  FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.	
<b>Heating or cooling fluids from equipment</b>								

- Tank cars	C	Low	High	3	Stainless steel tanks are used which are heated with cooling water from the motor through a system of double walls (and not coils).	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter A).</a>	Use of thermal heating fluids in direct heating systems is forbidden.	
- Rail tanks, tank barges	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter A).</a>	Heating coils of rail tanks must be of stainless steel.  If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	The use of hot water or steam heating is recommended.
- Tank coasters	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	
<b>Foreign bodies</b>	P	Medium	Medium	3			A quality plan should require the loading of tank cars with refined oils under a roof.	

## C. Storage of crude and refined coconut oil

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Contamination due to lack of segregation</b> (contamination from previous cargoes, use of incorrect joinings, shared equipment)	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. Less risk is involved when the tank terminal applies the EU list of acceptable previous cargoes during sea transport to the storage of vegetable oils. Least risk is involved when the vegetable oils are stored in tanks that are dedicated to the storage of foodstuffs.	Terminals in the EU that store oils and fats for food application are obliged to apply HACCP (EC Regulation No. 852/2004)	Food or feed dedication of storage tanks. Otherwise, storage tanks must at least adhere to the EU rules on previous cargoes that have been set up for sea transport in Regulation 579/2014 as amended by Commission Regulation 2016/238.	
<b>Contamination by cleaning agents</b>	C	Low	High	3	This risk classification applies to terminals that store both chemicals and vegetable oils. They may abstain from using cleaning agents that are suitable for use in the food industry. For tank terminals in the EU that apply HACCP and that keep the storage of vegetable oils and chemicals separated, the chance of using the wrong cleaning agents is very low.		Cleaning agents must be suitable for use in the food industry.	
<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Use stainless steel tanks or in case of use of tanks with virgin coating, or do not sell the fatty acid distillate as feed.	
<b>Thermal heating fluids from failing equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during storage, the chance of leakage of thermal heating fluids into the product is low.		If thermal heating fluids have been used, the storage company must provide for documentation on net losses and analyse accordingly, if necessary.	The use of water and steam heating is recommended.
<b>Misuse of additives</b>	C	Low	Medium	2	Additives allowed for food oil applied to oil going to feed –or vice versa- for			



					which use they may not have been approved.			
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## D. Transport of coconut oil by ocean going vessel

HAZARD	CAT.	CHANCE	SERIOUSNESS	RISK CLASS.	JUSTIFICATION	LEGISLATION, INDUSTRY STANDARDS AND/OR CONTRACT TERMS	CONTROL MEASURE	REMARKS
<b>Transport contamination</b>								
- Contamination by previous cargoes that is present in tanks or pipes	C	Medium	Medium	3	Ocean going vessels carrying oils and fats for edible use into the EU must have as an absolute minimum as the immediate previous cargoes a product that is either a foodstuff or a product appearing on the EU list of accepted immediate cargoes of Directive 96/3/EC.	<p>Regulation 579/2014 as amended by Commission Regulation 2016/238 (Derogation to EC Regulation No. 852/2004) requires that previous loads have to be checked.</p> <p>FOSFA contracts oblige the seller to inform the buyer what the three preceding cargoes have been during the sea transport of oils and fats.</p> <p><a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref 14COD152 chapter B)</a> (including FOSFA operational procedures).</p>	<p>FOSFA certificate of compliance, cleanliness and suitability of Ship's tanks issued by a FOSFA Member Superintendent. FOSFA combined Masters certificate signed by the Captain/First Officer or an equivalent statement signed by the ship's owner or authorised agent, applicable before any loading or cargo transfer.</p> <p>The use of dedicated pipe lines at loading and unloading.</p>	
- Contamination by cleaning agents	C	Low	Little	1	Usually maritime business sticks to good practice and cleans tanks with sea water.			
<b>Solvent from coating</b>	C	Low	High	3	Solvents from virgin coatings migrating to the oil, which may end up in the fatty acid distillates during refining		Do proper analyses on maiden voyages oil before accepting and monitor refining or, or do not feed the fatty acid distillate.	

<b>Thermal heating fluids (THF) from failing equipment</b>	C	Low	High	3	Toxic thermal heating fluids may still be used. However, due to the relatively low heating temperatures applied during transport, the chance of leakage of thermal heating fluids into the product is low.	<a href="#">FEDIOL Code of Practice for the transport in bulk of oils and fats into or within the European Union (Ref.14COD152 chapter B)</a> (including FOSFA operational procedures).	If thermal heating fluids have been used, the transporter of the oil must provide for documentation on possible net losses and analyse accordingly if necessary.	The use of water and steam heating is recommended.
<b>Hydraulic oils from failing portable pumps</b>	C	Low	High	3	Hydraulic oils from portable pumps may be toxic.		The use of portable pumps with clear separation of hydraulic motor from pump. If not, hydraulic oils of food grade quality must be used.	Hydraulic motors that are directly linked to the pump allow for unwanted leakages of hydraulic oil into the vegetable oil in case of seal failure.

## 10. Annex Minimum monitoring requirements- sector vegetable oil and protein meal

### 1. Monitoring plan for oilseeds, vegetable oil and by- products

EFISC-GTP system participants shall implement a monitoring plan as described in the EFISC-GTP Code §4.4.3.

**In case insufficient data is available for a risk assessment the following minimum monitoring requirements shall apply.** The total minimum number of analysis will depend on the volume of feed materials in tons manufactured in one location as shown in the tables below.

**Table A. Oilseeds, expeller, meals, hulls and lecithin**

Annual production in tons/ Parameter	< 300.000	≥300.000 <600.000	≥600.000
<b>Aflatoxine B1*</b>	4	6	8
<b>DON</b>	4	6	8
<b>ZEA</b>	4	6	8
<b>Dioxin</b>	4	6	8
<b>Dioxin PCB</b>	4	6	8
<b>PCB</b>	4	6	8
<b>Salmonella</b>	52	52	52
<b>Heavy metals (Pb, As, Hg, CD)</b>	4	6	8
<b>Pesticides (in seeds)</b>	4	6	8
<b>Pesticides (in meal)</b>	4	6	8

\* The following products have an increased risk for aflatoxins: cotton seed, groundnuts, groundnuts expeller, groundnuts extracted, dried copra, copra expeller, copra extracted and walnut expeller. An additional number of analysis have to be made (See table C).

**Table B. Number of examinations by annual production in tons for one location for feed oils and fats (crude, refined or rumen protected) and their by-products**

Annual production in tons/ Parameter	< 100.000	≥100.000 <250.000	≥250.000
<b>Dioxin*</b>	8	10	12
<b>dI PCB*</b>	8	10	12
<b>PCB</b>	8	10	12
<b>Nickel**</b>	4	6	8
<b>Pesticides</b>	4	6	8
<b>PAH (BAP)</b>	4	6	8

\* Control plan for dioxin testing of fatty acids distillates, palm fatty acid distillates, hydrogenated deodistillates , soap stock and acid oils and crude coconut oil (see the FEDIOL Code of practice on dioxins).

\*\*Analysis only when nickel is used in the manufacturing process.

No examinations for mycotoxins with vegetable oils and fats with the exemption of crude coconut oil: see table C

**Table C. Number of additional Aflatoxine B1 analysis by location/ year**

Annual production in tons/ Parameter	< 300.000	≥300.000 <600.000	≥600.000
<b>Aflatoxine B1</b>	12	16	24

