



Country specific requirements for transfrontier transport and use of recycling-derived fertilisers in NW Europe

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Summary and conclusions

The objective of the NWE-Interreg project ReNu2Farm is to increase the use and production of recycled nitrogen (N), phosphorus (P) and potassium (K) for fertilisers in Northwest Europe (NWE).

The proper development of the market for biobased, recycling-derived fertilisers is hampered among others by the legal status of the fertilisers. Because the products are often produced from waste or from animal by-products, the end products are considered as waste or animal by-products as well. For that reason, it is not allowed or difficult to trade these products between member states within EU as fertiliser. In an adjacent report that has been written within the scope of the ReNu2Farm project the legislative framework at EU level for the trade and use of recycling derived fertilisers has been described. An important development has been the publication of the EU Fertilising Product Regulation 2019/1009 in June 2019, which will replace the current Fertiliser Regulation EC 2003/2003 from July 2022 onwards. EU regulation 2019/1009 aims at 'facilitating the recognition of organic and waste-based fertilisers in the single market and thus encourage the recycling of bio-nutrients as fertilising products in the circular economy'. However, EU Regulation 2019/1009 is facultative, which means that it exists next to the continuing national legislations for the trade of fertilisers. In the present report, we describe national legislations for the trade and use of fertiliser products in countries in North West Europe (NWE). Based on that overview, we identified legal barriers for the trade of fertiliser products.

The countries in the NWE area have their own national legislations:

- The Netherlands: Fertiliser Act (Meststoffenwet) and the accompanying Implementation Decree (Uitvoeringsbesluit Meststoffenwet) and Implementation Regulation (Uitvoeringsregeling Meststoffenwet).
- Belgium: Royal Decree on the marketing and use of fertilisers, soil improvers and culture substrates (Koninklijk besluit betreffende het in de handel brengen en het gebruiken van meststoffen, bodemverbeterende middelen en teeltsubstraten).
- France: The marketing of national fertilisers in France is regulated by the Rural code (Code Rural, Livre II, Chapitre V : Mise sur le marché et utilisation des matières fertilisantes, des adjuvants pour matières fertilisantes et des supports de culture L.255-1 à L.255-18), the Decree of 21 December 1998 concerning the authorisation of fertilisers and cultivation materials (Arrêté du 21 décembre 1998 relatif à l'homologation des matières fertilisantes et des supports de culture) and the Decree of September 2003 on the mandatory implementation of standards. (Arrêté du 5 septembre 2003 portant mise en application obligatoire de normes).

- Germany: The manufacture, placing on the market and use of fertilisers, soil improvers, culture media and plant aids are governed by the Fertiliser Act (DüG) and its regulations. The requirements for placing fertilisers on the market are laid down in the Düngemittelverordnung (DüMV) (Fertiliser Regulation). It covers the requirements on the origin of the products, appearance, nutrient contents, maximum levels of contaminants and tolerance levels.
- Ireland: The marketing of national fertilisers in Ireland is regulated by the Fertilisers, Feeding stuff and Mineral Mixtures Act 1955 and the Statutory Instrument SI 248/1978 Marketing of non-EEC fertilisers regulations 1978.
- United Kingdom: For (mineral) EC Fertilisers, England and Wales has developed the EC Fertilisers Regulation 2006. In addition, national fertilisers are regulated via the Fertiliser Regulations 1991 and 1998. Because UK has left the EU (Brexit), things have been changed from 1 January 2021, fertilisers are marketed under either the domestic framework or the new 'UK fertiliser' label, which have replaced the EC Fertiliser label.

With respect to the consequences of national legislations for the possibilities for recycling derived fertilisers (RDF's), it is concluded that:

- RDF's are treated differently in the national legislations of member states within NW Europe, amongst others in the following ways:
 - Procedures for the authorisation of waste or by-products as fertiliser are often not clear and strongly differ between countries.
 - In some countries, recycling derived fertilisers are authorised by a category with minimum criteria, while in other countries the same products undergoes a case-by-case authorisation, that is applicable only to the specific product from a specific waste stream / site / process and/or a specific producer.
 - Criteria for contaminants like heavy metals are different between countries, so that a specific RDF may meet the criteria for heavy metals in one country and not in another country;
 - The fertiliser status and end-of-waste status are of relevance. In some countries, the end-of-waste status is supplied as soon as a product receives a fertiliser status, but in other countries that is not the case.
- As a result of the first conclusion, a specific RDF (this is for example the case with poultry litter ash and struvite) may have a fertiliser status in one country and a waste status in another country. This hampers the recycling of nutrients from waste, because it hinders:
 - cross-border transport,
 - to use it as raw material in fertiliser production,
 - to use it as a component for blending,

- to market and use it directly as a fertiliser in different countries.
- Mutual recognition is interpreted differently by the member countries within NW Europe, and in practice most countries prescribe the regular procedure for the authorisation of fertilisers, even if a fertiliser product has a fertiliser status in another member state.
- It requires a lot of administrative work and good knowledge of the authorisation procedures for getting a fertiliser or end-of-waste status in the different countries.

1 Introduction

The objective of the NWE-Interreg project ReNu2Farm is to increase the use and production of recycled nitrogen (N), phosphorus (P) and potassium (K) for fertilisers in Northwest Europe (NWE).

Within the scope of sustainable agriculture and a circular, biobased economy, it is crucial to find ways to reduce quantities of non-recycled nutrients like N, P and K and to decrease the dependency on nutrient import. In the NWE Interreg project ReNu2Farm opportunities for the replacement of nutrients from traditional mineral fertilisers by recycling derived fertilisers are explored. Within the NWE territory, regional differences can be identified with respect to nutrient supply and demand. Hot spots with a surplus of N and P from animal manure are identified in the NWE and at the same time, there are regions with a shortage of nutrients from animal manure. Opportunities for the replacement of nutrients from traditional mineral fertilisers by recycling-derived fertilisers from regions with a nutrient surplus are explored within the scope of the current project.

The proper development of the market for bio based, recycling derived fertilisers is hampered among others by the legal status of the fertilisers. Because the products are often produced from waste or from animal by-products (e.g., sewage sludge, food waste and animal manure), the end products are considered as waste or animal by-products as well. For that reason, it is not allowed or difficult to trade these products between member states within EU as fertiliser.

In another report that has been written within the scope of the ReNu2Farm project (Van Schöll & Postma, 2022) the legislative framework at EU level for the trade and use of recycling-derived fertilisers has been described. An important development is the publication of the EU Fertilising Product Regulation 2019/1009 in June 2019, which replaces the Fertiliser Regulation EC 2003/2003 from July 2022 onwards. EU regulation 2019/1009 aims at 'facilitating the recognition of organic and waste-based fertilisers in the single market and thus encourage the recycling of bio-nutrients as fertilising products in the circular economy'. When strict rules for the safe recovery of nutrients into secondary raw materials are fulfilled, those raw materials may be used as a component of CE-marked fertilising products, which are classified in Product Function Categories (PFC's). The consequence is that RDF's may become an EU fertiliser product, provided that they meet the requirements for raw materials (classified in component material categories, or CMC's), production and contaminants. In order to verify that EU fertilising products comply with the requirements of this FPR, conformity assessment procedures have been defined. The procedures differ in dependence of the PFC's that are produced and the CMC's that are used.

EU Regulation 2019/1009 is facultative, which means that it exists next to the continuing national legislations for the trade of fertilisers. If a CE mark is used for a fertiliser, the product should comply with EU Regulation 2019/1009. However, it is also possible to choose for national legislations and regulations, which is especially of interest for products that are meant for use in the region or country and/or for products that are exported from one country to another.

In the present report, we describe national legislations for the trade and use of fertiliser products in countries in Northwest Europe (NWE). Based on that overview, we identified legal barriers for the trade of fertiliser products.

2 National legislations

2.1 General

Every member state has its' own national legislation for the trade and use of fertilisers, which will still exist after the new EU Fertiliser regulation 2019/1009 is in place. After publication of EU 2019/1009 in July 2019 the member states started to implement that in national legislations. This process should be finished in July 2022, because EC Fertiliser regulation 2003/2003 will be withdrawn then. In general, it is expected that most member states will leave their national legislations unchanged.

The countries in the NWE area have their own national legislations:

- The Netherlands: Fertiliser Act (Meststoffenwet) and the accompanying Implementation Decree (Uitvoeringsbesluit Meststoffenwet) and Implementation Regulation (Uitvoeringsregeling Meststoffenwet).
- Belgium: Royal Decree on the marketing and use of fertilisers, soil improvers and culture substrates (Koninklijk besluit betreffende het in de handel brengen en het gebruiken van meststoffen, bodemverbeterende middelen en teeltsubstraten).
- France: The marketing of national fertilisers in France is regulated by the Rural code (*Code Rural, Livre II, Chapitre V : Mise sur le marché et utilisation des matières fertilisantes, des adjuvants pour matières fertilisantes et des supports de culture L.255-1 à L.255-18*), the Decree of 21 December 1998 concerning the authorisation of fertilisers and cultivation materials (*Arrêté du 21 décembre 1998 relatif à l'homologation des matières fertilisantes et des supports de culture*) and the Decree of September 2003 on the mandatory implementation of standards. (*Arrêté du 5 septembre 2003 portant mise en application obligatoire de normes*).
- Germany: The manufacture, placing on the market and use of fertilisers, soil improvers, culture media and plant aids are governed by the Fertiliser Act (DüG) and its regulations. The requirements for placing fertilisers on the market are laid down in the Düngemittelverordnung (DüMV) (Fertiliser Regulation). It covers the requirements on the origin of the products, appearance, nutrient contents, maximum levels of contaminants and tolerance levels.
- Ireland: The marketing of national fertilisers in Ireland is regulated by the Fertilisers, Feeding stuff and Mineral Mixtures Act 1955 and the Statutory Instrument SI 248/1978 Marketing of non-EEC fertilisers regulations 1978.
- United Kingdom: For (mineral) EC Fertilisers, England and Wales has developed the EC Fertilisers Regulation 2006. In addition, national fertilisers are regulated via the Fertiliser Regulations 1991 and 1998. Because UK will leave the EU (Brexit), things

will change and from 1 January 2021, fertilisers will have to be marketed under either the domestic framework or the new 'UK fertiliser' label, which will replace the EC Fertiliser label.

In the following paragraphs, the national legislations and regulations are described per country, with special emphasis on the legislation with regard to recycling derived fertilisers.

2.2 The Netherlands

2.2.1 Regulation of National Fertilisers

The marketing of fertilisers in the Netherlands is regulated by the Fertiliser Act (Meststoffenwet) and the accompanying Implementation Decree (Uitvoeringsbesluit Meststoffenwet) and Implementation Regulation (Uitvoeringsregeling Meststoffenwet). The Fertiliser Act defines the general requirements and criteria for fertiliser categories. Fertiliser categories are EC-Fertilisers, regained phosphates, sewage sludge, compost, animal manure, liming materials, other organic fertilisers and other inorganic fertilisers. The Fertiliser Act of the Netherlands designates nutrients, acid neutralising value and organic matter as agronomic valuable components of fertilisers. For the protection of the health of the environment, plants, animals and human the contents of heavy metals, arsenic and organic micro-contaminants are limited. The specific criteria for the different fertiliser categories are defined in the 'Implementation Decree' and 'Implementation Regulation'. Thresholds for contaminants are expressed on nutrient content and are roughly based on a maximum amount that may be brought to the soil. It is the responsibility of the producer that the fertiliser product complies to the requirements of the Fertiliser Act. Any product that complies to the requirements and criteria for a fertiliser category can be marketed without registration or authorisation, with the exception of fertiliser products that are produced from waste or residue products.

2.2.2 Regulation of recycling-derived fertiliser products

The handling and management of waste and residue products is regulated by the Environmental Act (Wet Milieubeheer). When waste products are authorised for use as a fertiliser according to provisions in the Fertiliser Act these are exempted from waste management requirements on handling, management and transport.

Compost, sewage sludge and regained phosphates (amongst which struvite) are defined as fertiliser categories in the Fertiliser Act. All other waste and residue products have to be registered on a positive list (Fertiliser Act Implementation Regulation, Annex Aa, Bijlage Aa Uitvoeringsregeling Meststoffenwet) to be authorised as a fertiliser product or component for the production of fertiliser products. Authorisation is given to specifically defined substances but is not limited to a specific producer or trademark. The time frame for registration of a waste or residue product as fertiliser is at least 6 months (but often

longer) and is free of charge. No end-of-waste status is given to products that are authorised as fertiliser!

A list of substances that may be used as a fertiliser or for the production of fertilisers can be found at the website of the national government (Fertiliser Act Implementation Regulation, Annex Aa) <https://wetten.overheid.nl/BWBR0018989/2020-04-16/#BijlageAa>.

A summary of the legal status of recycling-derived fertilisers in the Netherlands is as follows:

- Ashes: waste; not authorised as fertiliser (generally too high contents heavy metals, especially Cu);
- Struvite: fertiliser category. Still waste, exempted from waste management regulations if used as fertiliser;
- Compost: fertiliser category. Still waste, but exempted from requirements on waste management regulations;
- Digestate: animal manure, fertiliser category. Digestion of manure with co-materials is only allowed if these co-materials are authorised for such use by registration on the Annex Aa of the Implementation Regulation Fertiliser Act.
- Ammonium sulphate from air scrubbing (biological or chemical): authorisation is considered as an inorganic fertiliser if recovered from authorised sources. Only few products are authorised as far as they originate from air from stables, composting of sewage sludge with green cuttings or poultry manure, drying facilities. Ammonium sulphate from other sources is not allowed to be used as a fertiliser. Mixing with other fertilisers is not allowed.
- Ammonium salts from stripping and scrubbing of manure or derived products are regarded as animal manure, following the definition in the Nitrate directive.
- Pig urine: animal manure, fertiliser category.

2.2.3 Mutual recognition of fertiliser products

Mutual recognition applies to fertilisers that are lawfully produced or put on the market in another EU member state or another state with which agreements have been made. However, these products are required to comply with the same or higher level of environmental safety as set in the Fertiliser Act. So, mutual recognition applies, but only when the requirements for the protection of the health of humans, animals or environment are equivalent to those for the Dutch national fertilisers. In practice this will mean that registration on the positive list will be required for recycling derived fertilisers.

2.3 Belgium

2.3.1 Regulation of national fertilisers

The marketing of fertilisers in Belgium is regulated by the Royal Decree on the marketing and use of fertilisers, soil improvers and culture substrates (28 JANUARI 2013-Koninklijk besluit betreffende het in de handel brengen en het gebruiken van meststoffen, bodemverbeterende middelen en teeltsubstraten). The Royal Decree contains general requirements on quality and labelling of fertiliser products, and a positive list of fertiliser types (as Annex 1). Each fertiliser type is defined by a specific type designation, a description, quality requirements (amongst others criteria on nutrient content), comparable to the Annex I of the Fertiliser Regulation EG 2003/2003. Except for sewage sludge, no criteria for contents of heavy metals or other contaminants in fertiliser types are defined. Fertiliser products that do not comply with one of the fertiliser types may only be brought to the market by derogation.

2.3.2 Regulation of recycling-derived fertiliser products

For waste products, derogation can only be granted if the product is authorised for use as fertiliser or soil improver by the regional authorities. The waste management in Belgium is regulated at the regional level (Flanders, Wallonia and Brussels region). Products are authorised if they are registered on a positive list (Flanders: VLAREMA annex 2) or have obtained a resource certificate (Grondstoffenverklaring) or -for organic waste streams- an inspection certificate (VLACO Keuringsattest). Products with a resource certificate or inspection certificate are considered as end-of-waste in Belgium.

Resource and inspection certificates are specific for a certain product and production location and for specific use. Products have to be safe to use for human health and environment within the good agricultural practice, for which thresholds for contents of heavy metals and organic contaminants are defined (Flanders: VLAREMA annex 2).

A list of derogations and authorisations is publicly available (www.fytoweb.fgov.be). A summary of the legal status of recycling-derived fertilisers in Belgium / Flanders is as follows:

- Ashes: if derogated, only with resource certification for product and producer.
- Struvite: if derogated, only with resource certification for product and producer.
- Compost: authorised, only with inspection certification. Considered end-of-waste.
- Ammonium sulphate from air stripping with acid: authorised, on list of fertiliser types KB.
- Ammonium sulphate from biological air treatment: not on positive list, only with resource certificate for product and producer.
- Ammonium salts from stripping and scrubbing of manure or derived products are regarded as animal manure, following the definition in the Nitrate directive.

- Pig urine: animal manure, fertiliser category.

2.3.3 Mutual recognition:

Products that are authorised for marketing as a fertiliser product in another member state may be marketed as a fertiliser product in Belgium if they comply with one of the fertiliser types of the Royal Decision. Products that do not comply with a fertiliser type of the Royal Decision have to obtain derogation. For such products, the mutual recognition procedure corresponds to a derogation application. The time frame for processing the application is four months from receipt of the complete dossier. The cost of processing the application is € 1500. The following information is required:

- Product-related technical rules (legislation), certified by the Member State and upon which the application for mutual recognition is based (in French, Dutch or English)
- The raw materials used and their origin
- A short description of the manufacturing process
- A *recent* product analysis carried out by an approved laboratory (in case of a non-Belgian laboratory, a copy of the approval issued by the competent authority should be enclosed, accompanied by the analysis method if appropriate)
- A label or accompanying document (in French or Dutch) as an example
- The purpose(s), dose(s) and instructions for use
- As the case may be, all documents proving that the product meets the requirements of Regulation 1069/2009 or any other EU food safety and environment protection legislation.

2.4 France

2.4.1 Regulation of national fertilisers

The marketing of national fertilisers in France is regulated by the Rural code (*Code Rural, Livre II, Chapitre V : Mise sur le marché et utilisation des matières fertilisantes, des adjuvants pour matières fertilisantes et des supports de culture L.255-1 à L.255-18*), the Decree of 21 December 1998 concerning the authorisation of fertilisers and cultivation materials (*Arrêté du 21 décembre 1998 relatif à l'homologation des matières fertilisantes et des supports de culture*) and the Decree of September 2003 on the mandatory implementation of standards. (*Arrêté du 5 septembre 2003 portant mise en application obligatoire de normes*). The Rural code gives the general definitions and conditions for the marketing of fertiliser products.

All non-EC-fertilisers have to meet the requirements of obligatory standard norms (NFU) of fertilisers or soil improvers, or they have to obtain an authorisation (*homologation*) to be marketed as a national fertiliser product. The French Agency for Food, Environmental and Occupational Health & Safety (ANSES) can authorise products following an

assessment which, under the prescribed conditions of use, reveals its absence of harmful effect on human health, animal health and the environment and its effectiveness, according to cases, in respect of plants and plant products or soils.

Fertiliser products that meet the obligatory standard norm (NFU) do not have to get an authorization and can be marketed in France. The Decree of September 2003 (with amendments) lists the titles of the standard norms that apply to fertiliser products. The list includes organic fertilisers and soil improvers derived from organic waste products (compost). Descriptions include origin, nutrient contents, thresholds for contaminations and pathogens, sanitation. Fertiliser type descriptions with criteria are not freely publicly available but have to be bought from the normalisation institute ANSES.

Most relevant standard NF U-norms are:

- NF U 42-001 (1981) for Fertilisers: contains various classes of mineral and organic fertilisers. The required minimum nutrient contents have been formulated for the different classes and types that have been defined. One of the classes is class VI, consisting of organic fertilisers that originates from animals or plants.
 - A fertiliser type within this category is animal manure, which should contain at least 3% N and 5% P₂O₅, while the sum of N, P₂O₅ and K₂O should be 10% at least.
 - Another class is poultry manure, which should contain at least 3% N and 3% P₂O₅, while the sum of N, P₂O₅ and K₂O should be 7% at least.
- NF U 44-051 for Organic Soil Improvers: Minimum limits for dry matter and organic matter contents have been formulated, while maximum limits have been formulated for the nutrient contents. The dry matter content should be 30% at least and the organic matter should be 20% at least. Maximum limits for nutrient contents are 3% for N, P₂O₅ and/or K₂O, while the sum of N, P₂O₅ and K₂O should not exceed 7% (VCM, 2014). Various fertiliser types are distinguished within this category, like compost of animal manure, green waste compost or compost from the residues of fungi growers (Ollivier, 2015)
- NF U 44-095 for Organic Soil Improvers: Composts composed from materials that are of use for agriculture and from materials from water treatment. Minimum limits for dry matter and organic matter contents have been formulated and maximum limits have been formulated for heavy metal contents, organic micropollutants and the number of pathogenic microorganisms. The dry matter content should be 50% at least and the organic matter should be 20% at least. As for NFU 44-051, the maximum limits for nutrient contents are 3% for N, P₂O₅ and/or K₂O, while the sum of N, P₂O₅ and K₂O should not exceed 7%.

2.4.2 Regulation on recycling -derived fertiliser products

Products that meet the standard NFU-norms do not have to be registered. The producer is responsible for the compliance of the product with the limits. The organisation that puts the product on the market has to have a seat in France.

On the other hand, products that do not meet one of the NFU norms have to be authorised (obtain 'homologation') and registered. Therefore, a detailed dossier (administrative and technical file) has to be submitted and approved. Derogation is given specifically to a producer and production site.

A list of products with a derogation for use as a fertiliser product or cultivation material is available at ephy.anses.fr.

A summary of the legal status of recycling-derived fertilisers in France is as follows:

- Ashes: not conform NFU. Ash with homologation can be brought to the market.
- Struvite: no NFU standard or homologation. Subject of green deal north west resources roundabout.
- Compost: if conforming to the NFU norm NFU044-051 or -095 Product.
- Ammonium sulphate from air scrubbing with acid: if conforming to the NFU norm NFU-042, criterium for N%>20%. For most ammonium salts the N content will be 8%, so the NFU-042 is not feasible. A request for a homologation could be send in.
- Product Ammonium sulphate from biological air treatment: unknown.
- Pig urine: animal by-product.

2.4.3 Mutual recognition of fertiliser products

Products either have to meet the NFU norms or apply for the homologation.

2.5 Germany

2.5.1 Regulation of national fertilisers

The production, placing on the market and use of fertilisers, soil improvers, culture media and plant aids are governed by the Fertiliser Act (DüG) and its ordinances. Different types of fertilisers are distinguished: solid animal manure, fluid animal manure, mineral fertilisers, etc.

The requirements for placing fertilisers on the market are laid down in the Düngemittelverordnung (DüMV) (Fertiliser Ordinance). It covers the requirements on the origin of the products, appearance, minimum nutrient contents, maximum contents of contaminants.

Fertilisers have to comply to one of the fertiliser types described in annex 1 of DüMV. Fertiliser types are classified in five categories:

1. Single mineral fertilisers
2. Compound mineral fertilisers
3. Organic and organo-mineral fertilisers
4. Micronutrient fertilisers
5. Fertilisers for ornamental horticulture.

2.5.2 Regulation of recycling-derived fertiliser products

The DüMV contains a positive list (annex 2 of DüMV) of products -including waste and residue products- that may be used as a component material for the production of fertilisers or soil improvers. It also defines levels of nutrients, contaminants and tolerance levels. Limits for heavy metals and organic contaminants are expressed on a dry weight base, except for Cd in P-fertilisers that are expressed per kg P₂O₅.

The use of organic waste and residue products is regulated by the Bio-Waste Regulation (Bioabfallverordnung or BioAbfV). This describes the required treatment of the products, a positive list of input materials and gives threshold values for contaminants and pathogens and all administrative requirements on handling, transport, and use of compost and digestates. For sewage sludge the maximum limits for contaminants are included in the Sewage Sludge Ordinance (Klärschlammverordnung or AbfKlärV), but biowastes and sewage sludges that are used in fertilisers should also comply with the limits in the Fertiliser Ordinance (DüMV).

The Verbringungsverordnung (marketing regulation) governs placing on the market, transport and taking possession of manure, as well as the related commercial substance streams.

The German fertiliser legislation does not provide for a formal "request procedure". Those wishing to produce or place on the market "new" fertiliser products (fertilisers, soil improvers, growing media or plant strengtheners) must however informally request the BMELV (Bundesministerium für Ernährung und Landwirtschaft; Federal Ministry of Food and Agriculture) to amend/alter the existing rules. These requests will be evaluated by members of the Scientific Advisory Board on Fertiliser Issues. (BMEL, 2020 <https://www.bmel.de/DE/themen/landwirtschaft/pflanzenbau/ackerbau/duengung.html>)

The following information is necessary in order to be able to evaluate a new type of fertiliser sufficiently (BMEL):

1. Purpose of the material (fertiliser, soil improver, growing medium or plant strengthener)

2. Description of the material (including composition, production method, quantities produced, validation procedures, etc.)
3. Material safety in accordance with the Fertiliser Act (DüG)
4. Mode of action and effectiveness
5. Distinguishing features relating to comparable materials
6. Confirmation of the responsible federal state authority that the material has not been registered previously under the Fertiliser Ordinance;
7. Suggestion of a change of type, for a new fertiliser type
8. Intended classification / labelling.

A summary of the legal status of recycling derived fertilisers in Germany is as follows:

- Ashes: only from certain sources, like organic fertilisers that are clean. Fly ashes are excluded. The requirements are specified in Annex 2 of the DüMV.
- Struvite: yes
- Compost: yes, but under strict control
- Ammonium sulphate from air scrubbing with acid: defined as input source for fertiliser production. Includes the ammonium sulphate derived from stripping and scrubbing during manure treatment.
- Product Ammonium sulphate from biological air treatment: unknown.
- Pig urine: animal by-product.

2.5.3 Mutual recognition of fertiliser products

The DüMV also gives the condition for mutual recognition of fertiliser products. In principle, this is possible, but only when the requirements for the protection of the health of humans, animals or environment are equivalent to those for the German national Fertilisers.

2.6 Ireland

2.6.1 Regulation of national fertilisers

The marketing of national fertilisers in Ireland is regulated by the Fertilisers, Feeding stuff and Mineral Mixtures Act 1955 (FFMMA) and the Statutory Instrument SI 248/1978 Marketing of non-EEC fertilisers regulations 1978.

The FFMMA sets the general conditions for the regulation and control of the manufacturing and placing on the market of fertilisers and sampling thereof. SI 248/1978 sets the requirements and criteria for fertilisers and liming materials in a structure comparable to annex I of the EC regulation 2003/2003. Thresholds for minimum nutrient

(NPK) contents are given, but criteria for heavy metals or other contaminants are not included.

It is differentiated between:

1. straight and compound N, P and/or K mineral fertilisers,
2. compound N, P and/or K fertilisers containing organic matter, and
3. low nutrient fertilisers (no criteria on nutrient contents).

Requirements on labelling and packaging are defined.

2.6.2 Regulation on fertiliser products

Fertiliser products that do not comply with one of the fertiliser types in SI 248/1978 have to get authorised by the Ministry of Agriculture. There is no protocol for the authorisation, but there is a Guide for the registration of a new type of fertiliser for registration in Ireland.

The information submitted to the Ministry of Agriculture must show that the fertiliser:

- provides nutrients in an effective manner;
- does not adversely affect human, animal, or plant health, or the environment.

No list of fertiliser products that are authorised to be brought on the market and used as a fertiliser is publicly available.

The handling and use of waste products is regulated by the Waste Management Act, S.I. No. 821/2007, the Waste Management (Facility Permit and Registration) Regulations and Environmental Protection Agency Acts. Moreover, regulations on Food Waste. S.I. No. 71 of 2013 (EU Household Food Waste And Bio-Waste) and Regulations 2013 and S.I. No. 508 of 2009 (Waste Management (Food Waste) Regulations 2009) are of relevance.

2.6.3 Mutual recognition of fertiliser products

Ireland does not have an official protocol of the mutual recognition of fertiliser products. Recycling-derived fertiliser products will have to submit a request for registration as a fertiliser, following the Guide to the registration of a new type of fertiliser for registration in Ireland.

2.7 United Kingdom

2.7.1 Regulation of national fertilisers

EC-Fertilisers have been regulated in England and Wales by the EC Fertilisers Regulation 2006. After Brexit, producers have been able to continue selling EC fertiliser, replacing the CE label with mention of 'UK fertilisers'.

In addition, national fertilisers are regulated via the Fertiliser Regulations 1991 and 1998. Fertilisers that meet the requirements of one of the fertiliser categories, don't have to be registered. Within FR 1991 the following categories of fertilisers are distinguished:

- A. Straight Fertilisers
- B. Compound Fertilisers
- C. Fluid Fertilisers
- D. Fertilisers containing Boron, Cobalt, Copper, Iron, Manganese, Molybdenum or Zinc as trace Elements
- E. Fertilisers containing mainly Calcium, Magnesium or Sulphur as Nutrients

Most fertilisers that are classified in one of the fertiliser categories mentioned above, are mineral fertilisers. However, in group A, organic products like dried blood, horn meal, meat and bone meal, hoof meal and rape meal and oilseed fertiliser are included.

2.7.2 Regulation on recycling-derived fertilisers

There is a possibility in the UK to use waste materials as fertiliser or soil improver. This is regulated by the Environment Agency, which has developed the U10 waste exemption for this purpose: 'the U10 exemption allows you to spread specific waste on agricultural land to replace manufactured fertilisers or virgin materials (such as lime) to improve or maintain soil.' <https://www.gov.uk/guidance/waste-exemption-u10-spreading-waste-to-benefit-agricultural-land#types-of-activity-you-cannot-carry-out>.

Types of waste that are allowed are specified by name and waste codes that are defined in the List of Wastes (LoW) Regulations. One needs to make sure that the waste fits within the waste code and the description. Moreover, maximum amounts of the waste products that may be stored and applied to the agricultural land are defined per waste type. Examples of some categories are as follows:

- Chalk;
- Ash from wood chips.

In addition, requirements about the way of storage and application have been formulated in dependence of the risks that are associated with the various waste products. Those conditions should be respected when the products are applied.

Moreover, it is indicated that it is not allowed to use waste materials that are not mentioned in the list, even if those products have a beneficial effect to soil quality and/or plant growth. Maximum levels of contaminants, like heavy metals, are not given.

A summary of the legal status of recycling derived fertilisers in the UK is as follows:

- Ashes: ash from incineration of clean plant material or untreated wood (special waste code 100101) and Poultry litter ash (PLA) that meets the end-of-waste criteria
- Struvite: with authorisation, product and producer specific

- Compost: only compost with an end-of waste certificate
- Ammonium sulphate from air scrubbing with acid or biological treatment: unknown.
- Pig urine: animal by-product (note: the regulation EC/2099/1069 on Animal by-products no longer applies in the UK after Brexit)

2.7.3 Mutual recognition of fertiliser products

Due to the leaving of UK from the EU, the UK will no longer fall within the scope of the mutual recognition principle from 1 January 2021 onwards. Fertilisers will have to be marketed under either the domestic framework or the new 'UK fertiliser' label, which will replace the EC Fertiliser label. See <https://www.gov.uk/guidance/manufacturing-and-marketing-fertilisers-if-there-is-no-brexite-deal>.

3 Consequences for RDF products

3.1 Evaluation of RDF's according to national legislations

In the foregoing chapter, the national legislations with respect to recycling-derived fertilisers of most countries in NWE region have been shortly summarised. In the description of each country, the consequences of the national legislations for the legal status of selected RDF's in that country are given. But what are the differences between countries in the way they treat RDF's? And what is the consequence of those differences? Those questions will be treated in this chapter. A summary of the differences of the way the selected RDF's are evaluated in Europe and the various partner countries, is given by Van Schöll (2019; table 3.1). The evaluation at the basis of the European legislation is discussed elsewhere (Van Schöll & Postma, 2022), and the situation based on national legislations is discussed per product below table 3.1.

Table 3.1. Overview of the evaluation of selected RDF's according to the national legislations in countries in NW Europe (Van Schöll, 2019).

	Compost	Ashes	Struvite	Ammonium sulphate	Ammonium nitrate
EC FR2003/2003	not included	not included	only 1 product	N% too low	If N% >15%, or manure?
EC FR revision	CMC compost	CMC Strubias	CMC Strubias	SafeManure	SafeManure
Netherlands	yes	no	yes	yes (some)	manure?
Belgium	certification	derogation	derogation	yes	manure?
Germany	yes	yes (limited)	yes	yes	manure?
France	yes (NFU)	derogation	no	??	manure?
Ireland	yes	no	no	??	manure?

Ashes are evaluated as follows in the various NWE countries:

- In The Netherlands ashes are not authorised as fertiliser, because they generally contain too high contents of heavy metals, especially Cu and Zn (see further under 3.2). However, for the export of poultry litter ash to an fertiliser production location, an end-of-waste status has been obtained in 2015 (see 3.2);
- In Belgium / Flanders, ashes are only authorised with a resource certification for product and producer.
- In France, ashes do not fall under one of the NFU, but poultry litter ash from BMC is authorised at the basis of a 'homologation' under the name 'Agriphos'.

- In Germany, only ashes from certain sources are authorised. Examples of those sources are sludges, materials of plant or animal origin. Fly ashes are not allowed. The requirements are specified in Annex 2, table 6 and 7 of the DüMV. The status of ashes in Ireland is waste. Use as fertiliser should be regulated under the environmental permit of production facility.
- In the United Kingdom (UK), ash that is produced by burning clean plant material or untreated wood, has a special waste code 100101. This ash is included in the U10 exemption, that 'allows you to spread specific waste on agricultural land to replace manufactured fertilisers or virgin materials (e.g. lime) to improve or maintain soil' (<https://www.gov.uk/guidance/waste-exemption-u10-spreading-waste-to-benefit-agricultural-land>). Moreover, end-of-waste criteria for poultry litter ash (PLA) has been defined (Environmental Agency, 2012a). If the criteria are met, the end-of-waste status is obtained and the ash may be applied as fertiliser. See further under 4.2 for additional information.

Struvites are evaluated as follows in the various NWE countries:

- The Netherlands: certain recovered phosphates (struvite, magnesium phosphate, dicalcium phosphate) are authorised as fertilisers by national regulation. However, struvite from municipal wastewater treatment plants is still considered waste, and it is only exempted from waste management regulations if it is used as a fertiliser.
- Belgium / Flanders: struvite is only authorised with resource certification for product and producer.
- France: for struvite no NFU standard or homologation exists and it has a waste status. It is subject of the Green deal North West Resources Roundabout (<https://www.wastematters.eu/news-from-europe/news-from-europe/struvite-to-be-included-into-the-international-green-deal-north-sea-resources-roundabout.html>).
- Germany: struvite is authorised by a special category in the DüMV (category 6.2.4 Phosphatfällung), which includes precipitates of phosphate that are obtained with calcium chloride, magnesium chloride, magnesium oxide etc.
- Ireland: unknown, no application done.
- United Kingdom: specific struvite products, like the one from Slough sewage works (Ostara process), have an authorisation, but that is restricted to one product from one producer. See further under 3.3.

Composts are evaluated as follows in the various NWE countries:

- In the Netherlands: compost is regulated as fertiliser category. Still waste, exempted from waste management regulations. Composted animal manure is regarded as animal manure.

- Belgium / Flanders: derogation and with inspection certification are required. Derogated composts are considered end-of-waste.
- France: yes, if conform the NFU norm NFU044-051 or -095 Product.
- Germany: yes, but under strict control.
- Ireland: regulated at the level of environmental permission production site.
- United Kingdom: A quality protocol is available for the end-of-waste status of compost from source-separated biowaste (Environmental Agency, 2012b; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/297215/geho0812bwpl-e-e.pdf). Criteria are formulated for the allowed input materials, for the processing and for the properties of the end product. If these criteria are met, the resulting outputs will normally be regarded as having been fully recovered and to have ceased to be waste. Only certified composts can be marketed and used as fertiliser or soil improver.

Ammonium sulphates are evaluated as follows in the various NWE countries:

- In the Netherlands, ammonium sulphate from air scrubbing (biological or chemical) has received an authorisation in dependence of origin and way of production. Only a few products (recovered from stables, composting of sewage sludge with green cuttings or poultry manure, drying facilities) have received authorisation, from other sources it is not allowed to be used as a fertiliser. Mixing with other fertilisers is not allowed. Ammonium salts from stripping and scrubbing of manure is still considered manure, in line with the definition of manure in the Nitrate directive.
- Belgium: Ammonium sulphate from air stripping with acid: yes, on list of fertiliser types KB. Ammonium sulphate from biological air treatment: not on positive list, only with resource certificate for product and producer. Ammonium salts from stripping and scrubbing of manure is still considered manure, in line with the definition of manure in the Nitrate directive.
- France: Ammonium sulphate from air stripping with acid: yes if conform the NFU norm NFU-042, amongst others $N\% > 20\%$. Because that will not be possible (N content will be 8% at maximum), so it will keep the status of waste or animal manure? A request for a homologation could be send in.
- Germany: Ammonium sulphate from air stripping with acid: yes defined as input source for fertiliser production. Ammonium salts from stripping and scrubbing of manure is considered inorganic waste product, and as such allowed to be used for production of N-fertilisers.
- Ireland: unknown
- United Kingdom: unknown

3.2 Consequences for practice: the poultry litter ash case

BMC Moerdijk in the Netherlands is incinerating 430,000 tonnes of poultry manure a year which represents one-third of the total production of poultry manure in the Netherlands. Products are electricity and poultry litter ash (PLA). The yearly production of PLA is about 60,000 tonnes (containing 6,600 tonnes P₂O₅ and 7,200 tonnes K₂O), which is sold as PK fertiliser and fertiliser component (figure 3.1). Because the 'production' of phosphate in animal manure in the Netherlands (169,000 tonnes P₂O₅ in 2019) is higher than the phosphate requirement (or potential 'consumption') by agricultural production (139,000 tonnes P₂O₅ in 2019), the P surplus on national scale is 30,000 tonnes P₂O₅ and a significant amount of phosphate from animal manure should be exported to other countries where input of phosphate is required for sufficiently high P doses to agricultural land, thus enabling good production levels.



Figure 3.1. Pictures of the production plant of poultry litter ash (PLA) of BMC in Moerdijk (left) and close up of the end product, PLA (right).

The PLA is a hydrated ash since water is added to the ash at the end of the process. This reduces the dust formation when the ash fertiliser is stored, transported, and applied to soil. This ash is used as a PK fertiliser and consists of the ash of poultry manure (75%), sand (12.5%), water (10%), a boiler additive (1.25%), and lime (1.25%). In terms of nutrients, it contains about 11% P₂O₅, 12% K₂O as well as 20% CaO, 5% MgO, and 7% SO₃. The sodium content is with 3% Na₂O low.

In addition to the nutrient contents, the heavy metal contents are of importance for the evaluation of the product as a fertiliser within the scope of the national legislations in the various countries. The Cu and Zn contents were 380 and 1900 mg per kg, respectively, which is rather high, and which is a bottleneck for getting the status of a fertiliser in some countries (see further).

The PLA is marketed directly as a fertiliser (30% of the produced ash) or as a component in bulk blending of the fertiliser industry (70%). The ash is blended into compost but also into mineral fertilisers. The current destination countries are France, Belgium, and the United Kingdom. In these countries, the ash has a national authorization to be sold as a fertiliser (see further).

The status of the PLA depends on the perspective (Waste Framework Directive, Animal By-Product Regulation, Nitrate Directive, national legislation). As the product is not regulated by the current EU Fertiliser Regulation BMC Moerdijk and its' customers had to prepare a lot of documents and go through long processes to have the ash registered as a fertiliser in France, Belgium, and England (De Leeuw, 2019).

Attempts has been done in several countries to get an authorisation for the status as fertiliser:

- In the Netherlands, the first letter about the legal status of the PLA was send to the Dutch government and many conversations have followed after that. The end-of-waste status was obtained in 2015, but the product is not authorised as fertiliser, because Cu and Zn levels were higher than the maximum allowed limits according to the Dutch legislation (Uitvoeringsbesluit Meststoffenwet Annex II, table 1 <https://wetten.overheid.nl/BWBR0019031/2020-01-01#Bijlagell>; CDM, 2016; both Cu and Zn contents in PLA are about two times as high as the maximum limits). The lack of a fertiliser status of PLA hampers its' export.
- In France, PLA is authorised to be used as a fertiliser since 2001, based on the imported product from the United Kingdom ('homologation'). At <https://ephy.anses.fr/mfsc/agriphos> the information about the fertiliser status of the product can be seen under the name 'Agriphos'. The first registration under this name was in 2014. The authorisation is owned by the applicant, so new applications for the same product by other organisations have to follow the same extensive and costly procedure.
- In England, Wales and Northern Ireland, end-of-waste criteria for PLA has been derived and described in a 'Quality Protocol Poultry Litter Ash' (Environmental Agency, 2012a). Criteria about input materials, sampling, storage, use, nutrient requirements and maximum limits for heavy metals have been formulated. If the criteria are met, the end-of-waste status is obtained and the product may be applied as fertiliser. The upper limits for Cu and Zn are relatively high in the UK (596 and 2063 mg per kg respectively), so that the actual Cu and Zn contents (380 and 1900 mg per kg dm respectively) just meet these limits.
- In Belgium, PLA has a derogation since June 2006, which is renewed in 2011 and 2016. An additional requirement since 2016 is that for the use in Flanders a valid 'raw material certificate' (a so called 'grondstofverklaring') delivered by OVAM is obligated.

In addition, the product should meet the criteria of VLAREMA 6 for its' use in Flanders. Within that scope, maximum levels for i) heavy metal contents in the product and ii) heavy metal dosage to agricultural land should be met. The maximum limits for the heavy metal contents are based on the assumption that 2 tonnes per hectare per year of the product is applied. However, because of relatively high P and K contents, a dosage of 2 tonnes per hectare per year is too high from a viewpoint of 'good agricultural practice'. With a 'normal' dose of 1 tonnes per hectare, the maximum dosage level is met. In spite of the fact that the upper limit for the Zn content in the product is exceeded, a 'raw material certificate', and the resulting end-of-waste status, was obtained in 2018.

From the example of the PLA it can be concluded that it is possible to export a fertilising product to other countries within NW Europe, also without a CE Fertiliser status. However, this requires a lot of administrative work and good knowledge of the authorisation procedures for getting a fertiliser or end-of-waste status in the different countries.

3.3 Consequences in practice: the struvite case

In several wastewater treatment plants in The Netherlands, phosphorus is gained during the water treatment via precipitation of struvite ($MgNH_4PO_4 \cdot 6H_2O$). The total production of struvite at 7 locations distributed over The Netherlands is about 3500 tonnes struvite per year, which contains about 1000 tonnes of P_2O_5 (Schemen, 2017). Other European countries where struvite is produced are Germany, Belgium / Flanders, UK, Denmark, France and Spain (Thornton, 2016; figure 3.2).

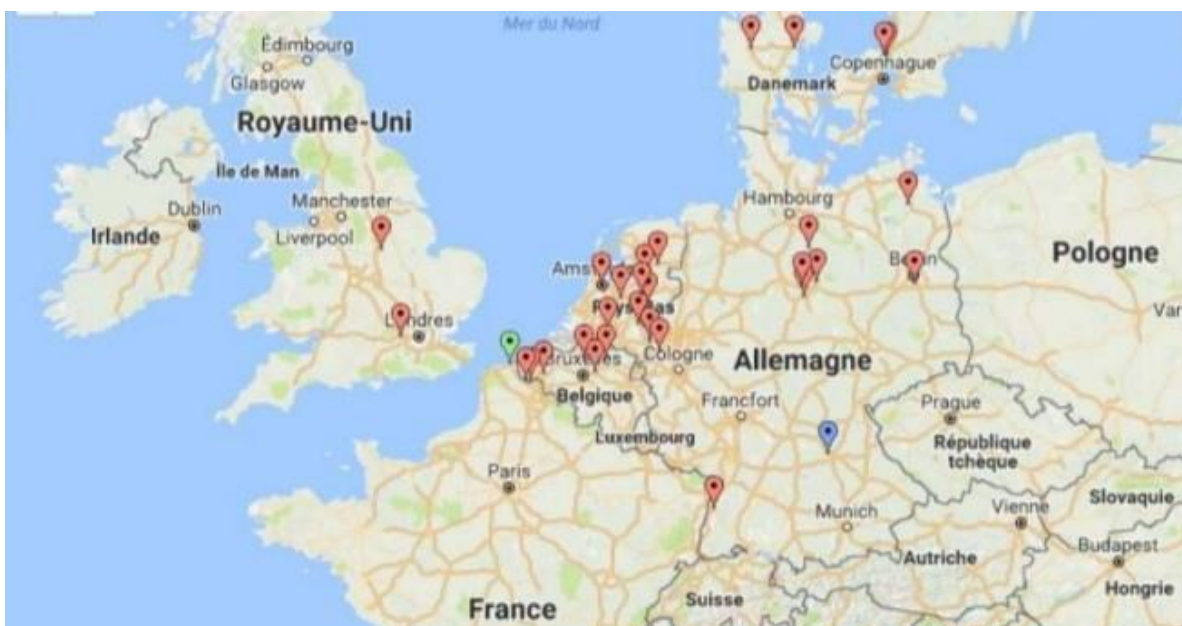


Figure 3.2. Locations of struvite production across Northwest Europe (source: Thornton, 2016; <https://de.batchgeo.com/map/f4c921a4573967d7e18aa0e651cc3264>).

Struvite might be used directly as a fertiliser, but it can also be used as a raw material for fertiliser production. The amount of P from mineral fertilisers used in the Netherlands is relatively low and amounts up to only 6,000 tonnes of P₂O₅, which is less than 5% of the total P use by (mineral and organic) fertilisers in the Netherlands.

One of the associated partners in the ReNu2Farm project is the Waterboard Vallei & Veluwe, which produces 1,800 tonnes of struvite per year at locations in Amersfoort and Apeldoorn. Different technologies are used for the struvite production, i.e. the Pearl- and the NuReSys-technology, resulting in slightly different products. Both products are relatively pure, and only contain very low amounts of organic matter and other impurities.

The product from Apeldoorn contains 1.8% N, 25.5% P₂O₅, 15.1% MgO and < 0.5% organic matter (De Vries et al., 2017; figure 3.3). Moreover, an extensive investigation of possible contaminants, like heavy metals, organic micropollutants and pathogens has been performed in struvite samples originating from various production locations (Morgenschweiss et al., 2016). It was concluded that the products met the requirements with respect to the contents of heavy metals and micropollutants in the Dutch Fertiliser Act, but that pathogens are present in amounts that require special attention.

The struvite that is produced at the location in Apeldoorn is used for the production of a P-containing mineral fertiliser (which is called Physiostart P Plus with 6% NH₄-N and 27% P₂O₅; see <https://aquaminerals.com/struvite-in-fertiliser-for-maize/>; Figure 3.3) by Timac Agro, which is part of the Groupe Roullier in France.



Figure 3.3. Pictures of struvite from the WWTP in Apeldoorn (left), which is used as raw material for the production of the fertiliser Physiostart P Plus bij Timac Agro (right).

Struvite has a fertiliser status in The Netherlands, but it is still considered as waste. The consequence is that, if the struvite is not directly used as fertiliser, but as a raw material for fertiliser production, it is still waste. Because Timac Agro is producing the fertiliser in France, the struvite should be transported to France, where it is still waste. So, the waste status is complicating the use of struvite as a secondary raw material for P fertiliser production. In some countries, struvite is not considered as waste, because it is considered a “by-product”, in others it is resolved by company self-declaration of End-of-Waste status validated by the regulatory authorities, in others it is not resolved to date.

Timac Agro has put a lot of efforts in making it possible to transport struvite to France and to use it there as a raw material for fertiliser production. In 2019, a permission is obtained in France for the transport and use of 100 times a certain amount of struvite from the Netherlands to the fertiliser plant in France (pers. communication E. van Delden, 2020). Timac Agro considers this as sub-optimal, because relatively small amounts should be treated each time separately, which is not efficient.

The situation with regard to the legal situation of struvite in different European countries is summarised by ESPP (Scope Newsletter 124, 2017) as follows (only relevant countries mentioned):

- Certain recovered phosphates (struvite, magnesium phosphate, dicalcium phosphate) are authorised as fertilisers by national regulation in the Netherlands as of 29/3/16. However, this regulation does not ensure End-of-Waste status. Waste status does not prevent application as fertiliser but is a procedural obstacle to cross border trade and to use as a raw material for fertiliser production. Clarification on the conditions for End-of-Waste status is still ongoing. Also, this regulation states that

these phosphates must be treated by a “suitable process” to eliminate “the majority of pathogens” and definition of such processes is also ongoing.

- Case-by-case authorisations have been accorded for recovered struvite by national/regional authorities. These are applicable only to the specific product from a specific waste stream / site / process:
- Agristo and Clarebout, both from potato processing (both NuReSys process) in Flanders,
- Slough sewage works (Ostara process) in the UK,
- Berlin Wasser sewage works in Brandenburg, Germany.

It is mentioned that ‘these case-by-case authorisations depend on the specific quality of the authorised product and so do not constitute a ‘blanket’ authorisation for struvite in the relevant country. However, these case-by-case authorisations can provide a precedent for future authorisation for other production sites, subject to their also proving product quality and safety. In some cases, they are supported by a clause in national legislation, e.g. “recovered precipitated phosphates” in German fertiliser legislation.’

Within the scope of the North Sea Resources Roundabout (NSRR), which is an initiative of The Netherlands, Belgium, France and UK, it is tried to tackle barriers to cross-border trade in secondary raw materials, like struvite (<https://aquaminerals.com/aquaminerals-signs-international-green-deal-on-struvite/>).

It can be concluded that the current lack of clarity and disparities between Member States with respect to the legal status of struvite poses a significant obstacle to P recovery via struvite. It poses further obstacles to transport, to sale as fertiliser, but also to use in fertiliser blending or in its’ use as a raw material in fertiliser production. It is not impossible to use struvite as a raw material for fertiliser production, but especially because of the waste status of struvite in many countries, it is complicated, it needs a lot of administrative efforts, and the final result is often not optimal.

4 Conclusions

From the information described in the foregoing chapter, the following conclusions can be drawn:

- Recycling derived fertilisers (RDF's) are treated differently in the national legislations of member states within NW Europe, a.o. in the following ways:
 - Procedures for the authorisation of waste or by-products as fertiliser are often not clear and strongly differ between countries.
 - In some countries, recycling derived fertilisers are authorised by a category with minimum criteria, while in other countries the same products undergoes a case-by-case authorisation, that is applicable only to the specific product from a specific waste stream / site / process and/or a specific producer.
 - Criteria for contaminants like heavy metals are different between countries, so that a specific RDF may meet the criteria for heavy metals in one country and not in another country;
 - The fertiliser status and end-of-waste status are of relevance. In some countries, the end-of-waste status is supplied as soon as a product receives a fertiliser status, but in other countries that is not the case.
- As a result of the first conclusion, a specific RDF (this is for example the case with poultry litter ash and struvite) may have a fertiliser status in one country and a waste status in another country. This hampers the recycling of nutrients from waste, because it hinders:
 - Cross-border transport,
 - to use it as raw material in fertiliser production,
 - to use it as a component for blending,
 - to market and use it directly as a fertiliser in different countries.

Mutual recognition is interpreted differently by the member countries within NW Europe, and in practice most countries prescribe the regular procedure for the authorisation of fertilisers, even if a fertiliser product has a fertiliser status in another member state.

It requires a lot of administrative work and good knowledge of the authorisation procedures for getting a fertiliser or end-of-waste status in the different countries.

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