



SYSTEMIC-AGROCYCLE policy research workshop: *Fertilising products based on animal manure under the Nitrates Directive and Circular Economy*

Scope, conclusions and key messages

15 June 2018

Supported by:



Circular Economy Package

In December 2015 the ambitious Circular Economy Package was adopted by the European Commission. This package was developed to help European businesses and consumers make the transition to a stronger and more circular economy where resources are used in a more sustainable way. The CE Package focuses on closing the loop and thereby creating jobs and generating sustainable growth.

One of the main objectives of the package is: *to create economically sustainable growth by maintaining the value of products, materials and resources in the economy for as long as possible.*

And the following strategy for closing the loop is mentioned:

1. Reduce waste to a minimum
2. Promote re-using / recycling of materials & products
3. Create value: from waste into valuable resource

And important element in the implementation of the Circular Economy Package is the development and implementation of new legislation. This includes a new regulation on fertilising products which should encourage nutrient recycling while ensuring the protection of human health and the environment. Indeed, there are already many directives in place that are there to protect our environment and human health, including the Nitrates Directive.

H2020 Research & Innovation Circular Economy

The Circular Economy Package not only deals with legislation but also EU financial support for this transition: e.g. €650 million from Horizon 2020 (EU research programme), and €5.5 billion from structural funds for waste management. H2020 Research and Innovation projects on Circular Economy need to give a boost to the implementation of Circular Economy by producing valuable new resources from waste streams like manure surplus, sludge from waste water treatment plants, food residuals etc. Those are main activities in the two H2020 projects SYSTEMIC and AGROCYCLE. One of the main aim is to reduce the use of natural resource to produce mineral fertilisers (like rock phosphate and natural gas to produce mineral N fertiliser). Furthermore, they focus on legal barriers and options to solve these barriers regarding re-introducing new renewable resources.

Interlinkages with other European projects focusing on nutrient recovery:



Nitrate Directive

The uptake of nutrient recovery from bio-waste, animal manure and sewage sludge across Europe is only viable if there is an effective market for the final products. A major barrier to the advancement of a viable market for nutrients recovered from manure is the limitations of the Nitrates Directive. Currently 170 kg N per ha per year of nitrogen from livestock manure can be applied in Nitrate Vulnerable Zones, including any processed form of manure (article 2g). The European Commission has recognised that the new products coming from nutrient recovery plants may have the potential to be as agronomically effective and have the same environmental performance as chemical/mineral fertilisers and therefore could, potentially, be given a similar provision as given to mineral/chemical fertilisers and therefore exempted from the 170 kg N per ha per year limitation (in case of no derogation) of the Nitrates Directive. In order to include harmonised criteria for the nitrogen fertilising products of the Nitrates Directive, EC DG Environment have mandated EC JRC with a two year study to look into the product quality, agronomic efficiency and environmental performance of fertilising products derived from manure.

Workshop

On 30 May 2018 SYSTEMIC and AgroCycle organised a policy-research workshop on 'Fertilising products based on animal manure under the Nitrates Directive and Circular Economy'. This workshop aimed to feed into the EC JRC process by reporting and discussing the characteristics of different groups of fertiliser products from different routes of fertilising production from manure and to identify what further information is needed. Prior to the workshop, SYSTEMIC provided factsheets of top priority N-products recovered from manure (ammonium sulphate, ammonium nitrate, mineral concentrates and struvite). Each factsheet gave the participants the information that is currently available on the nutrient recovery techniques for manure, the quality of the recovered products, the agronomic and environmental aspects of these fertilising products, and finally the legal aspects (<https://systemicproject.eu/downloads/#toggle-id-3>).

The broad range in techniques for processing manure results in a broad range of fertilising products, ranging from products which retain the characteristics of manure, products with altered characteristics (e.g. higher mineral nitrogen content) and mineral fertilising products. The policy research workshop focussed on mineral nitrogen fertilising products based on manure.

Conclusions

The characteristics of the fertilising products, in combination with their use based on 4R¹ stewardship determines their agronomic and environmental effects. Therefore the focus should be given to the product characteristics when assessing their agronomic functionality and environmental risks **and not to their production processes, as this would hinder further technological innovation**. For this, clear and transparent physical and chemical criteria (e.g. NH₄-Ntotal ratio, C-org, pH, EC ...) have to

¹ Stewardship on 4R:

- Right application rate (crop, soil)
- Right composition of the fertiliser product
- Right place and application method
- Right timing of application

Interlinkages with other European projects focusing on nutrient recovery:



be developed to distinguish them from manure as defined in article 2g of the Nitrates Directive. The Nitrates Directive steward on the management of nitrate losses to waters as main environmental aspect. The environmental criteria of the renewable products should be in line with criteria for fertiliser products and preferable less contaminated.

Ammonium sulphate, ammonium nitrate and mineral concentrate **can fully replace mineral nitrogen fertilisers** without an increased risk of nitrate leaching. For struvite this is not yet clear as information on the nitrogen fertiliser replacement value is lacking as struvite is considered a phosphorus fertiliser and the amount of nitrogen applied is modest (ca. 15 kg N/ha) and therefore, there is no urgent need to regulate the product as N-mineral product.

Testing fertilising products should take into account the stewardship of 4R stewardship. For testing new fertilising products based on manure the question raised was which **reference mineral fertiliser** should be used. The choice of the reference fertiliser (solid or liquid) should be based on comparable characteristics. Concretely:

- Renewable liquid fertilising products should preferably be compared with a liquid reference fertiliser.
- Renewable solid fertilising products should preferably be compared with a solid reference fertiliser.
- Renewable ammonium fertilising products (ammonium sulphate, mineral concentrate) should preferably be compared with an ammonium reference fertiliser.
- Renewable ammonium nitrate fertilising products should preferably be compared with an ammonium nitrate reference fertiliser.
- The same method of application should be used.
- The application rate (total nitrogen) should lead to a crop response (thus suboptimal, not (super) optimal).

Nitrogen fertilising products based on manure may need to meet regulatory requirements for quality in terms of consistency (EU/national). Depending on the process, the content of the fertilising product can differ, so it is important to fix ranges in which different parameters are acceptable, in this way that the impact of this variation on the environment can be disregarded and farmers can include these renewable fertilising products in their nutrient management plans.

After the recovery of N from manure, other nutrients and/or contaminants will still remain in the side products, so an overall view should be maintained. These other fertilising products are likely to possess a lower nitrogen fertiliser replacement value. The Nitrogen Fertilising Replacement Value for all products has to be known/determined. A balanced fertilisation plan is needed to serve the agronomic requirements and to prevent environmental risks coming from these other fertilising products.

In addition to the four fertilising products addressed in the factsheets, ammonia water, liquid fractions of digestate and biochars may have a use as nitrogen fertilising products and should be included in the evaluation processes.

Interlinkages with other European projects focusing on nutrient recovery:



Key messages

- The nitrogen fertilising products (ammonium sulphate, ammonium nitrate and mineral concentrates) recovered from manure can fully replace mineral nitrogen fertilisers from chemical processes with the same agronomic effectiveness and similar risk of nitrate leaching provided that their use is based on the 4R stewardship.
- A clear characterisation of the (chemical) characteristics of these fertilising products is needed. This characterisation, and not their technical production processes, steers their use, their agronomic functionality and environmental risks, although some characteristics could already be predicted via the applied technique (e.g. by stripping/evaporation the transfer of carbon or heavy metals to the end-product will be often very low). Research questions on these parameters for products from these techniques would then be irrelevant, provided that the processing technique and the aids used do not lead to the transfer of contaminants/pathogens.
- Clear and transparent physical and chemical (harmonised) criteria have to be developed to distinguish them from manure (e.g. $\text{NH}_4\text{-N}_{\text{total}}$ ratio, C-org, pH, EC ...).
- Environmental criteria of the renewable products should be in line with criteria for fertiliser products and preferable less contaminated.
- Testing new fertilising products is an academic activity. New research for the 'high priority' fertilising products is not needed. The focus of new scientific efforts should be on new fertilising products of manure that currently lack supporting information. The choice of the reference fertiliser (solid or liquid) should be based on comparable characteristics.
- Testing of new fertilising products should only be carried out under the conditions of their use (which differ between European regions). Their production should be tuned to the requirement of use. Only by testing under controlled conditions can results be compared.
- Limit the research questions to those that serve the scope of the Nitrates Directive.
- Biochemical modelling needs to take into account of stewardship on 4R, greenhouse gas emissions and ammonia volatilisation. It is questionable if current models are fully adapted to this.
- Currently knowledge available is mainly academic, including the protocols used. Attention has to be given to results that answer to the needs of farmers. This is also needed to increase the acceptance of these new fertilising products by farmers.
- Consistency of products (control risk on N losses to the environment) and formulations (no pathogens, plant diseases, seed weeds...) are essential for acceptance by farmers. Establish working groups of producers of new fertilising products based on manure to steer on product characteristics and quality (consistency) which determine mainly the agronomic effectiveness and control of environmental effects.
- In addition to the four fertilising products addressed in the factsheets, liquid fractions of digestate, ammonia water (such as from evaporators), and biochars may also have a use as a nitrogen fertilising product and should be included in the evaluation processes and SYTSEMIC reporting. Special attention should be given to the variation in nitrogen content, nitrogen forms, minimum dry matter content and maximum organic carbon content

Interlinkages with other European projects focusing on nutrient recovery:



- Comments on the presented factsheets can be sent to SYSTEMIC (systemic@wur.nl). Furthermore, other relevant information, literature and data can be sent to SYSTEMIC (systemic@wur.nl) and to your own member of NEG who will provide it to JRC.
- EC / JRC – initiate and maintain communication lines with EU projects early in the process to (i) indicate research & data questions and (ii) interact on expert input on the process. This is best done as soon as possible (summer 2018) to increase overall research capacity of relevant projects to be aligned with the desired input to the SAFEMANURE process. The Nutrient Recycling project cluster that is gathered around the CDB (Common dissemination Booster - European Commission Service) can act as a good starting point for this.

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Interlinkages with other European projects focusing on nutrient recovery:

