



HELCOM Workshop on nutrient recycling in the Baltic Sea countries, 27-28 March 2017, Berlin, Germany

The HELCOM Workshop on nutrient recycling in the Baltic Sea countries held on 27-28 March in Berlin, Germany, was organized by Julius Kühn-Institut and HELCOM in cooperation with the European Union Strategy for the Baltic Sea Region Policy Areas Bioeconomy, Hazards and Nutri.

The workshop gathered 40 participants representing Denmark, Estonia, Finland, Germany, Latvia, Poland, Russia and Sweden as well as HELCOM Observers and invited guests from NGOs, companies and phosphorus initiatives. The aim was to find suggestions for HELCOM to promote nutrient recycling in the region while preventing the spreading of hazardous substances, and ensuring a good environmental status of the Baltic Sea

The programme with links to presentations is attached as Annex 1 and the list of participants as Annex 2.

Introduction

Chris Thornton from the European Sustainable Phosphorus Platform introduced the concept of nutrient recycling. Phosphorus is a non-substitutable, nonrenewable natural resource. Europe is heavily dependent on import of phosphate rock. Nutrient recycling is a measure to increase resource use efficiency and decrease dependency on import. Sources for phosphorus recycling include livestock manures, waste water treatment, food wastes and various other organic sources. The importance of nutrient recycling has been acknowledged also in the EU. Phosphate rock was added to the EU critical raw materials list in 2014, and nutrient recycling is part of EU circular economy package adopted in 2015. Revision of EU fertilizer regulation is currently ongoing. In addition to phosphorus, recycling of nitrogen can also bring benefits. For example, ammonia capture reduces ammonia emissions which are a problem also in some countries around the Baltic Sea.

HELCOM framework for nutrient recycling

The HELCOM Contracting Parties agreed in the Ministerial Meeting in 2013 to enhance the recycling of phosphorus (especially in agriculture and waste water treatment) and to promote development of appropriate methodology. At present, the countries around the Baltic Sea are at different stages. In most countries, a holistic strategy and targets for nutrient recycling do not yet exist but some issues are still addressed.

In the HELCOM Group on Sustainable Agricultural Practices (Agri group), Germany and Finland have taken the lead to coordinate the work towards fulfilling the ministerial commitment. An Overview of nutrient recycling in the Baltic Sea countries including descriptions of current status of nutrient recycling policies and legislation in the countries was collected as a first step in summer 2016. The HELCOM Working Group on Reduction of Pressures from the Baltic Sea Catchment Area (Pressure group) has worked on a recommendation on sewage sludge handling which was adopted in the HELCOM 38-2017 meeting. The Recommendation will also be a tool to enhance safe nutrient recycling.



Country examples

German phosphorus strategy

Claus- Gerhard Bergs from the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety presented the German phosphorus strategy that is to be adopted during 2017. Previously, the major part of sewage sludge was incinerated and landfilled. Part of the sewage sludge has been used in agriculture but the new strategy is to phase out the direct use of sewage sludge as a fertilizer on land and promote the recycling of phosphorus and other nutrients. There will be a transition period of 12 or 15 years for large waste water treatment plants (over 100 000 or 50 000 inhabitants correspondingly). The smaller and medium sized plants of up to 50 000 inhabitants are exempt. According to the estimations, 65% of sewage sludge is treated in the large plants that are to become accordance with the new regulation. The accepted techniques for phosphorus recovery are mono incineration where 80-95% of P can be recovered but a pretreatment of the ashes is needed for fertilizer use, and co-incineration where 40-50% of P can be recovered but no pretreatment is needed for fertilizer use. Costs are around 400 million euros for the investments to incineration plants and P recycling plants and the annual costs are around 100 million euros.

Finland

Marja-Liisa Tapio-Biström from the Ministry of Agriculture and Forestry of Finland presented the Finnish approach to nutrient recycling. The challenges for the Finnish food system, as for many European countries, are dependency from oil, improving the self-sufficiency rate for protein feed, decline of soil humus content, decoupling of animal production and plant production, and increase in meat consumption. Nutrient recycling and sustainable soil management are seen as a means for tackling these challenges. The rural development programme is the main tool for Finland to enhance nutrient recycling. There is financial support in the form of agri-environmental measures, investment support to farms and enterprises, advisory services and training programs, and development projects. There is also 6.5 million euros earmarked from the rural development programme to develop projects and investment support aimed at nutrient circulation and water protection in vulnerable areas. Nutrient recycling is also in the government circular economy programme. The goal is that in nutrient vulnerable areas at least 50 % of manure and sewage sludge is under advanced processing by 2025. The government key project offers financing for e.g. experimental projects, sewage pilots and management of horse manure.

Manure parallel session

Current status

One of the conclusions found in the HELCOM Overview on nutrient recycling in the Baltic Sea countries was that nutrient recycling is not yet an established concept within the Baltic Sea region. First, the HELCOM Contracting Parties should agree on a definition for nutrient recycling. The manure parallel session participants noted that nutrient recycling is not the same as balanced fertilization but involves many other aspects as well. Although the workshop was mainly focused on manure and sewage sludge there are also other sources of nutrients to be considered.

It would be useful to gather information on the cycles of N and P in different levels (farm, national, regional scale) starting first with the food system, and especially manure cycles, before setting regional goals for the amount of recycled nutrients. This information currently does not exist for all countries. The planned HELCOM project on manure standards will provide information for calculating the manure resources in the region. HELCOM Secretariat could look into the information already existing in other organizations such as EUROSTAT. The main objective is closing the nutrient loop. If the cycle is not closed on a farm scale it must



be closed on regional or country level. Nutrient management plans on a regional scale could be one option to close the loop.

Potential drivers

The participants identified several reasons why manure nutrients are not recycled back to the fields in an optimal way. The participants emphasized that the economic value of manure should be acknowledged. New business opportunities and economical drivers to promote nutrient recycling could be found when the nutrients as well as organic matter in manure and other organic fertilizers are fully valued. The loss of soil organic matter can decrease yields which has an effect on farm economy.

In many countries, animal production is concentrated in certain regions creating areas where there is an excess of nutrients. It is important to identify these areas and apply appropriate measures. Limiting stocking rate could be considered to avoid hotspots. Another solution is manure processing in areas with high number of animals and exporting the manure nutrients to other regions. With the current prices of mineral fertilizers this is often not economically profitable or even feasible.

Even if manure or processed manure products can be exported not all plant production farms are willing to have manure as fertilizer for various reasons. The time when manure would be available might not be optimal or there might not exist appropriate equipment for spreading. Furthermore, in areas dominated by plant production, the attitudes towards manure application can be negative because of fear of smell or hygienic issues. To overcome the obstacle of negative attitudes, both the manure application practices and the image of manure should be updated. Modern application techniques such as injection can decrease nitrogen emissions to air as well as odors significantly. Also, the public should be made aware of the importance of nutrient recycling.

The participants noted that there are many policy instruments and HELCOM goals, for instance promotion of nutrient accounting and advanced manure standards, which should drive the region towards nutrient recycling, already in place. It is more a question of implementation.

It is important to increase knowledge of farmers and advisory services. Farm level nutrient bookkeeping including calculation of nutrient balances is a good tool for this since it makes the farmer aware of the nutrient flows to and from the farm. Fertilizer recommendations could be updated according to the latest research to properly take into account that there is no need to apply more phosphorus on soils with high P content.

The participants concluded that there is not a single solution for enhancing nutrient recycling but the obstacles depend on regional and local circumstances. More exchange of experiences is needed. The participants found the examples and good practices from other countries very interesting and something that they would like learn more of. They hoped for more opportunities to ask more specific questions and hear of solutions that have already been found elsewhere in the region.

Sewage sludge parallel session

Current status

The parallel session on sewage sludge discussed significance of sewage sludge as a P resource compared to mineral fertilizers and other sources of phosphorus.

The participants pointed out that despite the fact that sludge is a minor resource compared to mineral fertilizers, in combination with the other sources of P such as manure or bio-waste, it can significantly



substitute mineral fertilizers and serve as a domestic source of P. Phosphorus is a strategic component for industrial production as well as being vital for flame retardants, electronics and other industries in addition to its use as a fertilizer.

Different sewage sludge handling practices in the Baltic Sea region and their potential to reuse P were discussed. The handling practices vary considerably between the countries, as well as the understanding of the need to recover phosphorus. Handling practices depend on the economic situation, availability of phosphorus in the market, size of the waste water treatment facility, applied techniques, quality of sewage sludge and waste water management.

Currently, P is not recovered from the sludge except for some unique cases when precipitation of P is a part of sludge dewatering. The only way to reuse P is direct application of sludge and products of its digestion or composting on agricultural or other lands.

All countries are seeking for opportunities to make the products of sewage sludge treatment suitable for further use particularly due to P its content.

Technological aspects

The size of the waste water treatment plant mostly identifies the approach to sewage sludge handling and consequently applicability of practices and technologies to reuse P. Also, the potential of P reuse from sewage sludge depends on the geographical conditions and economical characteristics of a particular area.

Different technologies for P recovery either from sewage sludge or ashes are already available and applied or tested across the Europe. Successful and economically feasible application of particular technology to recover phosphorus depends on the whole technological cycle of waste water treatment and sewage sludge handling.

The technology to recover P should be considered as a part of the whole technological cycle of waste water treatment taking into account also waste water and consequently sewage sludge quality, sewage sludge treatment, method of P removal from waste water, energy consumptions etc.

A palette of different techniques and their applicability for P recycling might be an effective tool to facilitate reuse of phosphorus. The palette should take into account the size of waste water treatment plants, concentration of the harmful substances in waste water and sewage sludge, regional economic and geographical characteristics, costs of energy, demand in P in the region and other parameters.

Potential drivers

One of the potential national measures to facilitate reuse of P might be establishing a national voluntary certification system assuring quality of the products used for fertilization.

Sometimes national legislation does not enhance effective reuse of P, for example, the use of struvite as a fertilizer is not allowed in some countries. Some other legal requirements such as requirements for concentration of hazardous substances are unnecessarily strict which also does not serve for facilitating the reuse of P from sewage sludge.



This could be solved through introduction of a flexible system of limit values for different land use and for sewage sludge with different content of P. In some countries, significant development of the legal framework including definitions is required.

Uncertainty of the legal framework as well as lack of a strategic approach is another obstacle hampering integration of P recycling practices.

Political drivers play an important role at the moment. It needs to be understood that sewage sludge handling is a costly process. Recovery of P can increase the cost of sewage sludge handling. Thus, reuse of P should be considered as a part of the whole waste water and sludge handling process to find the most sustainable solutions.

Creating marketing options for products containing recycled P could significantly facilitate its reuse. Mixing sewage sludge products with mineral fertilizers or governmental support for using products containing recycled P could serve for promotion of these products in the market.

Educational work with target groups which are potential consumers of recycled P is one of the promotion measures. An environmentally friendly image of fertilization with recycled phosphorus should be promoted among consumers, retailers and producers through public campaigns simultaneously with educational campaigns aimed at prevention of dumping of harmful substances into sewerage.

Technological development is one of the potential drivers. Further technological development is needed. But this development should be considered as a part of the strategy taking into account the whole waste water treatment and sewage sludge handling process.

Suggested regional actions for HELCOM to facilitate nutrient recycling

- Agree on a definition for nutrient recycling that could be presented in the HELCOM Overview on nutrient recycling in the Baltic Sea countries.
- Collect data on cycles of N and P in the Baltic Sea region. The planned regional project on manure standards could provide more information on manure cycles and the HELCOM Recommendation on sewage sludge handling is a good basis for gathering information on P in sewage sludge. Also, information on the economic aspect of nutrient recycling could be sought.
- Further work to reach the goals that have already been set for promoting nutrient bookkeeping and advanced manure standards.
- Start a regional project to identify areas of high nutrient surplus and programmes for these areas identifying suitable measures.
- Establish a HELCOM exchange programme for experts, students or farmers to learn more about the solutions in different countries
- As a follow-up to the HELCOM Recommendation on sewage sludge handling, invite Contracting Parties to establish national programmes or other tools to facilitate sustainable handling of sewage sludge.
- Collect the data on the use of different sewage sludge technologies and further elaborate reporting format as well as specify it in order to collect relevant information in 2018.
- Establish a project or lead country(s) driven process to collect information on the technological solution and elaborate a palette of technological solutions for P recovery from sewage sludge
- Based on HELCOM Recommendation on sewage sludge handling reporting to look for an opportunity to elaborate and agree on regional goals for P reuse from sewage sludge and substitution of the mineral P fertilizers with recycled P.



- Collect more information on national programmes and other instruments which are already established nationally to enhance recycling of P as an initial step of implementation of the sewage sludge recommendation, and add the information to the HELCOM Overview on nutrient recycling in the Baltic Sea region.

Suggested national actions

- Establish national tools to assure quality of the products based on or containing sewage sludge. National systems should apply harmonized and transparent criteria and labeling system.
- Include in the national legislation a permitting system for industrial wastewater acceptance to communal sewerages with consequent treatment on the municipal waste water treatment plant. National permitting system should be based on this criteria assuring quality of the sludge.
- Create options for promotion of products containing recycled P in the market including information campaigns and communication with stakeholders and target groups such as farmers and food industry. A well substantiated answer to the question “Is it safe?” should be communicated.
- Support recovery of P at the waste water treatment plant where technological solutions for recovery might be sustainable. But the final goal of this support should be producing a product viable in the market.
- Promote and implement farm level nutrient accounting



Programme

Monday, 27 March 2017

Venue: Julius Kühn-Institut (Haus A, 3rd floor), Königin-Luise-Straße 19, Berlin

12:00-13:00 Lunch (at own expense)

13:00-15:00 Plenary

Chair: **Marja-Liisa Tapio-Biström**, Ministry of Agriculture and Forestry, Finland

Introduction

Chris Thornton, European Sustainable Phosphorus Platform

Nutrient recycling in the HELCOM framework

Susanna Kaasinen, HELCOM Secretariat

Country examples of policies to enhance nutrient recycling

Claus-Gerhard Bergs, Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany

Marja-Liisa Tapio-Biström, Ministry of Agriculture and Forestry, Finland

15:00-15:20 Coffee break

15:20-17:30 Parallel sessions

Group 1: Manure

Moderator: **Mikko Rahtola**, Natural Resources Institute Finland

Introductory presentations:

Henning Lyngsø Foged, enAgro Plc, Baltic Slurry Acidification project, Denmark

Eija Turtola, Natural Resources Institute Finland, PROMISE project, Finland

Kari Koppelmäki, University of Helsinki, Palopuro Agroecological Symbiosis, Finland

Beata Jurga, The Institute of Soil Science and Plant Cultivation - State Research Institute, Poland

Group 2: Sewage sludge

Moderator: **Dmitry Frank-Kamenetsky**, HELCOM Secretariat

Introductory presentations:

Taavo Tenno, University of Tartu, IWAMA project, Estonia

Anna-Maria Sundin, Environmental Protection Agency, Sweden

Olga Rublevskaya, Vodokanal, Russia

Daniel Frank, German Phosphorus Platform

Andrzej Podscianski, National Water Management Authority, Poland

The groups are invited to suggest major means to enhance nutrient recycling in agriculture and waste water management as well as to identify hurdles hampering progress in these fields.

18:00 Dinner (offered by Julius Kühn-Institut)



Tuesday, 28 March 2017

9:00-10:30 Parallel sessions

Group work continues

10:30-11:00 Coffee break

11:00-12:30 Plenary

Chair: **Marja-Liisa Tapio-Biström**, Ministry of Agriculture and Forestry, Finland

Reporting back from the parallel sessions

Discussion and conclusions

12:30 Lunch (offered by PA Bioeconomy, PA Hazard and PA Nutri)



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List of participants

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