SuMaNu national stakeholder events: compilation of the discussions and feedback to the draft SuMaNu policy recommendations

The following is a compilation of the views expressed by stakeholders in the national stakeholder events organized by SuMaNu platform project.

The aim of the events was to get feedback to the draft policy recommendations. The discussed recommendations were the draft versions, and so they were partly different than the final, published versions. The final six policy briefs are available on the project website https://balticsumanu.eu/.

The views in this report do not necessarily represent the views of the SuMaNu project, but reflect the different views given in the discussion.

1. An overview of the organized national stakeholder events

Denmark

Date

26 Nov 2020

Participants

The roundtable discussion had 11 participants representing SEGES, Institute of Bioscience of Aarhus University, Institute of Environmental Science of Aarhus University, The Danish society for Nature Conservation, Ministry of Food Agriculture and Fisheries, The Agricultural Agency of Ministry of Food Agriculture and Fisheries, Ministry of Environment, The Environmental Agency of the Ministry of Environment, Green Transition Denmark, and Organe Institute.

Main feedback and remarks

The recommendation #1 concerning phosphorus was regarded as most relevant in a Danish context and was discussed, whereas the rest five recommendations to a large extent are already being regulated in Denmark.

Regarding the minimum regulative measure for P fertilisation, Denmark has since 2016 enforced P fertilisation ceilings. At the moment it is 30 to 35 kg P per ha, dependening on the fertiliser type. The HELCOM recommended limit of 25 kg P per ha for livestock manure is not implemented in Denmark.

Regarding P fertilisation limits according to crop requirements, the comments were diverse, but generally crop-specific regulated maximum allowable P fertilisation limits were supported. This would give livestock farmers incentives to export their excess manure P to regions in deficit, and this kind of regulation would be more precise and fair than the current flat ceilings. No need for amending the recommendation.

Regarding the P-index development, the research expertise in Denmark is more in favour of the direct use of "quantified risks for each loss transport route separately (erosion, leaching, macropores, lowland soils and banks)". This is because a P-index is seen to be a subjectively weighed parameter. The question is, if the recommendation shall use the expression "risk factors for P-loss from the field" rather than "P-index" to make it more understandable.

The roundtable confirmed that there are rather diverse viewpoints ranging from farming perspectives to NGO's, whereas the main interest of the authorities is regulations that are simple, concrete, and easy to control. Not the authority representatives, neither anyone else were able to explain the apparent lack of Denmark implementation of HELCOM recommendation.

Cooperation in the Baltic Sea Region on phosphorus fertilisation issues is difficult due to the use of different methods for analysis and classification of soils, and therefore it would be most realistic to start with a cooperation on the introduction of completely new and more interesting analysis methods than the currently existing ones.

Estonia

Date

27 November 2020

Participants

There were 23 participants representing Estonian Crop Research Institute - ECRI (4), Estonian University of Life Sciences - EULS (1), Ministry of Rural Affairs (5), Ministry of Environment (3), Private companies (4), Järvamaa Farmers Union (1), Agricultural Registers and information Board - ARIB (1), Agricultural Research Centre - ARC (3), The Estonian Chamber of Agriculture and Commerce (1).

Main feedback and remarks

Most recommendations are relevant for Estonia. However, some of them are required by law already in Estonia, such as BAT for cattle farms and 25 kg P/ha as five year avearage. It was suggested that a roadmap from the recommendations should be developed for every Baltic Sea Region (BSR) country. The roadmap should include the following parts:

- What are target values for the country (ammonia emissions, greenhouse gas emissions, N use, P use) and how far is the country from the targets?
- What are the other problems in the country with manure and nutrient management (storage capacities, phosphorus recycling etc.)?
- What kind of policies would help to manage these problems? What kind of policies are implemented today in the country? How well they work? In which order to build or implement additional policies? Which one is more urgent?
- What is the implementation cost of one or another policy?

A national Agricultural Big Data System is required in Estonia to connect data in different registers: e.g. soil maps, soil and manure analyses, crop needs, environmental restrictions, field books, manure spreading plans, animal buildings, manure storages, cultivated areas of different crops, number of animals. The system would help to have overview about data and analyse them. The output of analyses can be produced at field, farm, region and country level. The system would have a connection with these policy recommendations:

- Fertilisation planning
- Farm-gate nutrient balancing
- Planning of manure storage
- Planning of manure spreading
- Analysing the need for regional nutrient reallocation
- Support the market for recycled fertiliser products (offer of products – need for products)
- Overview about raw materials for manure products
- Manure standards should be updated once a year
- BAT lists should be updated once a year
- The system helps to build more tight co-operation between farmers, advisory services and scientists
- The system helps to build a holistic approach of manure handling.

Finland

Date

26 Nov 2020

Participants

There were 32 participants in the Finnish national stakeholder event. Participants represented several stakeholder groups: Ministry of Agriculture, Ministry of Environment, Natural Resources Institute Finland (Luke), processed organic fertilizer producers, farmers, farming advisory services and non-profit organizations.

Main feedback and remarks

- Fertilization planning on the field plot level is an important measure, and the Finnish Agri-Environmental Scheme is a very important guiding tool for the fertilization planning.
- Farm-gate nutrient balancing was seen as a good and informative measure for farmers, as it could help to find out the need for manure nutrient use on the farm and the need for exporting manure nutrients from the farm.
- There is a strong link between the farm-gate nutrient balancing and the general aim to reallocate nutrients regionally.

- Due to the lack of time slots suitable for manure spreading in the spring and summer, and the growing distances to the field plots in investing animal farms, the optimal use of manure is often not possible. To optimize the use of manure, more manure storage capacity, including satellite storages, and access to better spreading technologies is needed on many farms.

- Some banks offering loans to animal farms are not familiar with the needed manure related investments, and thus do not offer loans for such technologies.

- Couple of larger scale manure processing plants in the regions with highest surplus of manure nutrients would be sufficient to enable the transport of nutrients to regions with nutrient (P) deficiency.
- Finding economic feasibility of manure processing is challenging, as the prices of mineral fertilizers are low. Adding anaerobic digestion as a step in the process could help, but still, also larger scale anaerobic digestion plants are economically viable only if they get a gate fee for the feedstock.
- To enhance the transport of P from areas with manure P surplus to areas with P deficit, a special support for P transport was suggested.
- The growing interest on improving the soil health and the soil organic matter content reflects on a growing interest on using manure and organic fertilizers. Therefore, it would be important to be able to define the monetary value of the organic matter in manure and organic fertilizers, and not only the value of the nutrients.

- Farmers still need more advisory and information on why there still is need for better manure management practices. Exact numbers and concrete examples are needed.

- There is need for (publicly) available data on regional and even farm level soil P data, to support the aim of transporting nutrients to the regions and farms with P-deficit.

Germany

Date

17 September 2020

Participants

There were 9 participants from the following advisor and scientific organisations: Agrar Beratung Nord, DLG (Deutsche Landwirtschafts-Gesellschaft), JKI, LFA MV (Landesforschungsanstalt für Landwirtschaft und Fischerei Mecklenburg-Vorpommern), LFB (Zuständigen Stelle für landwirtschaftliches Fachrecht und Beratung) and Thuenen-Institute.

Main feedback and remarks

- Implementation of a standard model fertilization planning at EU level is difficult.
- Mineral fertilizers are still too cheap compared to manure.
- There is less use of manure on plant production farms under the present conditions because of fertilizer prices and regulations (DüV).
- It is important to compare the costs for processing and transportation of manure.
- Not only nutrients should be considered. The main problem in arable farming regions is rather the lack of humus than the lack of nutrients.
- Implementation of BAT for storage may be difficult.
- Acidification is unproblematic concerning technical and environmental terms, but acceptance by farmers and society may be difficult. More information is needed.

Latvia

There were two national stakeholder events organized in Latvia.

Date

12 March 2020

Participants

There were 11 participants representing the following organizations and stakeholder groups: farmers, advisors and farmers cooperatives.

Date

26 June 2020

Participants

High level officials of the Ministry of Agriculture, board members of the Union Farmers Parliament, managers of the cooperatives, farmers.

Main feedback and remarks

- It would be recommended to implement fertilization planning for all types of farms in all Latvia territory. Fertilization planning should be based on soil agrochemical studies results (if such procedure is managed for farm first time) or on soil analysis results.
- Support measures and public financing should be assigned for soil analysis and advisory support for fertilization planning. This is important especially for small farms, which do not have adequate education and also available financial resources to develop fertilization plan and follow the guidelines.
    - It is not advisable to set P fertilization limit for organic fertilizers (manure), due to several reasons: Animal density in Latvia is really low and as the consequence, amount of organic fertlizers is limited.
    - P content in Latvian soils is low. Water monitoring indicates, that P leaching from agriculture lands do not happen.
- To start developing national level database, which would support nutrients balance calculation at every farm. If calculations should be done by farmers, it would be too costly, since large amount of data is needed.
- Recommendation for Latvian policy decisionmakers – to assign financing for research projects, to investigate nutrients circulation on different types of farms: plant production (without manure application), animal production (manure use for fertilization of meadows and pastures) and mixed farms (manure and artificial fertilizers application)

- Research in Latvia is needed to develop recommendations to the farmers about cultivation and management of green manure/winter crops/catch crops. Mainly reason – there is high deficit of organic fertilizer, manure.
- Farmers are interested in better management of manure and incorporation technologies. However, these are finance intensive activities, without real pay-back. Banks are not willing to provide crediting for environmental investments without economic background. State and EU co-financing is crucial, to foster investments in modern and more intensive manure management.

- cooperation between scientists, advisors and farmers is crucial for better manure management

Poland

Date

3-4 September 2020

Participants

There were 50 participants representing advisors, researchers, farmers and politicians.

Main feedback and remarks

- There was discussion on the limitation of industrial farms in the light of the changing climate, related to e.g. sufficient time windows for slurry spreading.
- There is need for support for the implementation of slurry acidification technology.
- There is need for subsidies to support the processing of fertilizers of animal origin under the new agricultural policy.
- There is need for improving knowledge transfer in agriculture.

The main theme of the event was "New challenges in fertilizer management". In the event, also emission reduction targets were discussed.

The success of the national event was a positive surprise. In total of 50 participants including 10 scientists participated in the stationary meeting (quite a rare event in the pandemic era).

Sweden

There were two stakeholder events organized in Sweden.

Date

23 Feb 2021

Participants

The event targeted authorities and policy makers and had six participants from the Swedish Board of Agriculture and the Swedish Agency for Marine and Water Management.

Date

25 Feb 2021

Participants

The second event had seven participants and targeted the users and was represented by the Federation of Swedish Farmers, the Rural Economy and Agricultural Societies advisory service, the Focus on Nutrients advisory project, and actual farmers.

Main feedback and remarks

Most remarks and feedback from both meetings where towards a general skepticism to added regulations and requirements that will further restrict farmers and cut into their already thin profit margins and lower their competitiveness in relation to countries without the strict

regulations. These types of restrictions will further push small family farms into bankrupsy and only encourage larger industrial sized farms with less connection to the land. More interest was generally given to increase knowledge and to find incentive solutions to supplement or cover the cost for farmers to use and implement greener technologies.

2. Feedback to specific policy briefs

#1 Development of coherent P fertilization policies in the Baltic Sea Region

Below are more detailed discussion notes on phosphorus fertilization policies and related issues in the national stakeholder events in the project countries.

Denmark

The Danish event was only focusing on the policy recommendation on phosphorus fertilisation, which was found most relevant in a Danish context. Due to the representation of various perspectives at the roundtable, it was not the intention to reach any conclusion, but to note some important remarks. Therefore, some of the remarks in the following are contradictionary, and the points shall not be understood as a memorandum or minutes of the roundtable. The following are alone to be regarded as Danish comments, which nonetheless are valuable feedback:

On phosphorus fertiliser norms: The effect of more precise fertilisation (input to crop production) in the form of better fertiliser norms combined with a risk factor for P loss from the field is relevant, but a long-term measure compared to those listed in the “Virkemiddelkataloget” (In English: “Catalogue of Measures”, Andersen et al., 2020, prevention of losses to the aquatic environment) having immediate effect. Phosphorus fertilisation norms is a tool for a needed redistribution of phosphorus between the Danish regions, and also for enabling fertiliser planning in relation to a regulated maximum. Cooperation in the Baltic Sea Region on phosphorus fertilisation norms is difficult due to the use of different methods for analysis and classification of soil, and it is therefore most realistic to cooperate on the introduction of completely new and interesting analysis methods.

On risk regulation of phosphorus fertilisation: The previously developed Danish P-index is qualitatively and not professionally validated, and it would be more accurate to use quantified risks for each loss transport route separately (erosion, leaching, macropores, lowland soils and banks), which the new phosphorus risk mapping (Andersen and Heckrath, 2020) allows for. In this way, one avoids the subjective interpretation of the individual transport routes that a single P-index necessitates. For example, it is relevant to take into account risks for macropore leaching through drains and bank erosion in fertiliser planning.

About policies: We must remember that phosphorus is a prerequisite for food production. There should be an appropriate balance between the use of short-term and long-term measures. It is not relevant to use crop fertiliser norms (quotas) for regulation of phosphorus fertilisation. The participants were unsure of how and whether HELCOM's recommendation of a maximum of 25 kg P in livestock manure per hectare is handled in the Danish administration, and also how and whether the reduction target of 38 tonnes of phosphorus loss in the Danish part of the Baltic Sea

is incorporated in Danish policies. Farmers do not get anything out of more accurate phosphorus fertiliser norms. Fertiliser trials shows, under special conditions, an effect of increasing phosphorus allocation even though the content in the soil is high. From a regulatory perspective, it is desirable that phosphorus regulation is administratively straightforward and legally clear. The new phosphorus risk mapping (Andersen and Heckrath, 2020) is quantitative and presented with indications of uncertainties. Agriculture is not the only contributor to phosphorus in the aquatic environment, as approx. one third comes from wastewater and approx. one-third from bank erosion. In Denmark, it has already been decided that the phosphorus ceilings will be tightened in the coming years, so that they end up at an average of 30-31 kg / ha - there is no associated target of this effect on a Danish phosphorus balance per ha despite intentions for emissions-based regulation. Other tools for a more sustainable use of phosphorus in fertilisation could be taxes on feed, feed minerals and mineral fertilisers, or by a general reduction of the livestock production. The introduced phosphorus ceilings could be refined, for instance by specifying them on soil type. The use of P balances is another option, and in areas with a high content of phosphorus in the soil, the balance could be negative.

Estonia

Regarding the planning of fertilising and use of P indices, it was asked, who would give the input data for Estonia. The question was answered by Kalvi Tamm, Head of Department in Estonian Crop Research Institute: these should be built in cooperation between EULS, ECRI and ARC.

Germany

There was no discussion on this recommendation

Finland

- There is need for (publicly) available data on regional and even farm level soil P data, to support the aim of transporting nutrients to the regions and farms with P-deficit soils.

Latvia

- Latvian experts do not fully understand the term “P indices”. Considering the low animal density in Latvia, there is a lack of manure, organic fertilizer and green manure (the use of manure has decreased 10 times since 1990) and the amount of phosphorus in soils is generally low. Some exceptions could be the territories around large animal farms (500+ dairy cows, 10 000+ pigs), where slurry is still being used within 10 km distance from the farm.
- Multiple studies in Latvia have shown, that during the first year after slurry application, only 50% of phosphorus in slurry is available for plants. Depending on the type of soil, phosphorus can also be rapidly bound to soil particles and become unavailable for plants.
- Experts consider, that it is not advisable to set P fertilization limits for organic fertilizers (manure), due to several reasons, such as: a) Animal density in Latvia is generally really low and as the consequence, the amount of manure produced is limited; b) P content in soils in Latvia is really low. Water monitoring indicates, that P leaching from agricultural lands do not happen. There are three poultry farms in Latvia, where historically high P concentration has accumulated. Since processing technologies are available in Latvia, manure is processed (dried) and transported to other farms and fields in distance.
- Only local risks can be observed for surface water contamination with P, if fertilizer is spread during inappropriate weather conditions (rain, too wet). This risk is minimized by legislation.

- In Latvia, there are only few farms with increased risk condition. There are three large scale poultry farms and some large scale pig farms, where large amount of manures are concentrated. There are still no regions with concentrated animal production, and the mentioned large scale animal production farms are situated in different parts of Latvia. On large poultry farms there has been investments to technologies to implement drying and pelletation of manure, which transfers the manure to more transportable form. Therefore, the risk for phosphorus overfertilization of fields around the farms is limited.

Poland

- The recommendation to introduce a norm of 25 kg P in manure per hectare settled within one year, may lead to irrational management of manure.
- The research of Dr. Agnieszka Rutkowska showed that when phosphorus fertilization was abandoned in the conditions of soils with high and very high absorbable P content, no clear significant decrease in yield was demonstrated.
- The results of the Slurry Acidification project are of great interest in Poland, a field hitherto unknown to many participants.
- The need to know the nutrition contents of manure was also emphasized for their better use in agricultural practice.
- At the end of the event, there were practical workshops on the use of application for nitrogen fertilization plans in accordance with the nitrate regulations. The applications were prepared at AAC and are widely used throughout Poland - both by farmers and control units.

Sweden

- There was no discussion on this recommendation since Sweden already implements limits of 22 kg/ha.

#2 Fertilization planning and nutrient balancing

Below are more detailed discussion notes on fertilizer planning, farm-gate nutrient balancing and related issues in the national stakeholder events in the project countries.

Estonia

- By farmers experience, the impact of digestate disappears pretty fast, whereas slurry had longer impact on crops. In addition, trials show that the nutrients in digestate are leaching faster than from raw slurry.
- Do the fertilisers produced from manure have the same restrictions as manure (N170)?
- Should the farm-gate balance calculation model be confirmed in legislation?

Finland

Field level fertilizer planning

- Fertilization planning on the field plot level is an important measure.
- There are good digital applications available for the field plot level fertilization planning and accounting. In Finland, as since 1995 appr. 90% of the farms have been following the field level fertilizing planning measure in the Agri Environmental Scheme, there are several commercial IT-programs available to assist in the planning and accounting.

- The Finnish Agri-Environmental Scheme is a very important guiding tool for the fertilization planning, and it was assessed that the situation is pretty good in that regard. On the other hand, several farms having field plots with high P content have not taken part in this voluntary program. The reason is that strict P fertilization limits in soils with high P content prevents the use of manure.
- Precision farming methods were missing from the suggested measures, and it should be added.
- Due to the lack of time slots suitable for manure spreading in the spring and summer, the optimal use of manure is often not possible. To optimize the use of manure, more manure storage capacity, including satellite storages, and access to better spreading technologies is needed on many farms.

Farm-gate nutrient balancing

- The farm level nutrient balancing measure was seen as a good and informative measure for farmers, as it could help to find out the need for manure nutrient use on the farm and the need for exporting manure nutrients from the farm.
- There is a strong link between the farm-gate nutrient balancing and the general aim to reallocate nutrients regionally.
- The farm-gate nutrient balancing is a challenging measure due to difficulties in assessing the yields, and the measure should be supported by appropriate digital applications and farm advisory services.
- The farm-gate nutrient balancing has not been a part of the Finnish Agri-Environmental Scheme, but there have been national projects developing the calculation e.g. in the milk sector.

Germany

- Implementation of a standard on EU level of fertilization planning was seen to be difficult as there are different methods for fertilizer planning in use indifferent countries and regions.
- Tools for planning such as FastTool still has to be proven to be adequate.
- Farm gate balance is not usable, because there is no relationship to the new Fertilization Ordinance.
- The farm nutrient balance was seen to be usable for nutrient efficiency on farm level, but not as an emission balance, as it does not show where the nutrient losses occur.

Latvia

Field level fertilization planning

- Planning the fertiliser use in Latvia is most commonly done by calculating first the need of fertilizers by estimating the yield potential, and then determining the necessary nutrient amount for each crop. In order to do this, there is a written handbook called ‘’Normative and calculation methodologies for soil cultivation and fertilization usage’’ (Kārkliņš; A. Līpenīte) – this handbook was published within the Manure Standards project.
- In Latvia the multi-year fertilization plans are made based on NPK and **not** NP, due to the reason that potassium is one of the main macronutrients, which is needed both for plant survival during the winter period as well as tolerance for dry conditions.
- The fertilization plans are based on potential yield and necessary NPK amounts for the estimated yields. But it is important to underline, that yield is influenced by many factors –

soil type, pH, plant-available P and K in soil, organic matter, etc. Calculating application rates based on manure nutrient content in the fertilisation plan was seen as a good and logical requirement.

- It should be recommended to implement fertilization planning for all types of farms in whole Latvia. Fertilization planning should be based on the results of soil agrochemical studies (if such procedure is managed for farm first time) or soil analysis. For the soil agrochemical study, a state agengy official comes to the farm and compiles the following data: soil type, granulometric composition of soil, pH, organic matter content and soluble P and K. Also the micronutrients can be added to the study. Based on the study, farmer receives a fertiliser recommendation. After conducting the full soil agrochemical study, a soil analysis every 5 years is recommended.
- Experts, representing farmers stakeholder group, are reluctant for development of unified fertilization tool. Most of farms already apply one or other tool, which are recognized in rather saturated fertilization tools' market. Numbers of commercial companies have developed common tools for planning of fertilization and application of plant protection measures. Transfer to the unified tool would make extra job and/or costs for farms, since then data input should be done twice. Tool currently offered at EU level is uncompetitive, since it is not adopted to the climatic conditions of each country and consequently - conversion of plant nutrients.

Farm-gate nutrient balancing

- Policy makers underline that farm level nutrient balance calculation could be a very useful tool, if representative and objective input data is provided. For example, harvested yields among different crops. Currently, there is a lack of these tools in Latvia, due to the reason that yield levels are not stable, which leads to non-representative data.
- Experts propose to start developing national level database, which would support nutrient balance calculation at every farm. If calculations should be done by farmers, it would be too costly, since large amount of data is needed. For example, as an input data soil and manure are analyzed by farmers. Additionally analysis of green manure and plant residues should be done or data collected. There is also data lacking on the NPK content of different end-products, such as grains and feed.
- Recommendation for Latvia policy decisionmakers - to assign financing for research projects to investigate nutrients circulation in different types of farms: plant production (without manure application), animal production (manure used for fertilization of meadows and pastures) and mixed farms (manure and artificial fertilizers application).

Soil nutrient content determination

- Soil analysis is basis for fertilization planning. Without soil analysis it is not possible to create fertilization plan and achieve economically rational yields. The question under discussion could be on the issue of how often this analysis should be done, due to the reason that soil properties are changing very slowly, especially organic matter content. Currently, it is agreed that soil analysis should be done every 5 years. If soil properties are analyzed for the first time, it is recommended to do the full analysis of all agrochemical factors, but after that only the determination of nutrients is necessary.

- Field cultivation history, including yields, is mandatory since 2004 for all farms located in nitrate vulnerable zones. In other parts of Latvia, it has been mandatory since 2014, when integrated pest management legislation was introduced.

Poland

The fertilization planning is obligatory for farms with an area of more than 100 ha, intensive crops (potato, sugar beet, vegetables etc.) with an area of more than 50 ha and farms with more than 60 animal units. For today, this only applies to nitrogen fertilization. Pursuant to the requirements of the European Commission, the fertilization plans will also apply to phosphorus fertilization.

Sweden

- Fertilization planning on the field plot level is an important measure. It is not mandatory, but most farmers do this, usually with their advisory.
- The annually updated recommendations for economically optimum fertilization are used for planning by most farmers.
- Weather and field condition can make it difficult to utilize manure optimally, fields can be too wet, or weather can be too hot and windy, it is not always possible to wait for optimal conditions.

- The farm level nutrient balance measure was seen as a good and informative measure for farmers and gives insight into connection between nutrient management and farm economy. It is a part of the "Focus on Nutrients" information initiative that is available to farmers.
- Especially for nitrogen, it will never be possible to be in balance. But even for phosphorus, it is important to realize that there needs to be some degree of buildup in the soil to improve soil fertility.
- The farm-gate nutrient balancing should be supported by appropriate digital applications and farm advisory services.

#3 National standards for handling and spreading manure

Below are more detailed discussion notes on standards for handling and spreading manure and related issues in the national stakeholder events in the project countries.

Estonia

- Mass balance method is required for manure calculations. This was composed in Manure Standards project but should be updated in future. In general, manure standards should be updated more frequently in Estonia.
- The recommendation to spread manure in spring and summer and use in autumn only for wintering crops is questionable. The problem is too small storage capacity, but also the spreading capacity in spring.
- In addition, the recommendation to cover the liquid manure storages with waterproof cover was discussed. A comment by a farmer was that he doesn´t plan to cover the storages, because his round tanks have small surface area/volume relation, and the evaporation balances the precipitations in some degree.

Finland

- Especially in bigger animal farms, there is a need for modern manure handling and spreading technologies, which would help in more efficient use of manure, despite of the limited time for manure spreading. Satellite storages, umbilical hose spreading and use of contractors were mentioned as examples of modern technologies.
- Especially in bigger farms, long distances to the fields are a more prominent factor preventing the optimal use of manure than the lack of available spreading area as such. In addition, manure transporting costs to the fields increases as the distances grow and fields are fragmented.
- Some banks offering loans to animal farms are not familiar with the needed manure related investments, such as building storage capacity, and thus do not offer loans for such uses and technologies.
- Umbilical hose spreading was mentioned as a technology that many farmers are interested in, as it reduces the risk for soil compaction.

Germany

- Accuracy of sampling manure on farms to measure the nutrient content is questionable, because of inconsistent sampling methods and nutrient loss from the samples.
- Implementation of standards for storage could be difficult due to a large variation range between different farms. For example, some farms do not have the possibility to increase storage capacities, as it is expensive.
- Acidification is unproblematic concerning technical and environmental terms, but there is still a lack of acceptance by consumers and society.

Latvia

- The issue of manure standards is currently difficult in Latvia. The average NPK content in different types of manure is stated in the national legislation. Within the Manure Standards project, precise manure analysis was done, and the results were very different from the values indicated in the legislation. The most convenient solution would be, if farms would do their own manure analysis, but a qualitative and representative sampling need to be ensured.
- There are contradictions between slurry spreading during the spring period and BAT, because when spreading slurry in spring, it is not incorporated into soil, which increases the greenhouse gas emissions. From the other perspective – N and P leaching is reduced, which could arise, if slurry is spread and incorporated before the winter period, and the period of frost is absent. The question – which of the targets (water quality or climate change reduction) is more important?
- To allow autumn spreading for establishment of winter crops only, and otherwise forbid it, is currently not possible to implement in Latvia, since the capacity of current storage facilities is insufficient. Currently, there is a requirement to ensure a capacity for 6 to 7 months. This requirement is also impossible to implement for farms with solid manure.
- All advisors agree though, that having sufficient storage capacity is fundamentally important for effective manure handling. By moving the spreading of manure to spring period, a greater nutrient use efficiency could be achieved, since crops more intensively would take up the nutrients. In contrast, during the autumn period, the P and K should be ensured for crops, but the amount of N should be reduced, since it also reduces the crop hibernation.

- Unfortunately, establishing of manure storage facilities demands a lot of financial resources, therefore it is only possible to do these investments with a help of state or EU support.
- Currently, BAT lists for reducing NH_3 and greenhouse gases for all livestock producers is not created in Latvia. But, considering the research, which was done by Latvian and Estonian researchers in GreenAgri project, the content of measures under BAT list are familiar. The biggest issue here is that advanced spreading machinery is very expensive, therefore farmers should start to buy spreading service, or create local cooperatives for sharing this machinery.

Poland

- This issue is largely regulated by Polish law ("Program of measures to reduce pollution of waters with nitrates from agricultural sources and to prevent further pollution"). Farmers must adjust the size of the slurry tanks according to the recommendations for storage capacity for 6 months.
- There are many positive opinions concerning the more common use of slurry acidification.

Sweden

- Currently, it is mostly smaller farms outside of the nitrate vulnerable zones in the forested regions that account for the use of broadcast spreading for liquid manure. The use of this spreading technique has been decreasing every year. Legislation banning the use of this would essentially drive these smaller farms out of business for relatively little environmental gain considering their location.
- The issue of increasing required storage capacity is similar, since storage structures are very costly and difficult to get bank loans for since there is little direct return on the investment.
- Even if there is investment support available, bank loans still need to be made to cover remaining costs and this is often difficult to get, since banks do not see the direct return on the investment.
- Co-operation with neighboring farms should be encouraged, but some crop farms could be hesitant to fertilizing with manure if it means using big heavy equipment that causes soil compaction.
- The solid fraction from separated cow slurry is more commonly used as a bedding material.

#4 Regional nutrient reallocation

Below are more detailed discussion notes on regional nutrient reallocation and related issues in the national stakeholder events in the project countries.

Estonia

- There was a question raised, what are supports for manure processing and production of manure based fertilisers (fertilisers from recycled manure) in other countries?

Finland

Develop a national strategy and consequent measures

- Couple of larger scale manure processing plants, situated in the regions with highest surplus of manure nutrients, would be sufficient to enable the transport of nutrients to regions with nutrient (P) deficiency.

- In cases, where there is a long transporting distance to centralized processing plants, and when there is a possibility to use manure nutrients on farms, smaller local processing plants might be sufficient. But again, especially in the case of smaller processing plants, there is the problem with economic feasibility of manure processing and upgrading the produced methane.
- Transferring animal production away from the regions with high animal density is not a realistic solution for regional manure surpluses. On the other hand, regional concentration of animal production was seen as an enabling factor for better economy of manure processing in larger scale centralized processing plants.
- Finding economic feasibility of manure processing is challenging, as the prices of mineral fertilizers are low. Adding anaerobic digestion as a step in the process could help.
- On the other hand, also larger scale anaerobic digestion plants are economically viable only if they get a gate fee for the feedstock.
- In general, regardless of the processing technology, it was considered important to plan the utilization of all produced products and by-products. In the case of anaerobic digestion, both energy and digestate are produced, and the need for upgrading the digestate to more concentrated fertilizer products must be recognized.
- To enhance the transport of P from areas with manure P surplus to areas with P deficit, a special support for P transport was suggested. This would encourage the farms with oversupply of P to process manure and transport it to other farms/regions. One possibility would also be to introduce a P intake support to farms with P deficiency, to enhance the use of processed manure-based fertilizers.
- Co-operation with neighboring farms should always be the first step in the manure management for investing animal farms, before acquiring more field for spreading manure.
- Farms with excess nutrients would need easy-access information about areas/farms in the need of P.
- Regional maps with flows and quantities of different available biomasses are a good tool for assessing the transport need of nutrients, and for planning the locations of centralized processing plants.
- Very tight P fertilization limits (total ban on P fertilization in soils with high P content) can prevent the motivation for farm-scale processing (separation) of slurry on pig farms.
- The aim of processing is usually to lower the water content of manure. On farm level, separation would often be a sufficient processing method, enabling the transport of solid fraction to other farms, or fields that are further away from the stalls.
- The solid fraction from separated cow slurry can be used as a bedding material.
- Anaerobic digestion increases the share of readily available N in manure, thus helping in reaching better nutrient use efficiency, if the digestate is applied during spring and summer. But if digestate is applied in autumn, and also in small farm scale processing plants, there is a risk for increased N leakage.
- In some areas with concentrated milk production, there would be interest for anaerobic digestion, as a method for reaching better N availability of the slurry. There would not necessarily be a need of transporting the manure away from the area, and also the farms might not be willing to give away manure.

- The farms with organic crop production might be interested in using more manure, but the availability of manure is a problem in some areas in Finland.

Create incentives to support production of manure-based fertiliser products especially in regions of intensive livestock production

- It is important to consider the price competitiveness of the fertilizer products already at an early stage of planning the processing plant to avoid a situation, where it would be difficult to find markets for products. The same applies to the feedstock, as it may also limit the demand for the fertilizer product.
- Applying blending obligation as a possible solution to enhance markets of recycled nutrients, should be studied. The blending obligation could also be on a farm level, backed up with a support mechanism, and not necessarily on fertilizer production level.

Create incentives to support the use of manure-based recycled nutrients to substitute mineral fertilisers and demonstration of their use

- Inorganic fertilizers on a crop farm are often much cheaper than the use of organic fertilizers. But as the profitability of farming is already low, it is not possible to increase the price of inorganic fertilizers
- The technical usability of recycled fertilizer products has improved during the last years, but it is still not at the same level with inorganic fertilizers.
- The growing interest on improving the soil health and the soil organic matter content reflects on a growing interest on using manure and organic fertilizers.
- It would be important to be able to define the monetary value of the organic matter in manure and organic fertilizers, and not only the value of the nutrients.
- In addition, it would be important to get estimates for if and how the increased soil organic matter content can be seen in higher yields, and how long it would take to achieve it.
- A farm using recycled nutrient products should get some kind of support or advantage for that, for example in the agri-environmental scheme.

Germany

- Using manure is still too uneconomical compared to mineral fertilizer. This is due to both price formation and given requirements in the Fertiliser Ordinance.
- There is very little acceptance towards use and transfer of manure by society. The Project Nutri-Recycle (transfer project) was unsuccessful.
- New legislation at EU level is needed to implement a market for manure.
- Comparing costs of processing manure and transportation of untreated manure is necessary.
- Subsidies for transportation are often unnecessary.
- The major problem in arable farming regions is rather the lack of humus than the lack of nutrients.

Latvia

- The recommendation for regional nutrient reallocation was hard to understand for Latvian advisors, since there is no clear definition of ‘’regional scale’’, and methodology of how it is determined. Should a country be determined as a region? As a baseline, in Latvia there is only country level statistical data – overall animal density, number of animals, amount of manure

and used NPK. Different information is absent. In theory, there could also be data for the amount of sewage sludge.

- Research in Latvia is needed to develop recommendations to the farmers on the cultivation and management of green manure, winter crops and catch crops. Main reason for this is that there is high deficit of manure. In Latvia, there is a lack of information on different possible green manure, winter crops and catch crop types, and their NPK value.
- Many large farms have invested in technologies to transform manure into more transportable form. Nutrient-rich material can be transported to regions where manure is not available.

Poland

- There is need to include subsidies for the processing of animal fertilizers in the new CAP.
- The possibility of disposing of excess manures to other farmers is still a good solution.
- The development of small gardens (very popular in recent decades) as an opportunity to better use of excess manure.

Sweden

- Moving the animals from regions with high animal density to areas with low animal density was discussed, but it was not seen as a realistic solution for regional manure surpluses. It would be better to find solutions for moving the nutrients.
- The general problem in manure processing was seen to be the economic feasibility, even with large, centralized processing plants. Currently, recycled nutrients have to compete with mineral nutrients which are effective and relatively cheap. The effects of the mineral nutrients are also well known, and techniques for spreading are developed.
- Investment support for building nutrient recycling plants was not seen to be enough, as investment will still be needed and if there is no market or buyers for the products, the endeavor will fail.
- There needs to be incentives for using recycled fertilizers instead of “virgin” mineral nutrients, to help establish a market or demand for the nutrients. Possibly be a part of the agri-environmental schemes.
- It has been recognized that there is growing interest on improving the soil health and the soil organic matter content, and that could be used to help promote positive aspects of using recycled nutrients.
- It was regarded beneficial to have calculations of the monetary value for adding organic matter to soils, and not only the value of the nutrients.
- There was seen in general a big interest in biogas production from manure, but again, it was not seen as economically feasible today, thus better support mechanisms would be needed for this.

#5 Minimal use of harmful substances and careful manure processing ensure safe recycling of manure nutrients

Below are more detailed discussion notes on safety of manure nutrient recycling and related issues in the national stakeholder events in the project countries.

Estonia

- It was seen that avoiding the of use of antibiotics and microelements in animal husbandry is not possible.

Finland

- In Finland, the level of antibiotics in manures are low, but there have been some pesticide residues detected in manure in the laboratory test conducted by organic fertilizer industry.
- It is important to minimize the hygiene risks related to the transporting of manures and animals between farms and between centralized processing plants. On the other hand, in larger centralized processing plants, the operations are at a more professional level, which may help reduce the risks.

Germany

There was no discussion on this issue

Latvia

- The recommendation on minimal use of antibiotics, as a measure to help avoid risks related to use of manure, was difficult to understand for advisors.
- The topic of antibiotic residue decomposition should be studied by scientists.

Poland

- Currently, producers of milk and meat can use veterinary medicinal products in animals only if the drugs are prescribed by a veterinarian and used strictly according to his indications. Only a veterinarian, after examining the animals and making a diagnosis, may order the animal owner to administer veterinary medicinal products, including antibiotics, according to the dosing schedule specified by the responsible entity, i.e. the drug manufacturer. A veterinarian treating a sick herd is each time obliged to leave animal treatment documentation on the farm. The breeder confirms with his own signature that he has accepted the rules of using the prescribed drugs.

Sweden

- There is a national certification system for digestates for quality assurance. The certification is voluntary, and facilities are audited by external inspectors. In the certification system, the entire chain is inspected from raw material to end product, so that a certified biofertilizer meets high requirements for, among other things, infection control, origin and low metal content.

#6 Knowledge transfer between farmers, advisors, researchers, authorities and policymakers

Below are more detailed discussion notes on knowledge transfer and related issues in the national stakeholder events in the project countries.

Estonia

- A national Agricultural Big Data System is required in Estonia to connect data in different registers including soil maps, soil analyses, manure analyses, crop needs, environmental

restrictions, field books, manure spreading plans, animal buildings, manure storages, cultivated areas of different crops, number of animals etc. The system would help to have overview about data and analyze them. The output of analyses can be produced at field, farm, region and country level.

The system would have a connection with the following policy recommendations:

- Fertilisation planning
- Farm-gate nutrient balancing
- Planning of manure storage
- Planning of manure spreading
- Analysing the need for regional nutrient reallocation
- Support the market for recycled fertiliser products (offer of products – need for products)
- Overview about raw materials for manure products
- Manure standards should be updated once a year
- The BAT lists should be updated once a year

- The system would also help to build more tight co-operation between farmers, advisory services and scientists.
- The system would also help to build a holistic approach for manure handling.

Finland

- Farmers still need more advisory and information on why there still is need for better manure management practices. Exact numbers and concrete examples are needed.
- The knowledge and information exchange is relatively open and working well. There is no culture of withholding the information, and there is a general will to provide answers to questions. On the other hand, some of the information and messages given are biased, as the interest of those giving the information are not always neutral.
- There is a need for targeted knowledge exchange towards the banks, regarding the need for investments on manure storages, manure processing and spreading technologies. At the moment, some of the banks are not accepting these investments in their loan applications.
- There is a need for a more holistic approach when looking for solutions in manure management.
- There is a need for demonstrations, also for solutions which might not comply with the present regulation, so that it can be tested whether the new solutions would work or not.
- There are examples of very successful development projects on producing tailor-made recycled fertilizers for organic farming, in cooperation with the processing company and farmers.
- It is important to look at the bigger picture, e.g. also consider the climate issues when looking for manure management and nutrient recycling solutions.
- The cross-sectoral work has been increasing at least between the authorities.
- The political decisions and regulations (both restrictions and support mechanisms) are of great importance in the manure and nutrient recycling issues. In the worst case, the regulations can lead to a wrong and unwanted direction. An example of this is to regard anaerobic digestion as a solution for problems, for which it offers no solution to.

Germany

There was no discussion on this issue.

Latvia

- The topic of knowledge transfer is seen very important in Latvia. A lot more should be told about optimal manure handling and spreading, including both the technical side, as well as spreading conditions.
- Currently there is no clear knowledge among small and medium size farms, when the slurry should be spread in order to cause the least harm to environment. The recommendation of using BATs and immediate incorporation simply makes them very dissatisfied, since it is just not economically possible to implement any of these technologies.
- Those farmers, who have participated in experience exchange visits to other countries and other farms, admit that the experience of other farmers has made it more clear of which machinery and technique is the most suitable for their farm. Unfortunately, the machinery dealers can only characterize the machinery they are selling.
- Efforts of Farmers Parliament is highly evaluated in knowledge transfer process. Farmers are interested in better management of manure and incorporation technologies. However, these are expensive activities, without real pay-back. Banks are not willing to provide crediting for environmental investments without economic background. State and EU co-financing is crucial, to foster investments for modern and more intensive manure management.
- Cooperation between scientists, advisors and farmers is crucial for better manure management.
- To make farmers listen and follow recommendations, studies and trials are needed. To consider, that standards of one country will fully fit to other conditions is shallow approach. Some trends can be transferred, but they should be adopted to local data and local conditions.

Poland

- The last two years have been a period of intensive training of advisors in fertilizer and nutrient management.
- The training is related to the implementation of the nitrate program which covers the whole country. At the request of the Ministry of Agriculture, advisory services are trained, providing advice to farmers in the field.
- Educational activities in this area are also carried out by Agricultural Institutes.

Sweden

- The Greppa Näring (Focus on Nutrients) project has been quite successful and is still growing, more so in some areas than others.
- There is a need for a more holistic approach when looking for solutions in manure management.
- There is a need for demonstrations, also for solutions which might not comply with the present regulation, so that it can be tested whether the new solutions would work or not.
- There are examples of very successful development projects on producing tailor-made recycled fertilizers for organic farming, in cooperation with the processing company and farmers.
- Political regulations and incentives really shape manure and nutrient recycling issues. Ineffective use of these tools leads to no real change. For instance, anaerobic digestion as a

solution for creating energy from manure, increasing nitrogen use efficiency and offering a hub further processing is stunted by excessive regulation and ineffective incentives.

3.Summary and conclusions

There were altogether nine national stakeholder events organized in the SuMaNu project, with the aim to get feedback to the six policy recommendations drafted in SuMaNu focusing on more sustainable manure and nutrient management in the Baltic Sea Region. Because of the outbreak of the Covid-19, most project partners had to change their original plans of organizing face-to-face stakeholder events, and to look for possibilities to organize the events online. Finally, six out of nine national events were organized as online.

All the national stakeholder events were successful. There were good discussions and valuable feedback to the draft policy recommendations was received. In addition, the possibility to participate online perhaps resulted in a greater number of participants in the end. Thus, we can conclude that online workshops were a good way of organizing the events, also when having participants from diverse stakeholder groups ranging from farmers to authorities. The project partners were also very flexible in the situation and took advantage of the possibilities of the new online technologies.

As for the feedback to the six draft policy recommendations, some of them evoked more discussion than others, and, in some countries, there was more discussion on some of the topics, where other policy recommendations were found more interesting in other countries.

For Policy brief #1, the phosphorus regulation was seen as a necessary tool for the redistribution of phosphorus between regions: from regions with phosphorus oversupply to regions with phosphorus deficit.

For Policy brief #2, the received feedback was generally quite positive. In most countries there is already some kind of fertilization planning widely used on farms, and it is seen as a good measure to help and guide fertilization. Farm-gate nutrient balance calculation was also seen as a good measure in principal, but there were some challenges recognized related to the practical implementation, and there would still be need for strong support by advisory services and available databases to implement it.

For Policy brief #3, there was an interesting issue raised in several partner countries. It is generally agreed that spreading manure mainly in spring and summer usually would result in better nutrient use efficiency and less nutrient losses, but lack of storage capacity, mainly for slurry, often forces the farmer to spread manure also in the autumn, even in cases where there is no sowing of plants in the autumn. Also lack of appropriate spreading time and weather in spring and growing distances to fields may lead manure application in autumn. But investing in manure (slurry) storage capacity is expensive, as also other manure related technics. And here, the banks offering loans for investing animal farms come to the focus. In several partner countries, it was brought up that the banks do not see manure storages as “investments generating profits”, and thus they do not offer loans for these investments. It seems that manure production and the need for manure storage capacity are not seen an integral part of animal farming. Thus, getting state or EU support for the manure related investments and

having banks accepting these as funded investments, would be a very concrete step for better manure management.

For Policy brief #4, it was mostly agreed that there is need for nutrient reallocation, although there is wide variation in the current situation between and within the project countries. One of the major challenges related to nutrient reallocation is the economic feasibility of manure processing. In the future, issues related to soil organic matter content and the value of organic matter in manure will be gaining more attention, and this may also act as a driver for growing interest and demand for manure and processed organic fertilizers.

For Policy brief #5 there was not much discussion. Maybe the topic of safety issues related to manure use and processing was not that familiar to the participants.

For Policy brief #6, it was generally agreed that agricultural advisory services are of great importance when communicating the different manure related regulations, calculation tools and technologies to farmers. There is still also need for more concrete examples, including calculations and concrete numbers related to the economic issues on manure and nutrient management.