

Regional Conference

Closing the mineral cycle at farm level – Good practices to reduce nutrient loss in Murcia, Spain

Tuesday, 4 November 2014

Consejería de Agricultura y Agua de Murcia, Plaza Juan, Murcia

Aim of the conference

This conference aimed to present the results from the EU project "Resource Efficiency in Practice - Closing Mineral Cycles", particularly focusing on the identified good practices for the Murcian region, to highlight farmers experiences with successfully implementing good practices and to initiate discussions among the participants on identifying solutions and the need for further actions to effectively address the nutrient losses in the region.

In total, 140 people participated in the conference, representing farmers, farm advisers, regional and national policy-makers, universities and environmentalists. The conference was supported by the Murcian Ministry for Agriculture and Water as well as the Murcian Coordination of Organisations of Livestock and Crop Farmers (COAG).

Good practices presented (by Marion Sarteel, BIO by Deloitte, project partner)

- Anaerobic digestion of manure for biogas production and improved nutrient uptake
- Cover manure during storage
- Improve the fertilisation management plans for all agricultural sites
- Use of cover crops
- Develop agroforestry systems
- Use drip irrigation technology

Key messages from the presentations

Europe is not self-sufficient in regard to nutrient use. In agriculture, some nutrients like Nitrogen, Phosphorus and Potassium have to be imported, therefore the focus is to make agricultural practices more sustainable and efficient. The project is a pilot project based on the interest of the European Parliament and coordinated by the European Commission to close mineral cycles at the farm level in order to decrease the economic and environmental costs that are incurred by a surplus of those nutrients.

Murcia is a region with an agricultural history spanning three centuries and is an important producer of agricultural products for Spain and Europe. Subsequently, there is a high interest to eliminate environmental contamination. Agricultural practices in Murcia already apply many technologies, i.e. to deal with a major concern of water scarcity.

Environmental threats to the region include the poor water quality of its ground and surface water, the high production of manure from pig farming and the lack of organic soil matter, which exacerbates the limited amount of water.

Jennifer Moreno Garcia (Biocampo) presented several opportunities to improve the situation. She mentioned practices to increase agrobiodiversity like crop rotation, cover crops, hedges and crop associations. Her talk focused on organic fertilisation with residues of harvest, green fallow, manure and compost and she presented technical specifics regarding the preparation of compost and its value for soil fertility.

Manuel Caro Ayala (Murcian Institute for Agricultural and Nutrition Research and Development, IMIDA) presented the Agricultural Information System for Murcia (<http://siam.imida.es>). The web-based platform provides its users with locally specific information on agrometeorology, fertirrigation, support to interpret soil, leaf or water analyses, plant pests and diseases, economic analysis and technical documentation on various topics.

D. Angel Garcia Lidón (Director General of the department of Agro-food industry and agricultural training at the County of the Murcian Region) gave the last presentation on policies for the efficiency of agricultural resources. These policies focus on the lack of water in the region and on fertiliser management. Regarding the latter, several actions were taken to improve the situation, such as the adoption of Good Agricultural Practices, research projects to optimise fertilisation, fertirrigation, information and training campaigns and the Agricultural Information System for Murcia.

Results from the working group questions

1. Success factors and barriers to the uptake of good practices

The discussion focussed on the measures that were proposed by the project for increasing nutrient efficiency in the Murcian region. The reaction of the participants let one assume that most of the good practices were already implemented.¹ Discussing the application of compost, the participants disagreed with the current limit for organic fertilisation as this limit was too low and there was no risk of contamination. Drip irrigation and the use of soil samples to optimise fertilisation are widely and successfully implemented. So far, 84% of the cultivated area under irrigation already is irrigated with drip irrigation. However, most participants did not approve of cover crops, covering manure storage facilities and anaerobic digestion as viable measures for the region: cover crops were perceived to cause competition with the main crop for water and nutrients; covering the manure storage ponds was perceived as not necessary as they only make use of the dried biomass. [However, open storage of manure causes ammonia emissions that are responsible for acidification, eutrophication and nutrient input into the environment.] The participants perceived anaerobic digestion as a practice that would neither produce a higher concentration of nutrients, nor a high amount of energy (due to the high water content) and was thus considered this option as not economically viable.

The Murcian farmers were interested in the adoption of new techniques to avoid nutrient surpluses and inefficient use of water. However, these measures would need to be adapted to the extreme climatic and soil conditions of the region. More specifications of the

¹ Due to the arid climate, agricultural production in the region is highly developed and dependent on technology (in part. irrigation)

measures and more research on nitrates and their sources, as well as studies on the composition of the soil and the need to sustain and increase soil fertility and resilience is needed.

2. New and innovative practices

Some innovative techniques can achieve higher nutrient efficiency in the region of Murcia. Generally, farmers know the good practices that were presented at the plenary session of the conference. These include: anaerobic digestion, optimised fertilisation programs, use of cover crops, drip irrigation and agroforestry development. However, local experiences indicate that some of them need to be adapted to the context of Murcia.

Slurry ponds in Murcia do not follow the suggestions of the project. On the contrary, due to weather conditions, manure often remains uncovered and is spread with the largest surface possible to enhance drying. The manure is separated which allows for the evaporation of slurry, which, due to weather conditions in the area (high temperatures and high radiation), is a rapid process. Farmers usually sell the solid organic matter, which in general is scarce and expensive in the region.

Farmers of the region perceive water scarcity as a limitation to the use of cover crops.

The general opinion is that not all techniques are applicable in all regions, but are dependent on the specific conditions of climate, crops and practices of each area. Therefore, participants found it essential to mention that measures are tailored to the conditions in each region. For example, soil acidification through the use of fertilisers is not a problem in Murcia. Arid conditions make nitrate leaching less likely than in other areas with high rainfall. On the other hand, the content of organic matter is very low and due to lack of water there are problems of salinisation.

Examples of innovative practices in the region

(a) **Incorporation of ground pruning or plant material into the soil.** Many farmers have practiced this technique for 7-8 years and have gained practical experience that contradicts with results predicted by research. It is practiced mainly in almond, olive and citrus orchards. For some farmers, the actual value of this method is questionable, since the organic material is applied to the area between the rows and not in the drip line (where the majority of the roots are concentrated). However, in conjunction with the expected scientific results, other farmers argue in favour of the technique because trees extend their roots far beyond the drip line. Therefore, nutrients and organic matter can be taken up.

(b) **Use of slurry in drip irrigation.** This technique is being used in the cultivation of citruses with a saving of 20 % in fertilisers. One barrier to implementation is that the solid matter in the slurry blocks the jets of the drip irrigation installation. To overcome the difficulties, it was mentioned that small rotor spreaders (with a range of 6 m) could be used to distribute the slurry and thus increase the efficiency of this technique.

(c) **Using the "Agricultural information network system of Murcia (SIAM)"** developed in the Murcia Institute for Agricultural Research and Development and presented at the regional conference by Manuel Caro Ayala. It is an intuitive tool for allowing farmers to have precise information on the weather in the region. This supports decision-making in agricultural practices. For example, some farmers mentioned that they used the system to decide on irrigation (depending on the accumulated precipitation) or for foliar fertilisation (depending on the wind). The website also includes other information useful to farmers, as the

interpretation of soil analysis or economic study information. The tool is free of charge and widely accepted by the Murcia farmers.

(d) **Drip irrigation.** This system is being used for many years now and has been implemented by the vast majority of farmers. It is an effective way of providing nutrients.

(e) **Use of treated wastewater for irrigation.** Researchers have documented trials to use sewage water from different purification stations for irrigation. As one step in wastewater treatment is the removal of nitrogen, an alternative would be to use these waters without prior removal of nitrogen. It has been observed that this can save about 1000 € per year of fertiliser costs. A limit of this technique is that the pre-treated water may not be discharged into the surface water in times of no need for irrigation, as the water quality does not comply with legislation. Another project investigates the use of aquaculture wastewater for irrigation in agricultural crops (CARBGROWTH project).

Barriers to the implementation of innovative practices focusing on the optimisation of nutrient use

(a) Lack of updated data on nutrient levels required by crops. It is important to redefine the crop-specific fertiliser demand. In the participants' view, the currently used and known values are obsolete. At present, production could be designed in a much more efficient way, but in general there is a lack of information and guidance. Thus farmers take into account the maximum values for application, which can lead to exceeding the capacities of soils to uptake the applied nutrients.

(b) High costs that make the practice economically unviable. An example of this is the case of recycling waste as organic fertilisers. Though farmers are generally aware of the importance of applying organic matter to the soil, organic matter (compost, manure) is scarce and expensive in the region. The high prices and additional labour costs make this practice sometimes impractical.

(c) Lack of knowledge transfer between researchers and farmers. There is a lack of communication between researchers and practitioners. Even in the case of demonstration projects, dissemination of results is not effective, since it is only among participating farmers or companies. In some cases, research is compartmentalised and not widely distributed to all farmers.

Barriers to apply innovative practices in order to optimise the use of nutrients

(a) Recommendations and legislation are too general. Legislation is too general for the whole region and its great diversity of microclimates, soil types, etc. It was mentioned that adapting legislation and agricultural practices to the specific agro-climatic characteristics of each area could be a viable practice.

3. Potential for cooperation and joint actions

In this working group, the discussion focused on possible ways and joint actions to implement measures to improve the efficiency of nutrients. Some participants stated that the region of Murcia is not comparable to any of the other regions for which the project was developed, due to their extreme climatic and agronomic conditions. The soils of this region are deficient in organic matter and agriculture in Murcia does not rely on subsidies.

A certain degree of partnership is necessary to reach a greater understanding among all stakeholders (farmers, institutions, organisations and government). Actions should be directed to a more local level and especially the farm level to reflect the reality of the farmers. It is necessary that these actions are consistent with the current rules. These

actions may include the use of guidelines to improve nutrient management on farms (e.g., the use of slurry). It is also important to demonstrate that these actions have been successful in other regions or similar holdings through demonstration in case studies. The Rural Development Programme (RDP) of the Common Agricultural Policy (CAP) may be a viable mechanism for promoting cooperation, technology transfer and advice to farmers.

4. Fine-tuning the legal framework and financial support

The following ideas have been proposed as effective solutions to the problem of excess nutrients in soils in Murcia:

- The need for further studies and tests in order to suggest viable solutions (similar to such as presented in the conference).
- The need to install treatment plants and collection of slurry. Unlike Northern Europe, this is a cost-effective and economically complementary activity for livestock holders in Murcia. The participants believed that slurry banks would not work in Murcia.
- Creation of wetlands.
- The need for more cooperation and networking between the different actors involved, at regional, national and European levels. The participants discussed how many departments act in isolation, each for their respective region, but should start to treat issues like nutrient management in a more integrated way throughout the whole region. In this way, solutions implemented in one region could be applied in other regions.

Regarding the PDR or Murcia, these problems can be addressed through agri-environmental-climate measures and technology transfer. Some participants believe that compulsory measures should be created which would give answer to these problems. Others farmers were not aware of this type of support for measures.

Livestock farmers complained about the exceeding costs imposed by solutions to these problems. In this sense, farmers may need to make use of subsidies. They also mention that the administration might need to finance slurry ponds.

Key messages and conclusions of the conference

The case of agriculture in Murcia is due to the extreme and dry climate conditions certainly different from the other cases covered in the project. However, nutrient inefficiencies can also be observed in this specialised and water efficient agricultural setting. Most of the inefficiencies are based on the lack of awareness of the impacts caused by agricultural practices. During discussion of the techniques in the working groups, participants mentioned that the proposed measure of covering manure was not viable for Murcia as the solid part of the manure would not dry fast enough. This showed that some farmers in the region are not aware of the loss of ammonia when the manure dries. As agriculture in Murcia has a long history, farmers are proud of their achievements. To improve the environmental situation in the region, it is necessary to increase awareness of the environmental impact of current agricultural practices.

Furthermore, the farmers of Murcia are interested in new approaches and technologies to optimise agricultural production. This attitude is promising for the implementation of new and innovative practices to improve nutrient efficiency in Murcia.