

GUIDING FARMERS TOWARDS SMART FERTILIZATION AND A BETTER SOIL QUALITY IN BELGIUM AND THE NETHERLANDS



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OBJECTIVES

The LIFE+ Demeter project developed an integrated approach to tackle environmental problems caused by unsustainable soil management, low soil quality and polluted water, in Flanders and the Netherlands.

The project partners wanted to:

- **Increase awareness amongst** all agricultural stakeholders about the benefits and principles of a sustainable soil and nutrient management in daily farm practices.
- **Develop a decision support tool** at field level integrating the major aspects of sustainable soil management: soil organic matter (SOM) optimization and N and P fertilization. The tool will translate results of scientific research into practical recommendations to farmers.
- **Train farmers and advisors** in the use of the tool. This will facilitate adoption of the tool and increase sustainable environmental results.

METHOD

Development of the decision support tool

The Demetertool ...

- ... is a free online open-ended tool
- ... works with limited input and a userfriendly interface
- ... consists of an OM module and a nutrient module
- ... operates on the field level.

An account can be created on <https://eloket.vlm.be/Demeter>

Following input of soil and management information, the Demetertool offers ...

- ... a longterm prediction of SOM stock evolution
- ... a soil balance based N fertilizer advice
- ... a simple P-balance for a given crop rotation

These practical recommendations aim at a more integrated sustainable management of both nutrients and soil organic matter on an individual plot scale.

To maximize its usefulness, the tool was tested by scientists, by 80 Flemish and Dutch farmers and 20 farm counsellors of the Flemish Land Agency.

Validation of the decision support tool - field monitoring study (2013-2015)

- 80 farms in Flanders and the Netherlands
- 1-2 fields per farm
- Soil analysis: %C, pH, plant available P, K and Mg, mineral N in the soil profile
- Manure analysis: total N and P content
- Collection of information about farm and soil management
- Recommendation report generated with the Demetertool for each field

The applied fertilization was compared to the recommended dose. The residual nitrate in the soil profile at the end of the growing season was measured.

Farm guidance

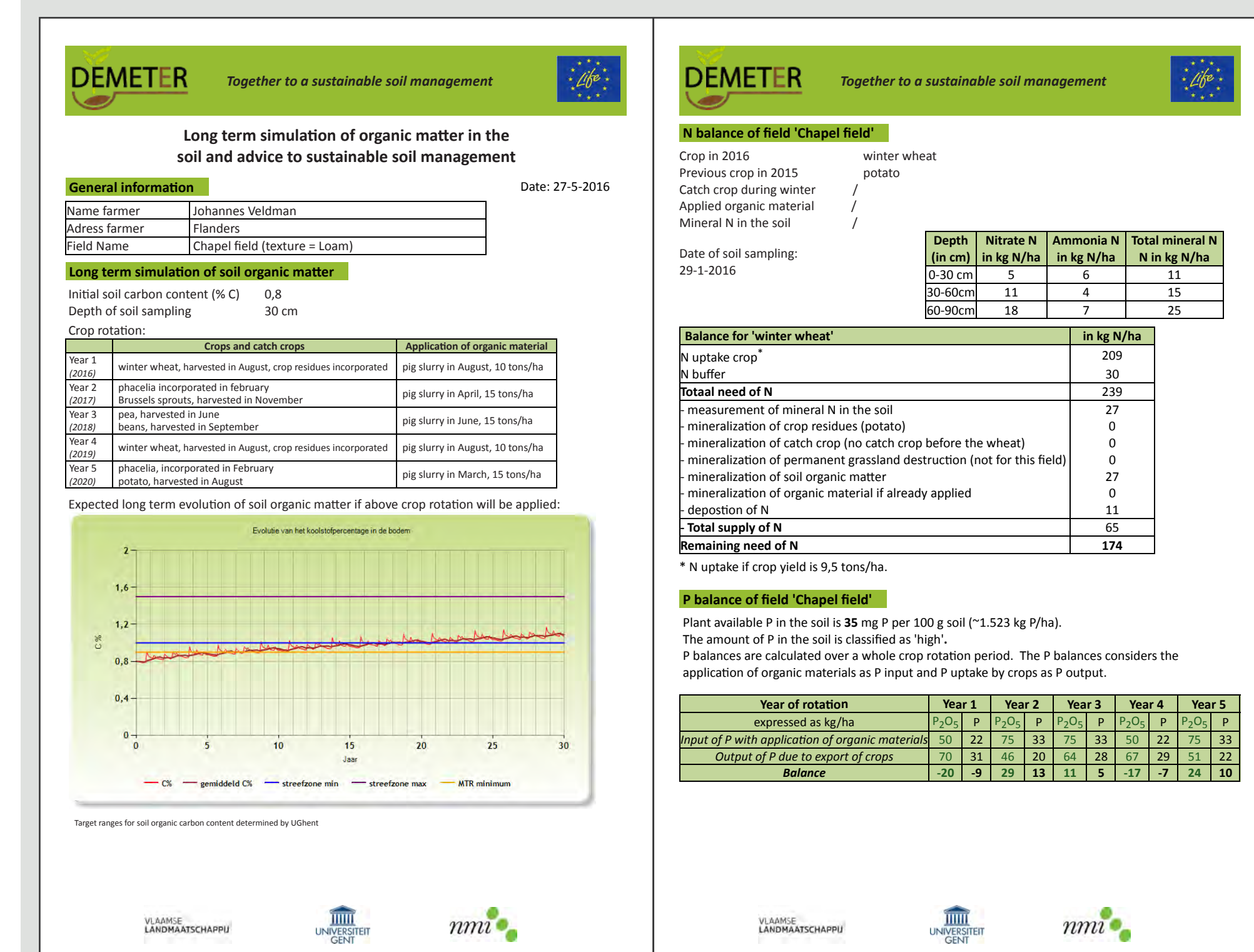
- Flemish farmers were visited and guided by the counsellors of the Flemish Land Agency individually. During these visits, the counsellors advised the farmers about a more sustainable soil and farm management.
- Dutch farmers visited study group meetings, in which measures to improve their management were discussed.

RESULTS

Since 2015, the **decision support tool (Demetertool)** is online. This freely available tool offers farmers a hands-on report (Figure 1) about both the SOM evolution and the nutrient management (N and P) on their land.

Farmers can change their inputs in the tool all the time and make simulations to calculate how much they can improve their soil quality significantly, even by taking simple measures s.a. catch crops, changing rotations and manure types, ...

Figure 1: Recommendation report generated by the decision support tool

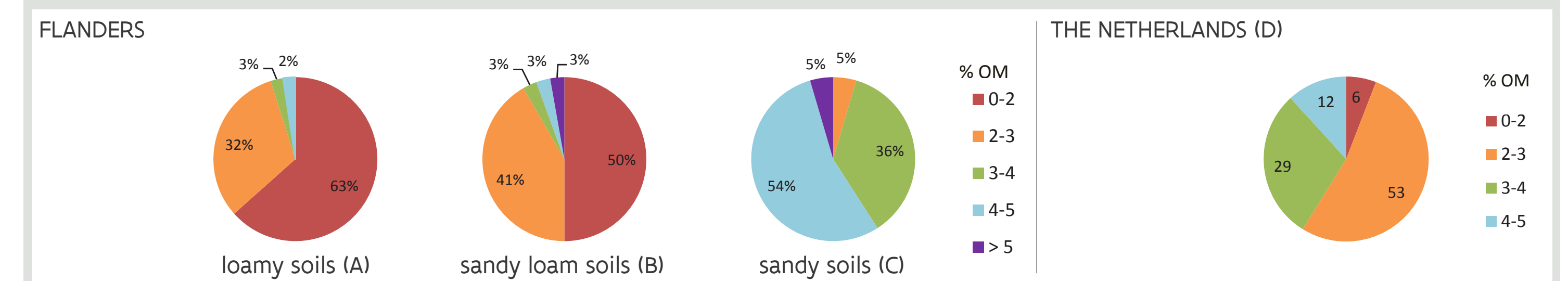


At the start of the study, 50% of the fields in Flanders had a SOM content below the optimal zone for crop production. The long term OM evolution (30 years) at that moment (based on the conventional crop and soil management of the farmers) showed that 30% of these fields were still under the limit after 30 years and 20% reached the optimal zone after 30 years. In the last year of the study the simulation was repeated with the implemented changes to crop and soil management due to training of the farmers by the counsellors. The new simulation showed that now 25% of the fields reached the optimal zone for OM in the soil after 30 years. This is a gain of 5% due to the proposed measures of the decision support system.

The fields in the **monitoring study** had a loamy, sandy loam or sandy texture in Flanders and a sandy texture in the Netherlands. In Flanders SOM content was low in the loamy and sandy loam soils: 63 and 50% of these fields had an OM content lower than 2%, respectively. In the Netherlands, 6% of the participating fields had an OM content lower than 2% OM and 59% below 3% OM (Figure 2).

Figure 2:

Distribution of the SOM content of the selected loamy soils (A), sandy loam soils (B) and sandy soils (C) over several classes in Flanders and the Netherlands (D)



During the 3 monitoring years, farmers applied the recommended amount of N (generated with the Demeter-tool) on 36% of the fields, applied less N than recommended on 30% of the fields, and more N than recommended on 34% of the fields.

These results were compared with the amount of residual nitrate in the soil. Fields on which more N than the N-advice was applied, had more chance (39%) to exceed the limit of 90 kg nitrate-N/ha for residual nitrate in the soil. This is a limit in Flanders which indicates a risk of nitrate leaching. The chance to exceed the limit of 90 kg nitrate-N/ha for fields with the recommended and lower N-application was 33% and 19% respectively.

To enhance the carbon evolution in the soil and decrease the risk of nitrate leaching during winter, the growth of catch crops after harvest of the main crop is a good practice. At the start of the monitoring study, catch crops were sown on 64% of the participating fields. At the end of the monitoring study this amount had increased to 74%.

Figure 3: Evolution of % catch crops during the monitoring study (2013 - 2015)

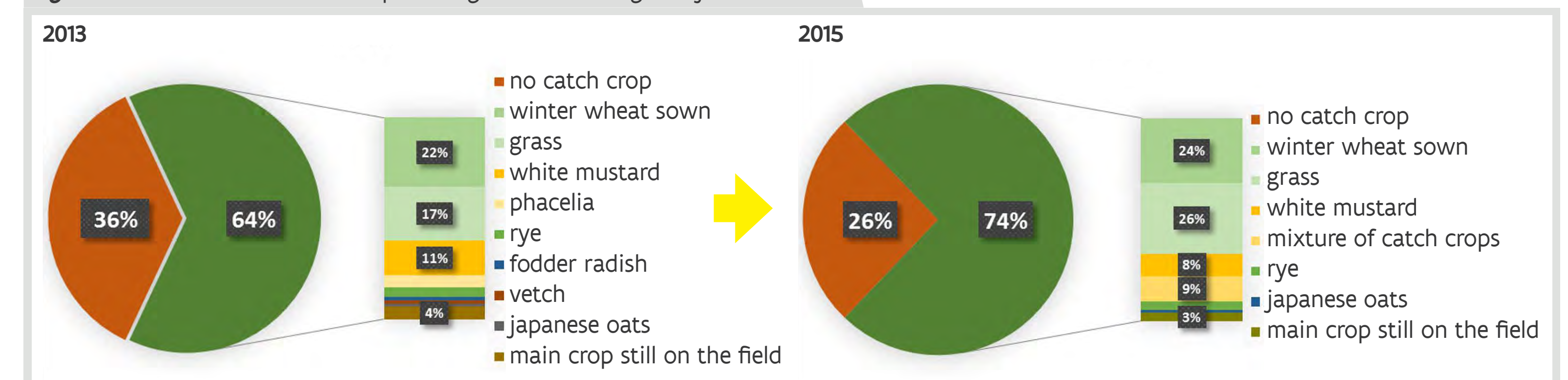


Figure 4:

Information package 'A successful harvest on a healthy soil'



The field monitoring study and guidance of the farmers resulted in the information package: "A successful harvest on a healthy soil".

Until now, this package contains information sheets about 17 topics: Catch crops, Soil acidity, Plant nutrients, Working with the Demeter-tool, Soil structure and compaction, Crop rotation, Organic matter, N-fertilization of vegetable crops, Phosphorus in the soil, ...

CONCLUSION

- ➔ A decision support tool which advises farmers to optimize nutrient and soil organic matter management at the level of the field has been developed and is freely available to farmers and other users.
- ➔ A widespread use of the tool and training of farmers will increase awareness amongst farmers for more sustainable soil management that will maintain or increase soil organic matter whilst minimizing nutrient loss risks.

