

Recommendations for the most promising activities, policies and tools



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The recommendations are drawn from the results of the FAIRWAY research programme, the effects of some of which are modelled using MITERRA-EUROPE and GeoPEARL, integrated assessment tools at national and EU level.

FAIRWAY's most important key messages were determined, from which the knowledge for most promising activities, policies and tools evolved. A methodology was applied to build project's key messages without losing track of the original authors, linkage to research tasks and case studies, and relevance to stakeholder groups. With this methodology a vertical and horizontal distribution of knowledge between science and practice has been clearly documented and can be followed through by any interested reader.

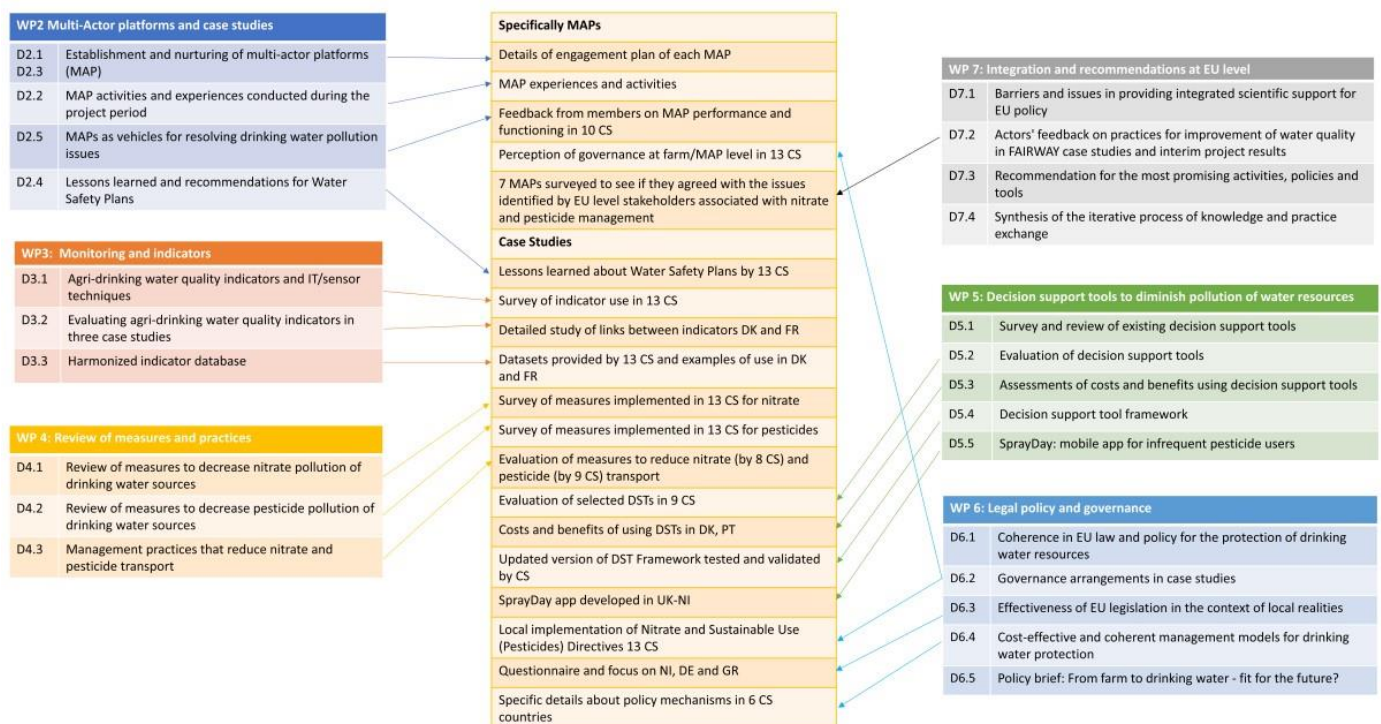


Figure 1. Links between work packages and case studies/MAPs (as exemplified in the deliverables)



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NITRATE LEACHING

The MITERRA-EUROPE model was applied to assess the potential effects of the promising measure cover crops on nitrate leaching on NUTS 2 level in the EU. The results are compared with scenarios without cover crops, high implementation rate of cover crops, and balanced nitrogen (N) fertilization.

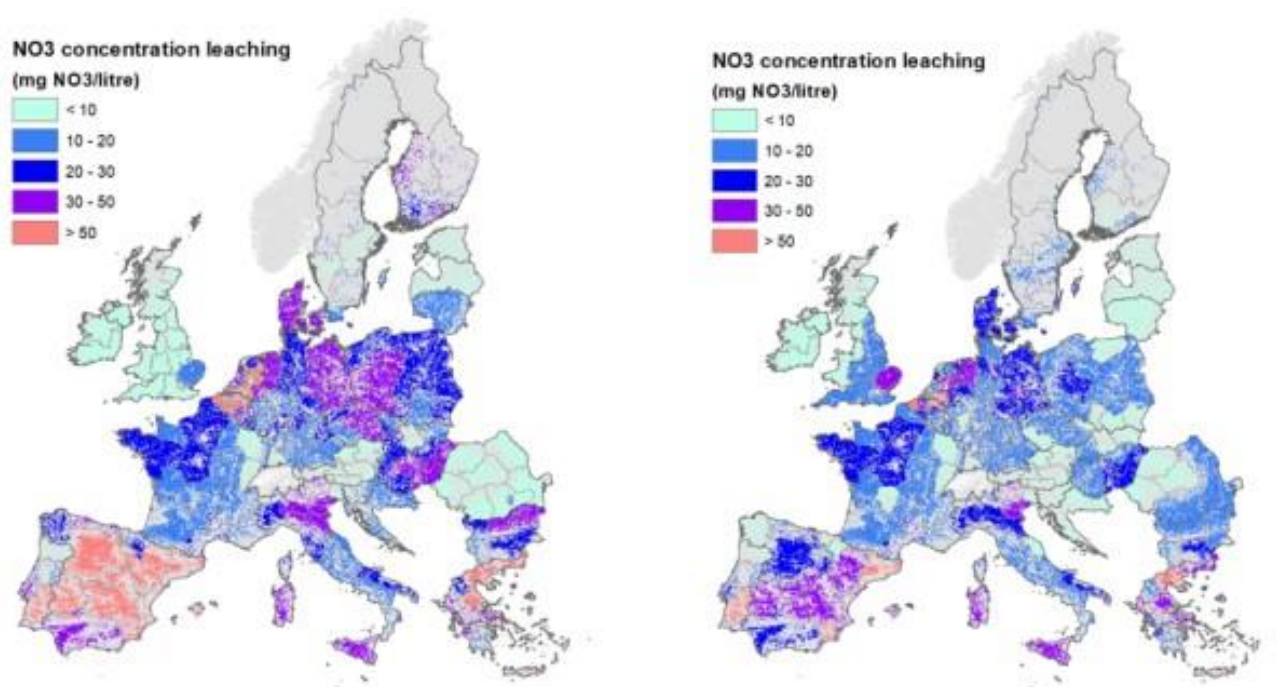


Figure 2. Calculated nitrate concentration (in mg NO₃/L) in water leaching from the rooting zone from agricultural soils in the reference year 2016 (left) and the scenario with balanced N fertilization (right).

The main conclusions of the assessments of most promising nitrate measures using MITERRA-EUROPE are:

- Cover crops are already grown in many regions in EU, and especially in Denmark, the Netherlands, Flanders and parts of Germany and France. Omitting cover crops in 2016 resulted in a 3% increase in the nitrate leaching to groundwater and N leaching to surface water across the EU level.
- Increasing the area of cover crops to 40% of the technical potential reduced N leaching to ground and surface water by 3%. Implementation of cover crops to 80% of the technical potential further reduced N leaching (7%).
- Application of balanced N fertilization in combination with cover crops (at 40% implementation) strongly reduced N leaching; on EU level by 19% for nitrate leaching up to 36% for nitrate leaching in combination with balanced N fertilization.
- Reduction of more than 20% in N leaching and runoff by implementation of a combination of cover crops and balanced N fertilization can be achieved in many areas in EU, including Flanders/Belgium, the Netherlands, parts of Germany, the northern parts of Spain and Portugal, the northern part of Italy, regions in Poland, Czech republic, Croatia, Bulgaria, and Greece.
- The reduction of the combination of N balanced fertilization and the growth of a cover crop on N leaching is larger than the sum of the single effects of both measures.
- Cover crops increase N₂O emission. However, when the growth of a cover crop is combined with balanced N fertilization, emission of N₂O is reduced. The risk on pollution swapping can be reduced if a combination of measures is taken.

PESTICIDE LEACHING

The effectiveness of measures that can reduce pesticide leaching (residues of plant protection products) was assessed using the spatially distributed model GeoPEARL. The leaching to groundwater of pesticides in the safeguard zones of seven drinking water areas in the south of the Netherlands were assessed for potatoes, maize, grass and leek. The seven areas are part of the Noord-Brabant case study. Measures include mechanically weeding instead of use pesticides, a reduction the pesticide dose with 50%, and less applications in time (1 instead of 2 applications and 2 instead of 3 applications).

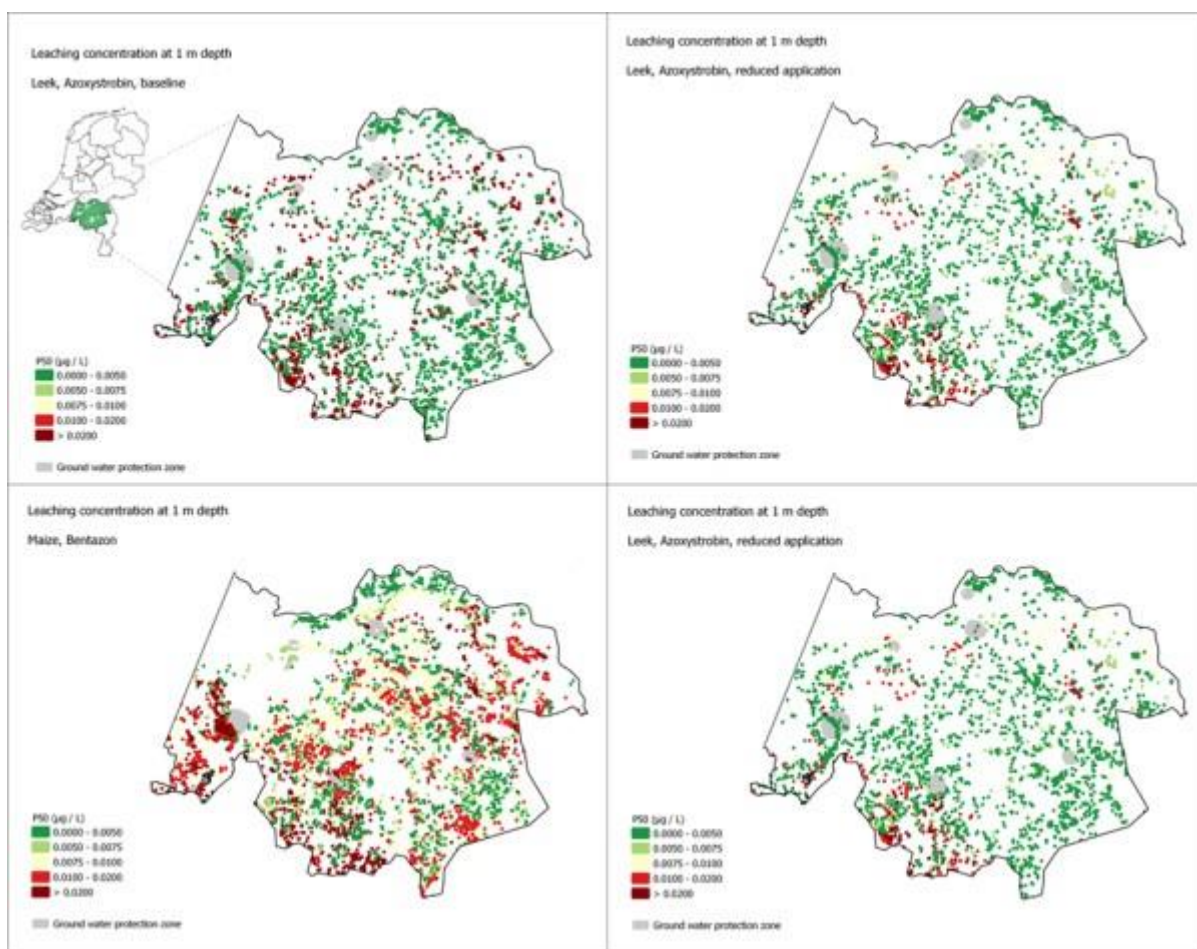


Figure 3. 50-percentile leaching concentrations calculated with GeoPEARL for the use of Azoxystrobin on leek (standard use of 1 instead of 2 applications), Bentazone and glyphosate on maize (standard application).

To sum up, the following recommendations on most promising measures can be derived from the results of GeoPEARL calculations:

- Decrease input of pesticides: decreasing the amount of applied pesticides with 50% reduces the concentration of pesticides in groundwater with more than 50%.
- Divide total application quantity over more application times: dividing the dose of pesticides in more dressings strongly (37-84%) reduces the concentration of pesticides in groundwater
- Alteration of pesticides with less harmful products or mechanical methods reduce leaching to groundwater and thus protect drinking water resources to a large extent.