

## Water management wants organic farming

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Organic farming has considerable advantages in terms of protecting drinking water and groundwater. This is because it does not use harmful substances that could potentially leak into the groundwater at all or only to a very limited extent, as the use of fertilisers is subject to strict restrictions. Nitrogen is therefore a very scarce resource. Careful handling is consequently inherent in this system. A further bonus: chemically synthesised pesticides are not permitted in organic farming and the use of veterinary medicinal products is subject to strict restrictions. With regard to water protection, water management and organic farming pursue the same goals.

### Agriculture endangers drinking water quality

The costs of drinking water treatment in Germany are rising due to increasing pollution, particularly from agriculture<sup>[1,2]</sup>. In 2017, they totalled around 633 million Euro per year<sup>[3]</sup>. One of the main reasons for these high costs is the high nitrate concentration in the groundwater. This, in turn, is a consequence of the high nitrogen surplus in agriculture, which is only slowly decreasing despite a wide range of measures and currently lies at around 80 kg per hectare per year<sup>[4]</sup>. The permissible nitrate concentration of 50 milligrams per litre is regularly exceeded at around a quarter of measuring stations across Germany<sup>[5]</sup>.

A further challenge to drinking water quality is the use of pesticides with a high level of toxicity. Between 2009 and 2018, the Federal Office of Food Safety found ten active substances above the threshold value of 0.1 micrograms per litre and three non-relevant metabolites (intermediate products of a biochemical metabolic process) above the reference value of 10 micrograms per litre at 114 measuring stations<sup>[6]</sup>. The use of veterinary medicinal products in agriculture also contributes to water pollution via the excretions of treated animals<sup>[7]</sup>.

### Reducing nitrate pollution through organic farming

Organic farming is an effective way of reducing water pollution. The lower fertilisation intensity in organic farming results in lower nitrate pollution. While the use of nitrogenous fertilisers in organic farming is limited to a maximum of 170 kg per hectare and year via farm manure, for which strict restrictions apply with regard to type and origin<sup>[8]</sup>, additional mineral nitrogen fertilisers are used in conventional farming. Nitrogen is a very scarce resource in organic farming. Organic farmers are therefore particularly keen to keep nitrogen in the system and avoid losses - among other ways - through leaching<sup>[9]</sup>. By means of a balanced crop rotation with undersown crops and catch crops, the aim is to transfer nitrogen from the legumes and farm fertilisers to the crops as efficiently as possible and thus with as little loss as possible<sup>[8-10]</sup>. Over-fertilisation is less likely due to the restrictions imposed - among others - by land-based animal husbandry<sup>[11-14]</sup>. Considered as a whole, all of these factors lead to a significant reduction in nitrate pollution of the water body over time following conversion of the overlying areas to organic farming methods. A comprehensive evaluation of the existing scientific literature on this topic has shown that organic farming leads to an average reduction in nitrate discharge of almost 40 %<sup>[11]</sup>.

### No chemically synthesised pesticides and fewer veterinary medicinal products

Organic farming also has a clear advantage when it comes to the use of pesticides. Groundwater pollution caused by chemically synthesised pesticides used in agriculture can be ruled out. The use of herbicides is not permitted in organic farming. Plant protection in organic farming is primarily ensured by system-related indirect measures such as balanced crop rotations and the cultivation of crops that suppress weeds (such as clover grasses) and is supplemented by mechanical and thermal measures<sup>[8,10,11]</sup>. The use of pesticides for the direct control of pests is largely avoided. A systems

approach, but also water protection in particular, are explicit objectives of organic farming in accordance with the EU Regulation on organic farming [8]. In addition, the risk of contamination of groundwater and drinking water with traces of veterinary medicinal products is significantly reduced in organic farming due to area-dependent livestock farming (dilution effect) and the very restrictive use of antibiotics<sup>[8,15]</sup>.

### **Water management and organic farming go hand in hand**

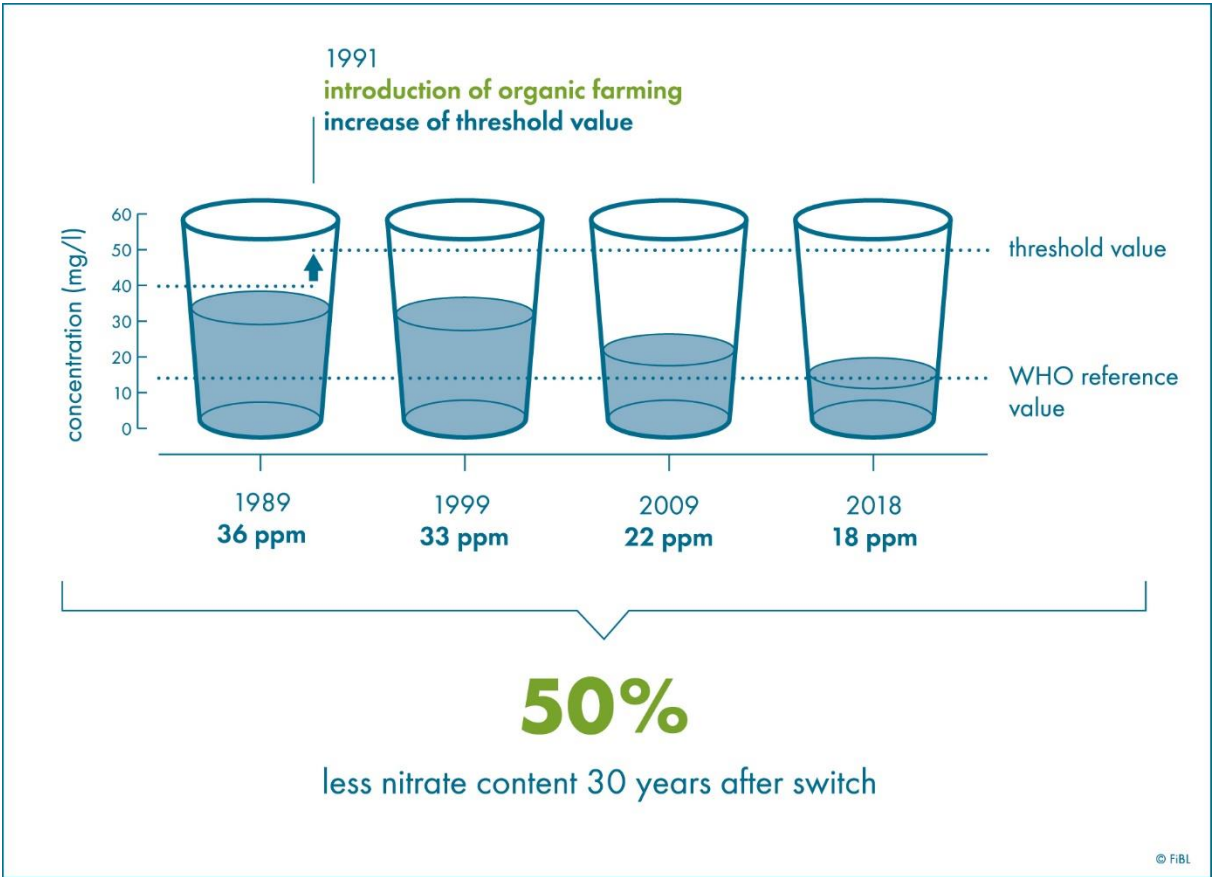
Water management and organic farming pursue the same goals with regard to water protection. Water management is interested in preventing substances that jeopardise water quality (nitrogen, pesticides, veterinary medicinal products) from entering ground and surface waters in the first place. Organic farming either excludes their use as a matter of principle (chemically synthesised pesticides), uses them restrictively (veterinary medicinal products) or is required to handle them carefully due to systemic shortages (nitrogen)<sup>[11]</sup>.

An increasing number of responsible parties in water management are recognising this win-win situation and are promoting organic farming in their water protection and water catchment areas, and in some cases have been doing so for decades. Examples include the municipal utilities of Munich (Mangfalltal) and Leipzig (Canitz water estate) as well as the district government of Lower Franconia.

### **Organic farming can also further improve**

Despite the advantages mentioned above, organic farming is also confronted with challenges that can be further optimised with regard to groundwater protection. For example, it is important to control the mineralisation of organic nitrogen reserves in the soil through tillage, crop rotation, cultivation techniques and irrigation management in such a way that the nitrogen is used as efficiently as possible for plant growth. There is also potential for optimisation with regard to the use of pesticides. Although the use of chemically synthesised active substances that are problematic for water protection is not permitted, active substances approved for use in organic farming are not per se unproblematic for groundwater quality. For example, copper, which is authorised to a limited extent in special crops and potatoes, can be discharged with the leachate at low pH values (<5). Here, it is important to ensure a sufficiently high soil pH value in the short term. In the mid and long term, this must be remedied by breeding resistant varieties, as has already been achieved in organic viticulture with PIWI varieties (fungus-resistant varieties), for example.

**Development of nitrate levels in the raw water of the Canitz water estate after conversion to organic farming**



Nitrate pollution in water bodies can be lowered through organic farming. As the example of the Canitz water estate shows, organic farming leads to a significant reduction in nitrate discharge into ground and surface waters.

## Literature and notes

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