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# Organic Farming Practices Reduce Nitrogen Pollution

A recent study has compared the levels of water pollution due to nitrogen resulting from organic, integrated, and conventional farming practices. The results indicate that organic and integrated fertilisation practices reduce nitrate pollution.

Water pollution due to nitrogen (N) is recognized as a significant environmental threat by scientists, environmental groups, and policymakers. Exceeding level of nitrates (a derivative of nitrogen) in drinking water may also lead to serious health risks particularly for pregnant women and infants. Nitrogen based fertilisers are widely used in agriculture and constitute the primary source of N pollution. In Europe, the use of nitrogen fertilizers peaked in the 80s. Nowadays, there is a clear need to develop new agricultural fertilisation practices that limit N pollution.

An American research team has recently evaluated the impact of farming practices on N pollution. For the first time, this study reports the simultaneous quantification of gaseous and leaching N losses in agricultural fields after fertilisation. The authors compared the different forms of N losses from organic, integrated, and conventional apple orchards in the Washington State region. All fields received the same amount of N inputs but under different forms:

- Conventional fields were fertilised with Calcium Nitrate ($Ca(NO_3)_2$)
- Integrated fields were fertilised with equal parts of compost chicken manure and Calcium Nitrate
- Organic fields were fertilised either with compost chicken manure or with alfalfa meal

After fertilisation, exceeding N escapes from the soil under different forms. Some of these forms are polluting whereas others are not. For each field, the authors measured the different forms of N losses, as follows:

- Atmospheric emission of nitrogen gas ($N_2$), a non polluting gas.
- Atmospheric emission of nitrous oxide ($N_2O$), a polluting greenhouse gas.
- Water pollution due to leaching of nitrate ($NO_3^-$), a chemical pollutant that can contaminate irrigation canals, rivers, and estuaries.

The comparison of the N loss levels in the three types of orchards led the authors to the following observations:

- The two organic fields exhibit higher $N_2$ losses compared to the conventional field with the integrated field falling in between. The study also revealed that the organic soils contain the largest and the most active microbial communities. These communities participate in the denitrification process, leading to N loss by $N_2$ emission.
- The conventionally fertilised field exhibits a Nitrate leaching up to five times higher than the two organic fields depending on the season.

The authors have also noticed that nitrate leaching rates in the conventional field are of similar magnitude as the $N_2$ emission rates in either of the two organic fields. This finding led them to suggest that organic fertilisation practices have shifted N loss from polluting nitrate leaching to non-reactive $N_2$ emissions.

The authors have demonstrated that N pollution is limited in organic and integrated fields compared to conventional fields. These results highlight how a change in agricultural practice can lead to a more sustainable development. They also support the current political ambitions of stimulating organic agriculture across the EU member states in order to reduce the present and potential N pollution.

**Source:** Kramer S. B. *et al.* (2006) « Reduced nitrate leaching and enhanced denitrifier activity and efficiency in organically fertilized soils», Proceedings of the National Academy of Sciences, 103(12): 4522-4527.
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