Agricultural catchments programme – key findings from over a decade of agricultural catchment research

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Summary

- The Agricultural Catchments Programme is building a robust scientific understanding of the factors affecting nutrient loss.
- Weather and soil type have a significant influence on nutrient losses to water and can override source pressures (farming intensity).
- Measures need time to be implemented on farms to deliver a positive impact on water quality.

Introduction

European member states are required to monitor their Nitrates Regulations, and in Irelands case through the Nitrates Action Programme (NAP). In Ireland the Department of Agriculture, Food and the Marine (DAFM) monitors the implementation of NAP through the Good Agricultural Practice (GAP) regulations. The DAFM has funded the Agricultural Catchments Programme (ACP) to monitor the effectiveness of GAP measures since 2008. In addition, catchment monitoring is required to support Ireland's derogation. The ACP provides the science for policy review of the NAP, its derogation across soil types and land use. The ACP is a combined research and advisory programme working with 300+ farmers across six small agricultural catchments.

Experimental design

The ACP monitor and research six meso-scale catchments (3 – 31 km^2). These were selected by a multi-criteria analysis to represent intensively managed agricultural land on different physical settings and dominating land use, therefore different types of riskiness for nitrogen (N) and Phosphorous (P) loss in terms of vertical drainage or lateral runoff risk. The catchment scale was chosen to include monitoring of both surface and groundwater as well as farming activity and surveys of soil, bedrock and topography.

Key findings

Over the whole 12-year period (Figure 1), the nitrate-N concentration and Total Reactive Phosphorus (TRP) were below the Environmental Quality Standards (EQS) in Corduff and Cregduff. Timoleague and Dunleer had an elevated TRP and nitrate-N concentration (above the EQS). The concentration was just below the EQS in Ballycanew for nitrate – N, it was above the EQS for TRP, in addition it was above the EQS for nitrate-N in Castledockerell. However, over the last 4-year rolling periods (2019 to 2022) there is a decreasing trend in nitrate-N concentrations in the Timoleague and Castledockerell catchment, stable in the Dunleer, Cregduff and Corduff and no trend in Ballycanew.

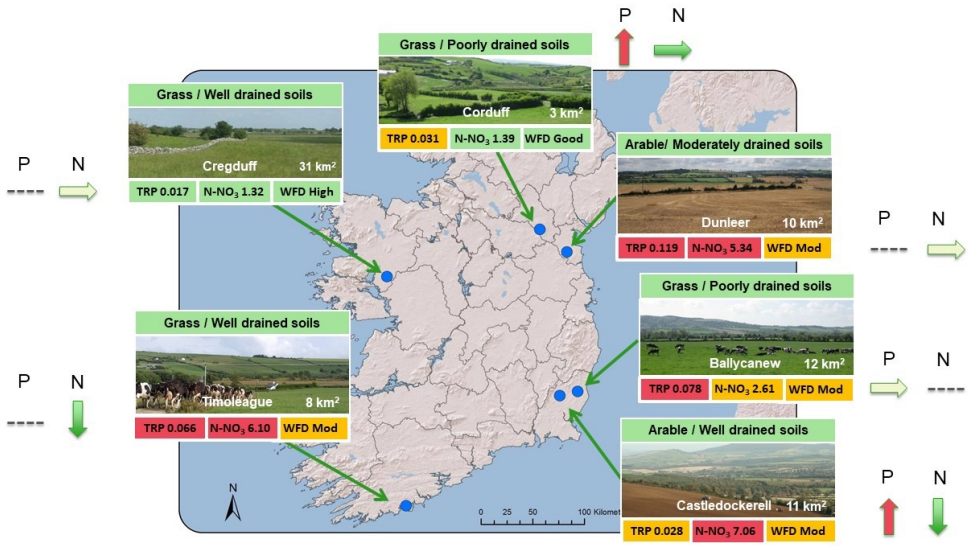

Figure 1. *12-year annual average Total Reactive Phosphorus (TRP) (Target <0.035) and nitrate-N (N03-N) (Target <2.6 mg/L) and the four-year inter annual trend for 2019 to 2022 indicated with symbols: ↑ increase; ↓ decrease; → stable; --- no trend*

Current research activities

High resolution monitoring (every 10 minutes) of water quality and quantity continues. Quantification of N and P loss on derogation and non-derogation farms through in field lysimeter and ceramic cup instrumentation is underway. The programme has expanded to include greenhouse gas and ammonia emissions and soil carbon sequestration. Development of models to represent the hydrologic, sediment, and nutrient dynamics in the ACP catchments is under way. The socio economic research is investigating farmer attitudes towards adoption of mitigation and management practices.

Conclusion

There is no clear, straightforward link between nutrient concentrations in the streams and source pressures (farming intensity) at the catchment scale – physical landscape, soil type and weather can override source pressures. There are time lags between agricultural pressures and water quality state. There are no "one-size-fits-all" solutions for mitigation strategies. An integrated approach to water quality research and knowledge transfer is key to sustainable agriculture.

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