

Variable response to phosphorus mitigation measures across the nutrient transfer continuum in two contrasting arable catchments

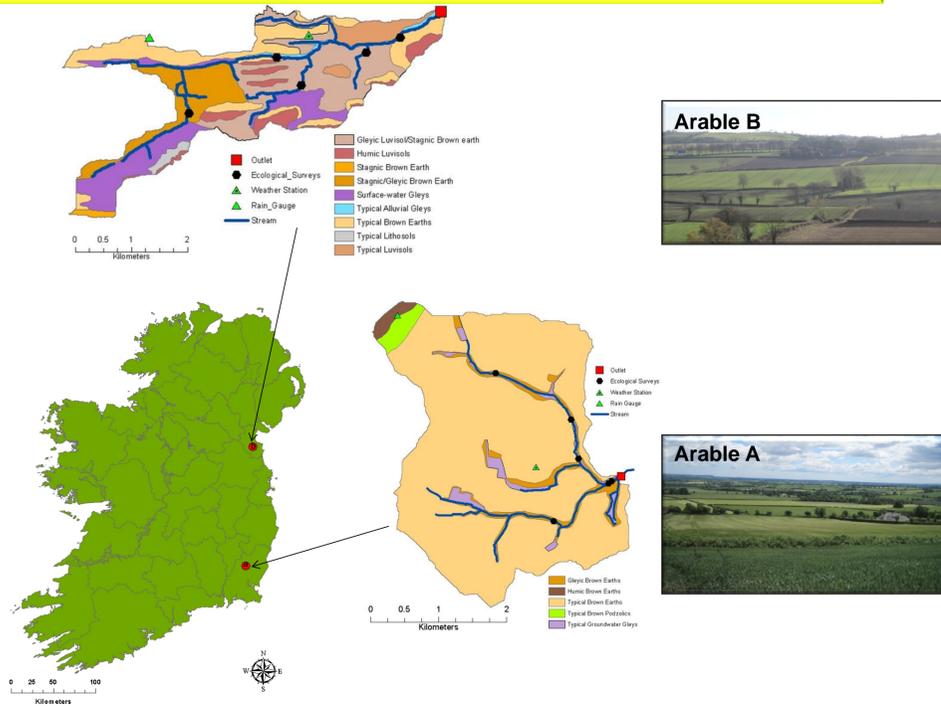
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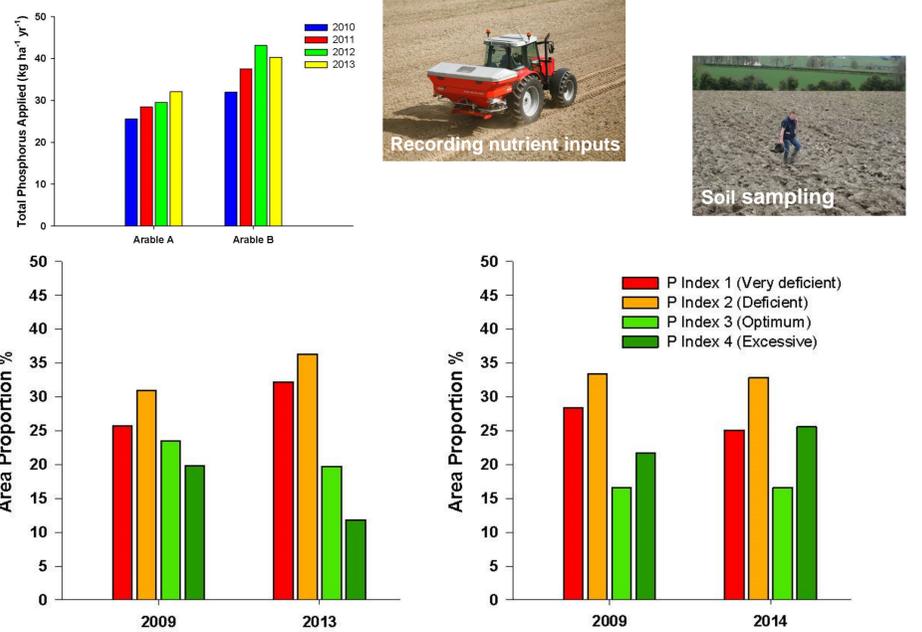
1. Measures regulating excessive soil P (at risk of loss) and their effect on the P transfer continuum were investigated in two contrasting Irish Arable catchments over a 4 year period. **Nutrient management records, soil P surveys** (excessive Index 4), **river P** and **biological quality** were monitored for trends.



2. Since 2010, **nutrient management records** indicated that P inputs increased in the Arable A (32 to 36 kg ha⁻¹ yr⁻¹). On average, P inputs were 9 kg ha⁻¹ yr⁻¹ higher in the Arable B, but decreased by 3kg ha⁻¹ in 2013.

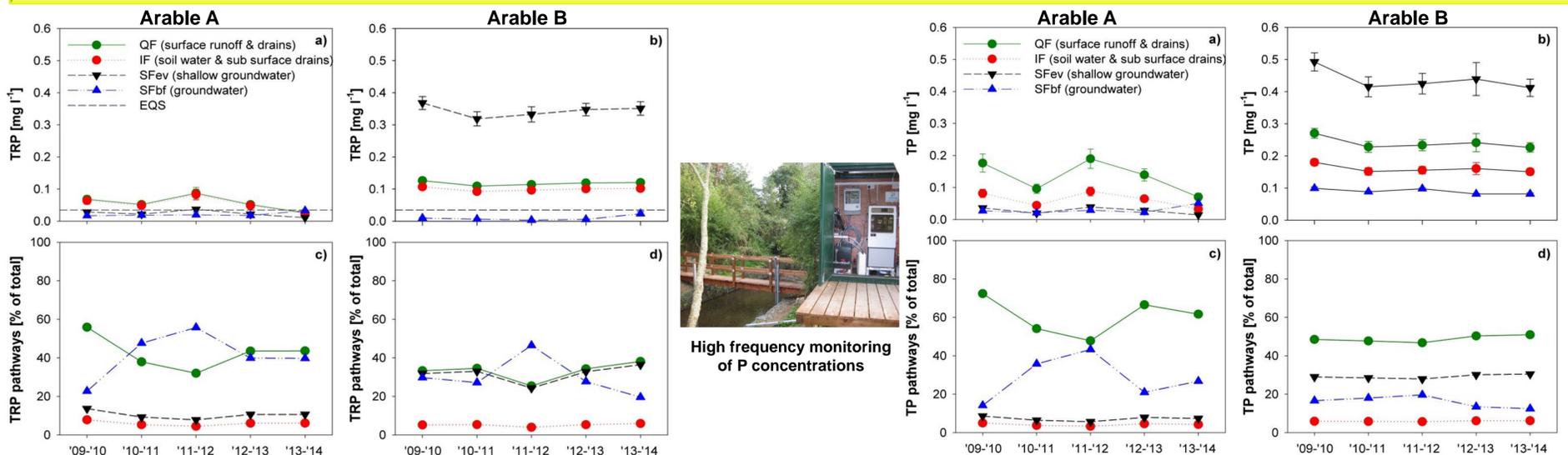
Following repeated catchment **soil P surveys** (< 2ha field areas):

- Arable A: excessive Index 4 soils reduced by 8% (20% to 12%)
- Arable B: excessive Index 4 soils increased by 4% (22% to 26%)



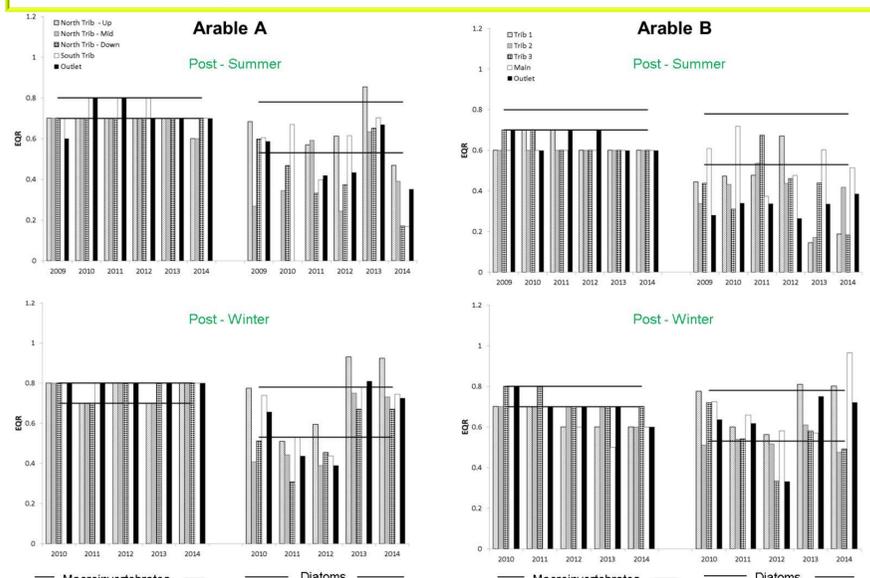
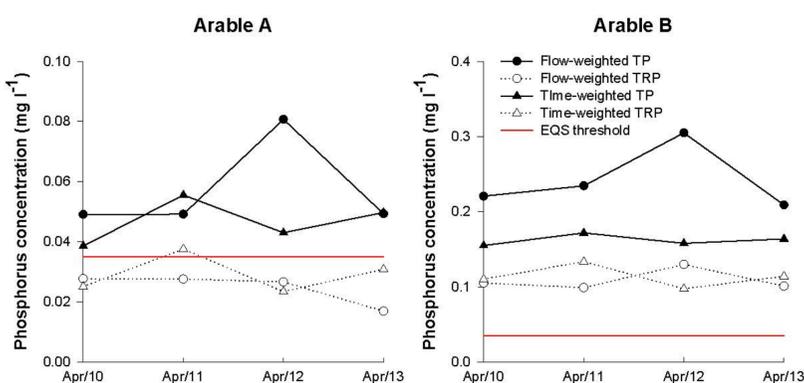
3. High frequency records of **river P** concentration and discharge in catchment rivers, highlighted the P concentrations in specific flow pathways over the winter periods. Total reactive P (TRP) and total P (TP) concentrations declined in almost all Arable A pathways since the winter period (nutrient closed period) of 2011-2012 and TRP fell below the environmental quality standard (EQS; 0.035 mg l⁻¹) in 2013-2014. The quick flow (QF) and slow flow as baseflow (SFbf) pathways dominated the transfer of TRP and TP.

In Arable B, TRP and TP concentrations were higher in most hydrological pathways, and were highest in the shallow groundwater (SFev) pathway. While there was no apparent trend for TP, the TRP concentrations slightly increased over the 5 winter periods in the SFev pathway. The transfer of TRP and TP varied over the years but was dominated by the QF and SFev pathways.



4. Between April 2010 and March 2014 daily **river P** concentrations exceeded the EQS threshold 20% and almost 100% of the time in Arable A and Arable B, respectively. There was no clear trend in time-weighted or flow weighted mean TRP concentrations. However, flow-weighted TP concentrations increased in the third hydrological year (April 2012 to March 2013).

5. **Biological quality** was generally better post-winter than post-summer, and was stronger than any other identifiable inter-annual trend over the 5 years in both catchments.



6. The response to P mitigation measures showed increases and decreases in the excessive **soil P** sampled areas. However, changes in **river P** were subtle in both catchments and only discernable through a deeper analysis of flow pathways in high resolution datasets. These trends were not identified in the total streamflow. **Biological quality** trends were also not discernable but more influenced by overriding seasonal pressures.