Agriculture as a phosphorus source for eutrophication in the north-west European countries, Norway, Sweden, Ireland, UK

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Introduction: The relative importance of agriculture compared to other phosphorus (P) sources for loss to water show considerable variation in NW Europe. Despite the geographical proximity and climate similarities (Atlantic influence), variability in local situations is very high.

Results: Most P-loss from agriculture is generally considered to be as particulate P, but dissolved P can nonetheless make up 9 – 93%. High levels of agricultural soluble P can result from desorption from particles following storm flow events or snow melt, loss from fertiliser or manure applications, or from decomposing vegetation. The proportion of dissolved P will also be higher if particulate P losses are lower, because of permanent pastures or soil "sieving" which retain particles, or if erosion prevention measures are taken.

Subsurface drainage can contribute 12 – 60% of agricultural P-losses and surface erosion 40 – 88%. Total P export for small agricultural stream catchments for the four countries considered vary from 0.3 to 6 kgP/ha/year. P-loss is particularly high in Norway where historic landscape modifications result in a high risk of soil erosion.

Use of mineral fertilisers has reduced (Figs.1 and 2). In addition, all four countries are currently developing measures to reduce agricultural P-losses, in response to the EU Water Framework Directive obligations to achieve "Good Quality" status in surface waters. Average P concentrations in South Swedish streams have shown reductions of 2% per year since 1993, following measures to reduce soil erosion.

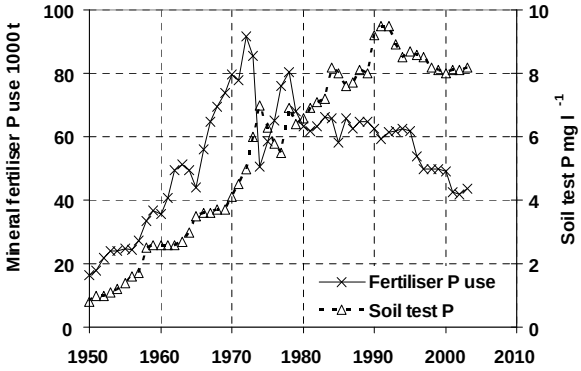

Fig. 1. Soil test P and the use of mineral fertilizer use in Ireland (1950-2010.)

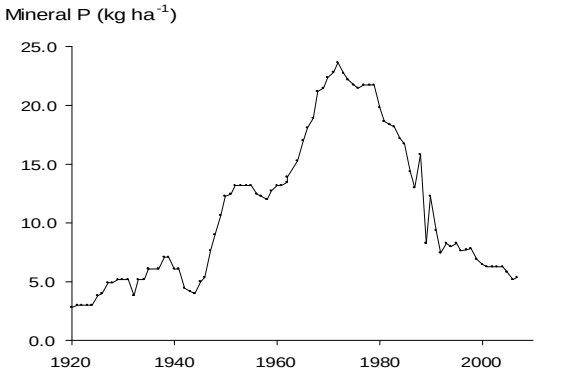

Fig. 2. Use of Mineral fertiliser P in Sweden over the last 100 yrs.

Conclusion: climate change may increase P-losses (more frequent freezing-thawing of the soil, more heavy precipitation events and enhanced water runoff) leading to soil erosion and P losses and this will be a challenge for each of these countries (Ulen, et al. 2007, *Soil Use and Management 23: 5-15).*