

## Soil phosphorus management in agricultural catchments in Ireland

David P. Wall, Sarah Mechan

*Agricultural Catchments Programme, Environment Research Centre, Teagasc, Wexford, Co.  
Wexford, Ireland  
david.wall@teagasc.ie*

In 2006 the EU Nitrates Directive National Action Programme (NAP) regulations (SI 101, 2009) were implemented on Irish farms. An evaluation of the NAP is being conducted in six agricultural catchments to monitor the consequences of compliance with the regulations in the wider landscape. These catchments were selected to encompass the range of Nitrogen (N) and Phosphorus (P) transfer risks in Ireland. This paper discusses the baseline soil P levels measured in this study in conjunction with P input-output balances and the environmental and farm management implications in relation to the NAP measures for four of these agricultural catchments.

Agricultural catchments ranging in size from 7.5km<sup>2</sup> to 12.1km<sup>2</sup> were selected to represent a range of soil types, geology, climate, land use type and intensity in Ireland. Two catchments are more than 30% cropped with wheat and barley (Tillage A and B) and two are grassland (Grassland A and B) sustaining more than 1.6 livestock units ha<sup>-1</sup> (LU ha<sup>-1</sup>). Average long-term annual rainfall ranges from 900 to 1200 mm. Under the NAP the application rates of P fertilizers and organic manures to agricultural land are governed by soil test P levels (Morgan-P) and indirectly by organic N limits ( $\leq 170$  kg organic N ha<sup>-1</sup>; where derogation granted  $\leq 250$  kg organic N ha<sup>-1</sup>). The nutrient application rules in place are aimed to limit excess availability of P in the soil in order to minimise the diffuse risks of P loss to water. Soils at soil P index 4 ( $>8.0$  mg L<sup>-1</sup> grassland soils;  $>10.0$  mg L<sup>-1</sup> arable soils) are considered to be excessive in terms of agronomic production (i.e. no yield response to P additions) and are at greater risk of transferring this excess via runoff to water bodies (Tunney, 2000). To evaluate these rules a census of soil P was taken across each catchment, with samples collected at a 2 ha resolution according to the standard agronomic soil sampling protocol in Ireland. Nitrogen and P inputs and off-take levels were recorded on farms within these catchments and are being used to develop P balances for these farming systems. These baseline data will act as a reference point from which all trajectories of change in soil P levels can be modelled and monitored over the term of the programme.

On a catchment basis, preliminary results show that mean and median soil P concentrations were lower in the Grassland B catchment compared to Grassland A. The two tillage catchments had similar mean and median soil P concentrations despite their differences in predominance of spring vs. winter cereals and soil type. In all catchments the mean soil P concentrations were within or below recommended optimum ranges of 5.1-8 mg L<sup>-1</sup> for grassland soils and 6-10 mg L<sup>-1</sup> for tillage soils (P index 3). Assessments of high hydrological transport risk coinciding with discrete areas of P-index 4 from legacy farming will inform further nutrient management advice.

SI 101, 2009. Statutory Instrument – EC (Good Agricultural Practice for the Protection of Waters) Regulations 2009, 51p, Stationary Office, Dublin.

Tunney, H., 2000. Phosphorus needs of grassland soils and loss to water. In: Steenvoorden, J., Claessen, F., Willems, J. (Eds.), International Conference on Agricultural Effects on Ground and Surface Waters. Int Assoc Hydrological Sciences, Wageningen, Netherlands, pp. 63-69.