Geophysical Research Abstracts,
Vol. 11, EGU2009-10647, 2009
EGU General Assembly 2009

Patterns and processes of nutrient transfers from land to water: a catchment approach to evaluate Good Agricultural Practice in Ireland

P-E Mellander (1), AR Melland (1), G Shortle (1), D Wall (1), S Mechan (1), C Buckley (2), R Fealy (3), and P Jordan (1)

(1) Teagasc, Johnstown Castle Environmental Research Centre, Co. Wexford, Ireland, (2) Teagasc, Rural Economy Research Centre, Athenry Research Centre, Co. Galway, Ireland, (3) Teagasc, Rural Economy Research Centre, Kinsealy, Dublin, Ireland

Eutrophication of fresh, transitional and coastal waters by excessive nutrient inputs is one of the most widespread water quality problems in developed countries. Sources of nutrient nitrogen (N) and phosphorus (P) can come from a multiplicity of sources and be dependent on numerous hydrological controls from catchments with both urban and agricultural landuses. Aquatic impacts are widely reported as a result of excessive nutrient transfers from land to water and include changes in ecological integrity and loss of amenity. In the European Union, the Water Framework Directive (WFD) and associated Directives are the key structures with which member states must develop national and often trans-national polices to deal with issues of water resources management. The linked Nitrates Directive is particularly concerned with integrating sustainable agriculture and good water quality objectives and is written into national polices. In Ireland this policy is the Nitrates Directive National Action Programme (NAP), Statutory Instruction 378, Good Agricultural Practise regulation, and amongst other things, sets targets and limits on the use of organic and inorganic fertilisers, soil fertility and slurry/fertiliser spreading and cultivation times. To evaluate the effectiveness of this policy, Teagasc, the Irish Agriculture and Food Development Authority, is undertaking a catchment scale audit on sources, sinks, and changes in nutrient use and export over several years. The Agricultural Catchments Programme is based on a science-stakeholder-management partnership to generate knowledge and specifically to protect water quality from nitrogen and phosphorus transfers within the constraints of the requirements of modern Irish agricultural practises.

Eight catchments of 5-12 km2 have been selected for the programme to represent a range of agricultural intensities and vulnerabilities to nitrogen and phosphorus loss including catchments that are situated on permeable and impermeable grassland soils; areas where arable production represents a significant landuse; and catchments on productive and unproductive aquifers. The catchments were identified using a GIS-based multicriteria decision analysis with objective criteria that included landuse data (including agricultural and settlement statistics) combined with soils and geology data to evaluate the risk of P and N loss. Shortlisted catchments were then finalised using practical criteria based on the potential for hydrometry and hydrochemistry research.

In each catchment, a conceptual model approach is being used to hypothesize the sources, seasonal mobilisation and pathways of nutrients and water through the soil/subsoil system and transfer into surface and ground water systems to stratify each catchment experimental design. Knowledge of the nutrient management of each catchment farm and resulting soil fertility will be used to monitor the sources of agricultural N and P. Environmental soil nutrient tests will provide baselines and checks on the potential for mobilisation. Areas of high soil fertility that are coincident with high surface or sub-surface hydrological connectivity will be monitored for subsequent nutrient transfer. Other potential nutrient source loads within the catchments, such as rural waste-water treatment plants and domestic septic systems, will be factored in as non-agricultural sources. Similarly, the potential for farmyard transfers will also be assessed. The net balance of nutrient transfer at the catchment outlets will be monitored using a high resolution method that is coincident with hydrometric measurements to ensure that there is a full understanding of the inter-dependence between point and diffuse nutrient transfers and hydrodynamics. This source to transfer approach is highly appropriate and a move towards inductive understanding of nutrient use and export in river catchments – the scale at which policies for water resources management will be assessed under

the WFD. The data are also highly conducive to constraining catchment scale, distributed models for predicting chemical transfers in runoff.

As the Programme is aiming to integrate the often perceived contentious objectives of water quality management with those of sustainable agriculture, farm economics will also be monitored at the same time and an assessment made of farmer attitudes. An advisory programme is also a major component and dedicated farm advisors will ensure that farmers are fully appraised of obligations and opportunities in the National Action Programme.