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Good water status: the integration of sustainable grassland production and water quality in Ireland

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The challenge for sustainable grassland production is to integrate economically profitable farming systems with environmental protection. The Water Framework Directive aims to achieve good status for all waters by 2015, to be achieved through the introduction of measures across all sectors of society. Within Ireland, the measures introduced under the Nitrates Directive will contribute to the achievement of good status for all Irish waters. The effect of grassland agriculture has historically investigated water quality issues and more recently it has been highlighted that water quality and other environmental impacts such as greenhouse gas emissions must be considered in an integrated manner. Integration is particularly important when the effect of agriculturally derived nitrogen is considered as nitrate leaching to groundwater has regional effects and gaseous emissions of ammonia and nitrous oxide have global transboundary impacts. The source-pathway-receptor model has been used to investigate the impact of agricultural activities on water quality. Much of the focus in Ireland over the past decade has been on the quantification of nutrient loss from different agricultural systems to surface water and groundwater. This research has highlighted factors that contribute to the source of elevated nutrients lost to water such as elevated soil test P and low nitrogen efficiency related to low recovery of nitrogen from organic nitrogen sources. Mitigation measures have been developed through the understanding of the source of nutrient loss to water and in Rep of. Ireland these measures were implemented nationally through the Good Agricultural Practice for Protection of Waters Regulations 2006 (SI 378-2006). Generic mitigation strategies applied nationally or regionally take no account of the inherent differences that occur during nutrient migration within the source, pathway model i.e. in poorly drained soils the main hydrological pathway is via overland flow and where present, land drainage. Areas of poorly drained soils are at higher risk of phosphorus, sediment and pathogen loss to surface waters and thus measures to reduce nitrate leaching on these soils may not be appropriate. Targeting mitigation measures based on the inherent risk of contaminant transport to water recognises both the contaminant source and its transport vector which is likely to improve the cost:benefit ratio for a particular measure. To achieve good status for all waters, measures should recognise inherent regional differences both in terms of nutrient migration as affected by soil type/properties, slope, distance to receptor and hydrogeology coupled with the driving meteorological factors such as rainfall, evapotranspiration and drainage quantities. Spatial and temporal variation in rainfall and associated drainage volumes greatly influence the transport of agriculturally derived contaminants and directly influence the typology of the receiving waters. Predicting the impact of agricultural practices on the quality of receiving waters requires an understanding of biogeochemical processes that occur along the pathway phase and a process such as denitrification should be considered. These processes must also be considered when setting achievable water quality objectives and standards and their downscaling for assessment of the impact of agricultural practices. The political agenda of having cheap readily available food and energy for society must be rationalised with the provision and protection of good water quality.