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Capacities and limits of two French grassland systems (intensive and extensive) to comply with the WFD - developing tools between science and policy to improve grassland management

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In France about 45% of the agricultural area is devoted to forage production for herbivores, of which about 70% are permanent grasslands (mountains and lowlands) and 12% are temporary grasslands, generally associated with maize silage in dairy farms. Large changes in land use and grassland management have occurred due to intensification of dairy farming in recent decades, in portions of the western lowlands (e.g., Brittany), where maize area has increased fourfold in 30 years and grassland has decreased by 27%. In such regions, characterized by high stocking rates and small or diminishing grassland areas, water quality and water ecosystems are strongly affected by eutrophication problems (nitrate and/or phosphorus fluxes) or contamination (e.g., with pesticides, ammonia, bacteria, veterinary products), driven by infiltration and/or run-off and functioning of the rhizosphere.

Environmentalists often consider grasslands as beneficial for water quality. This perceived characteristic is linked to their i) permanent soil cover and well-developed rhizosphere that provide a buffer for water quality; ii) frequently riparian location within a catchment and their border vegetation (e.g., hedgerows); and iii) usual management with moderate levels of nutrient input and no pesticides, enabling them to dilute and regulate diffuse pollution. The real situation, however, is more diverse and complex: intensively grazed grasslands can generate diffuse pollution, and poor management of wetlands, riparian zones and watercourses can occur in all types of cattle farms and affect ecosystem health and biodiversity.

Our analysis of the relationships between aquatic-ecosystem quality and grassland management will be based on two contrasting French grassland systems (intensive in Brittany and extensive in an alpine region) 1) to evaluate the need for a specific set of best management practices and 2) to discuss the placement and management of grasslands for more sustainable dairy production. The low effectiveness and acceptability of some scientific and policy tools that aim to maintain grassland areas and protect water resources (e.g., by applying the same standards to all cases) will be discussed to determine how to increase the ability of livestock systems to comply with the WFD.

Some tools already are available to aid decision-makers:

1. Models, such as those predicting N-fate at field (STICS), farm (Mélodie) and watershed (TNT2) scales as a function of agricultural practices and watershed structure; these models can improve quantitative assessment and evaluate the effects of decisions by regional and national authorities who follow outcome-based policies (e.g., the WFD).
2. Decision-support tools, based on diagnostics of landscape and agricultural practices, to improve understanding of local systems and to identify potential solutions for land and watershed managers, farmers, and technical organizations.