UNDERSTANDING AND ENHANCING NUTRIENT ATTENUATION CAPACITY IN NZ AGRICULTURAL CATCHMENTS

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Productive farms and their associated processing industries are important for New Zealand's future economic and social welfare. The current view is that for New Zealand to make a sustainable future income, the profitability of grazed pasture systems needs to increase without grazed systems impacting negatively on the environment. A large research investment to date by government and rural industries has identified that ruminant grazed systems are inherently leaky with respect to nitrogen, the key nutrient implicated in the deterioration of surface and ground water quality in New Zealand's agricultural catchments.

Sophisticated nutrient budgeting software (Overseer NB) has been developed to assist farm managers to use nitrogen efficiently within their farming enterprise. Significant effort and investment is being devoted to the development and implementation of best management practices to reduce nitrogen leaching, and to manage and mitigate its likely impact on freshwater quality and ecosystem health. Current nitrogen management efforts, however, appear to be focused mainly within the farm boundary and concentrate on identifying and reducing nitrogen loss from the root zone of high nitrogen leaching farms so that they comply with some set limits. This approach ignores the transport and transformation of nitrate-nitrogen (NO_3-N) along pathways from farms to rivers and lakes. Little if any consideration is given to the attenuation capacity as NO_3-N passes from the paddock root zone to rivers and lakes. One reason these processes are not accounted for is that relatively little is known about them.

Preliminarily analysis in the Manawatu River catchment suggests that nitrogen loads measured in the river are significantly smaller than the estimates of nitrogen leached from the root zone. The on-going field observations, surveys and experiments indicate denitrification as a key NO_3-N attenuation process in the catchment. This nitrogen attenuation capacity appears to vary among the sub-catchments of the catchment. Further understanding of this nitrogen attenuation capacity in NZ agricultural catchments is important for a number of reasons. Firstly, we may be able to manage or enhance the 'hot spots' and 'hot moments' of this attenuation process. Secondly, by taking a catchment perspective, we may be able to redesign landuse practices in a coordinated fashion that increases agricultural production while reduces nitrogen loss from the catchments, i.e. 'matching landuse practices with nutrient attenuation capacity'. This will be crucial to identify the most critical areas for investment and development of innovative solutions to reduce high nitrogen loads to rivers and lakes.

Editor's Note: A manuscript has not yet been submitted for this presentation.