

# Three alternative approaches to regional/national upscaling DNDC: a New Zealand case study

Donna Giltrap<sup>1</sup>, Anne-Gaelle Ausseil<sup>1</sup>, Surinder Saggar<sup>1</sup>

1. Landcare Research, Palmerston North, New Zealand.

**Abstract:** The DNDC model was originally developed to simulate soil greenhouse gas fluxes at the site scale. However, more recently it has frequently been used to estimate fluxes at regional to national scales. At regional- and national-scale the soil parameter and farm management data available are generally less precise than for site scale simulations. The strategy for generating regional estimates therefore usually involves running a number of site scale simulations to estimate both the regional value and the uncertainty due to variability of the input parameters. In this paper we shall compare 3 methods that have been used to estimate N<sub>2</sub>O emissions from grazed pastures in the Manawatu-Whanganui region using the New Zealand specific NZ-DNDC model.

Method 1: The region was divided into a number of sub-units and the model was run for each sub-unit using 2002–2003 climate data and the maximum and minimum value of the most significant factor (MSF) within each sub-unit.

Method 2: A large number of simulations were run using 30 years of climate data, 3 types of farm management, and combinations of soil properties covering the ranges that occur in New Zealand pasture soils. From these simulations, look-up tables of long-term N<sub>2</sub>O emission factors (EFs) were generated for each farm type, soil type, and climate zone.

Method 3: A statistical meta-model was developed using the simulation data generated in method 2.

Our presentation will compare the results from these three approaches, with pros and cons of each approach.

**Keywords:** NZ-DNDC, upscaling, nitrous oxide, emission factors, most significant factor.