

Repeated-measure analysis of the temporal nitrous oxide emissions from the multi-species mixtures

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Repeated measures analysis was applied to analyse the nitrous oxide (N_2O) emission observed from an experiment that consisted of controlled agricultural plots with evenly distributed mixtures of species from three different functional groups: two grasses (*L. perenne* and *P. pratense*), two legumes (*T. repens* and *T. pratense*) and two herbs (*C. intybus* and *P. lanceolata*). Observations were preprocessed to create repeated measures data, based on seasons and the time of fertiliser application. The concepts of mixed-models and diversity-interaction (DI) models were combined to develop statistical models to predict the seasonal variations in the diversity effects in the multi-species mixtures. The combined statistical models were extended to include the effect of multiple levels of fertiliser application as well. Effect of reduced fertiliser application is found to be a dominant factor for seasonal variations in the N_2O emission. Model which considered diversity effects and the effect of reduced fertiliser application was able account for 86.2% variation in the seasonal N_2O emission. Multiple DI models were fit on on the N_2O emissions observed immediately after fertiliser application. Comparison of multiple DI models shows that significant identity effects were observed consistently after each fertiliser application, whereas a significant diversity interaction effect was observed only once between legumes and herbs.