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Abstract: In rural landscapes the nitrogen cascade, i.e. the way reactive nitrogen transforms and transfers into, within and out of the agro-ecosystems depends on farm management, landscape structure and their interactions with soil types, topography, climate and hydrology. While NO_3^- emissions to water bodies are frequently measured and modeled at the catchment level, this is rarely the case for NH_3 and N_2O emissions. However on one hand NH_3 emissions to the atmosphere in intensive livestock production areas may be of the same order of magnitude as NO_3^- emissions to water. On the other hand, indirect N_2O emissions resulting from nitrification or denitrification processes after lateral transport of NO_3^- and/or NH_4^+ may be as high as direct emissions occurring in the field after N input by agriculture. As a part of the ESCAPADE project (ANR-12-AGRO-0003), N emissions to air, soil and water are assessed from modelling and data collection in three sites characterized by contrasted agriculture types, bedrock, soil and climate conditions, as well as landscape structures. Two integrated and spatially distributed models are used complementarily. The main objectives are (1) to evaluate the ability of these models to simulate observed spatio-temporal patterns of N fluxes under different environmental and agricultural conditions (2) to discuss the relative importance and main controlling factors of these different forms of N fluxes. These models will be used to assess the impact of mitigation and adaptation scenarios related to farm management, changes in landscape structure and agricultural policies on nitrogen losses towards the environment.

***Keywords**:* nitrogen; modelling; emission; transfer; landscape; agroecosystems; scenarios