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A DUAL ISOTOPE APPROACH TO ASSESS CONTROLLED DRAINAGE AS A NEW MITIGATION MEASURE

Carstensen, M. V., Poulsen, J. R., Ovesen, N.B., Hvid, S. K., Børgesen, C. D., Kronvang, B.

Department of Bioscience RKS, Aarhus University, Denmark

ABSTRACT

In Denmark around 50% of agricultural fields are drained by subsurface drains which are often transporting high amounts of nitrate directly from the fields to nearby streams with risk of creating eutrophication of freshwater and coastal water bodies. As the loss of nitrate from fields are the dominating N source to most coastal water in Denmark different mitigation measures that can assist in reducing N loss to surface waters are highly needed. Previous studies have proven that controlled drainage (CD), where the groundwater table is artificially set, is a potential method to ameliorate the N loadings from drain pipes. However, CD has not been tested in Denmark, nor has it been combined with cultivation of a winter crop. Hence the objectives of this study were to investigate if i) CD can be used as a mitigation measure in Denmark ii) a dual isotope approach (δ15N and δ18O of nitrate) can be used as a tracer for changes in soil N processes when using CD. The effects of CD on N losses were examined during a three year period at three sites, two sites on loamy soil with four and two subfields and one site on a loamy sandy soil with four subfields. Drain water flow and groundwater levels were continuously measured at each subfield. Each week grab and composite drain water samples were collected and analysed for ammonium, nitrate and total N concentrations. Each month drain water samples representing low and high flow events were collected for isotope analysis. The first year was used as reference period without CD. During the second and third year the subfields were divided into two groups, one with CD and the remaining serving as controls. Results will be shown from applying the dual isotope technique together with actual N mass-balances from the subfields.