# Management of Vegetable Crop Residues for Reducing Nitrate Leaching Losses in Intensive Vegetable Rotations

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## INTRODUCTION

Crop residues of field vegetables are often characterized by large amounts of biomass with a high N content. Even when these residues are incorporated in autumn, high rates of N mineralization and nitrification still occur causing important N losses through leaching. Crop residues thus pose a possible threat to meeting water quality objectives, but at the same time they are a vital link in closing the nutrient and organic matter cycle of soils. Appropriate and sustainable management is needed to fully harness the potential of crop residues.

## MATERIALS AND METHODS

**Evaluation of two fundamentally different management strategies**

### On-field treatment

*Long term field experiments (18 months)*

- Inclusion non-vegetable crops (Italian ryegrass -*Lolium multiflorum*)
- Inclusion catch crops (Italian ryegrass and winter rye - *Secale cereale)*
- cauliflower crop (*Brassica oleracea* var. *botrytis*

*Short term field experiments (2 – 6 months)*

comparison between:

- conventional crop residue incorporation
- no-incorporation crop residues
- total removal of crop residues
- cauliflower, leek (*Allium porrum*) and headed cabbage (*Brassica oleracea convar. capitata var. Alba*) crop

- application of immobilizing materials
- immature green waste compost, cereal straw, corn straw residue
- cauliflower crop

- Undersow of catch crops
- Italian ryegrass, winter rye and phacelia (*Phacelia tanacetifolia)*
- cauliflower crop

### Removal

*Ensilage crop residues*

- 4 crop residues: leek, celery, cauliflower and headed cabbage
- mixed with corn straw residue

*Composting crop residues*

- 2 crop residues: leek and headed cabbage
- mixed with wood chips, bark and straw

*Mechanization of crop residue removal*

- Evaluation of mechinal removal
- Adjustment of harvest machines

*N dynamics will be modelled using EU_rotate N*

## RESULTS

Field experiments are still ongoing but some preliminary results are already available.

- Crop residues left undisturbed continued to take up N from the soil, further depleting the soil mineral N (Fig. 1)

- Undersow of Italian ryegrass and phacelia may affect $N_{min}$ (Fig. 2)

- Clear differences in chemical properties of the silage products were found, with less optimal quality for silage based on cauliflower and headed cabbage

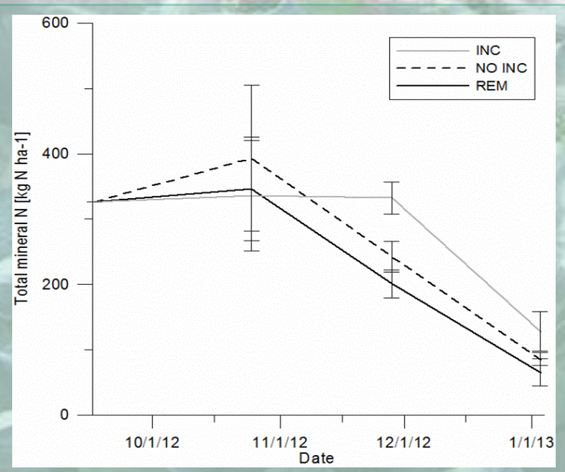


Figure 1: $N_{min}$ of the 0 – 90 cm soil layer following a cauliflower crop (INC= incorporation crop residues, NO INC= no incorporation crop residues, REM= removal crop residues).

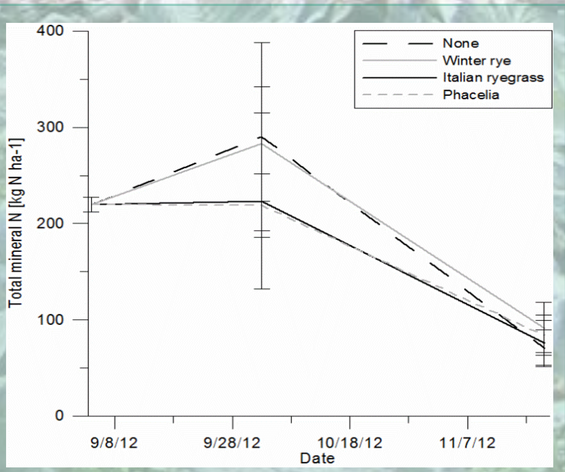


Figure 2: $N_{min}$ of the 0 – 90 cm soil layer following a cauliflower crop with undersown catch crops

## CONCLUSION AND PERSPECTIVES

Incorporation of crop residues increases total mineral N content and possible risk for nitrate leaching, whereas removal of crop residues lowers total mineral N content. Undersowing catch crops in vegetable fields may aid in preventing nitrate leaching but further investigation is needed. Technical constraints hamper efficient removal of vegetable crop residues and adjustment of harvest machines is needed. Evaluation of alternative crop rotations, immobilizing materials and potential valorisation of vegetable crop residues through ensilage or composting is currently ongoing and results will be presented later.

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