



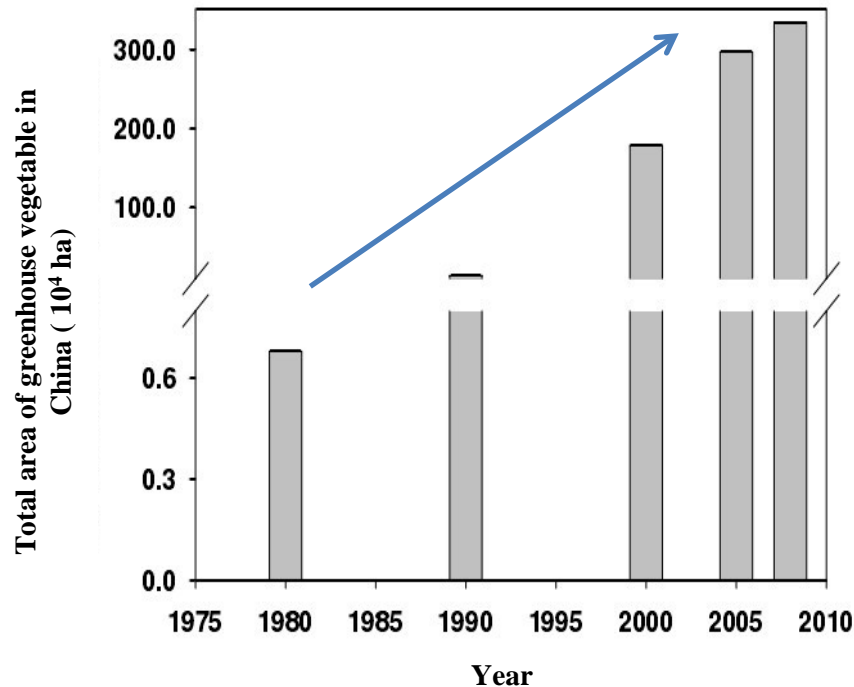
Comparison of performances of the DNDC model and the EU-Rotate_N model on greenhouse vegetable cultivation

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Role of greenhouse vegetable systems in agro-system nitrogen cycles



Input: High water

High N fertilizer (1257 kg N ha⁻¹)



Output: High water drainage

High nitrate leaching

High residual nitrogen

High nitrogen gaseous emission

Total area of greenhouse vegetable cultivation in China increased by about 30 times, accounted for 11.6 % of the national agricultural acreage.

Recourses and Environmental issues from greenhouse vegetable

- ◆ Water and N fertilizer waste
- ◆ Increase Nitrate concentration in groundwater
- ◆ Greenhouse gases (N_xO)

DNDC and EU-Rotate_N models

DNDC model

◆ Advantage

Working well in simulating
GHG release for various
ecosystems

◆ Limitation

- simulation depth
- barely used to simulate nitrate leaching

EU-Rotate_N model

◆ Advantage

Good performances in
simulating dynamics of
water and nitrate content

◆ Limitation

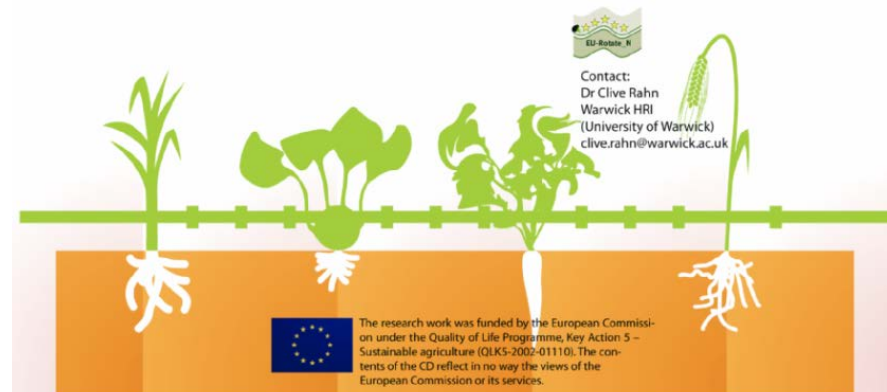
- Can't distinguish between NH_3 or N_2O forms of gaseous N.

Objective

- ◆ Compare performances of **DNDC** and **EU-Rotate_N** models in simulating nitrate leaching on a greenhouse vegetable case.



EU-Rotate_N



Field Experiments Design

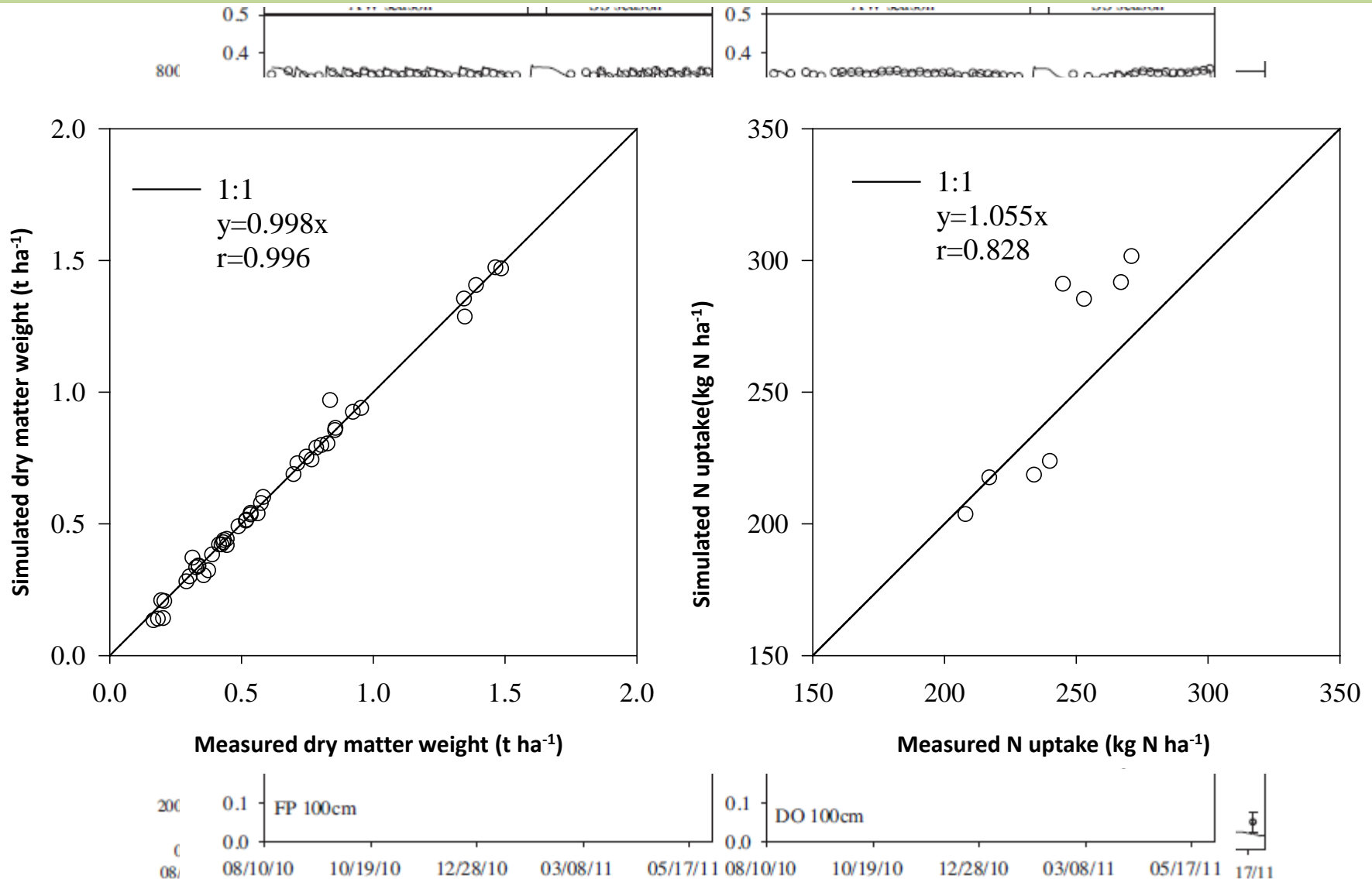
Field experiments were located in *Shouguang City, Shandong Province*.

Water and N-fertilizer management had 4 treatments, including:

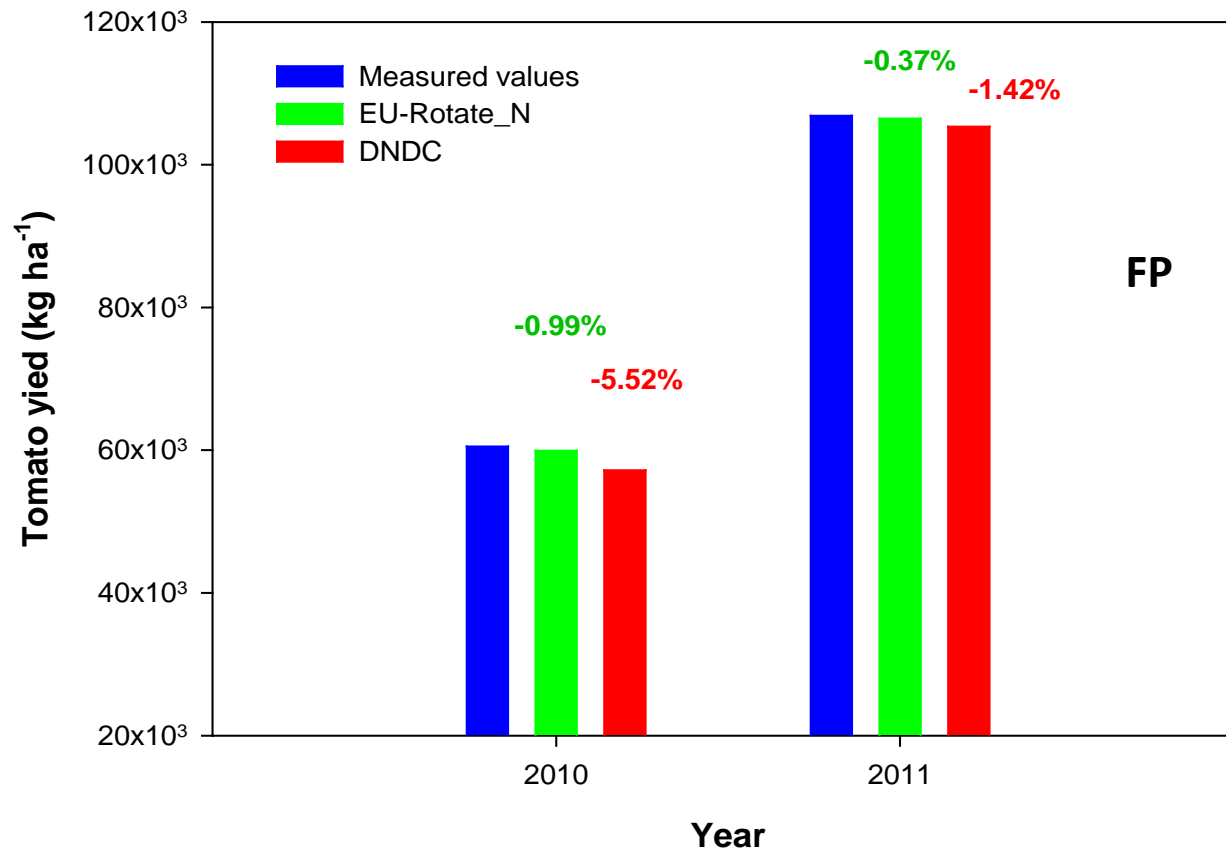
- | | | |
|------------------------------|---|--|
| Furrow
irrigation | { | Farmer practice (FP) |
| | | Farmer practice + wheat residues (FPR) |
| Drip
irrigation | { | Optimizing fertilizer (80% of FP) (DO) |
| | | Optimizing fertilizer + wheat residues (FPR) |



Performances of EU-Rotate_N model

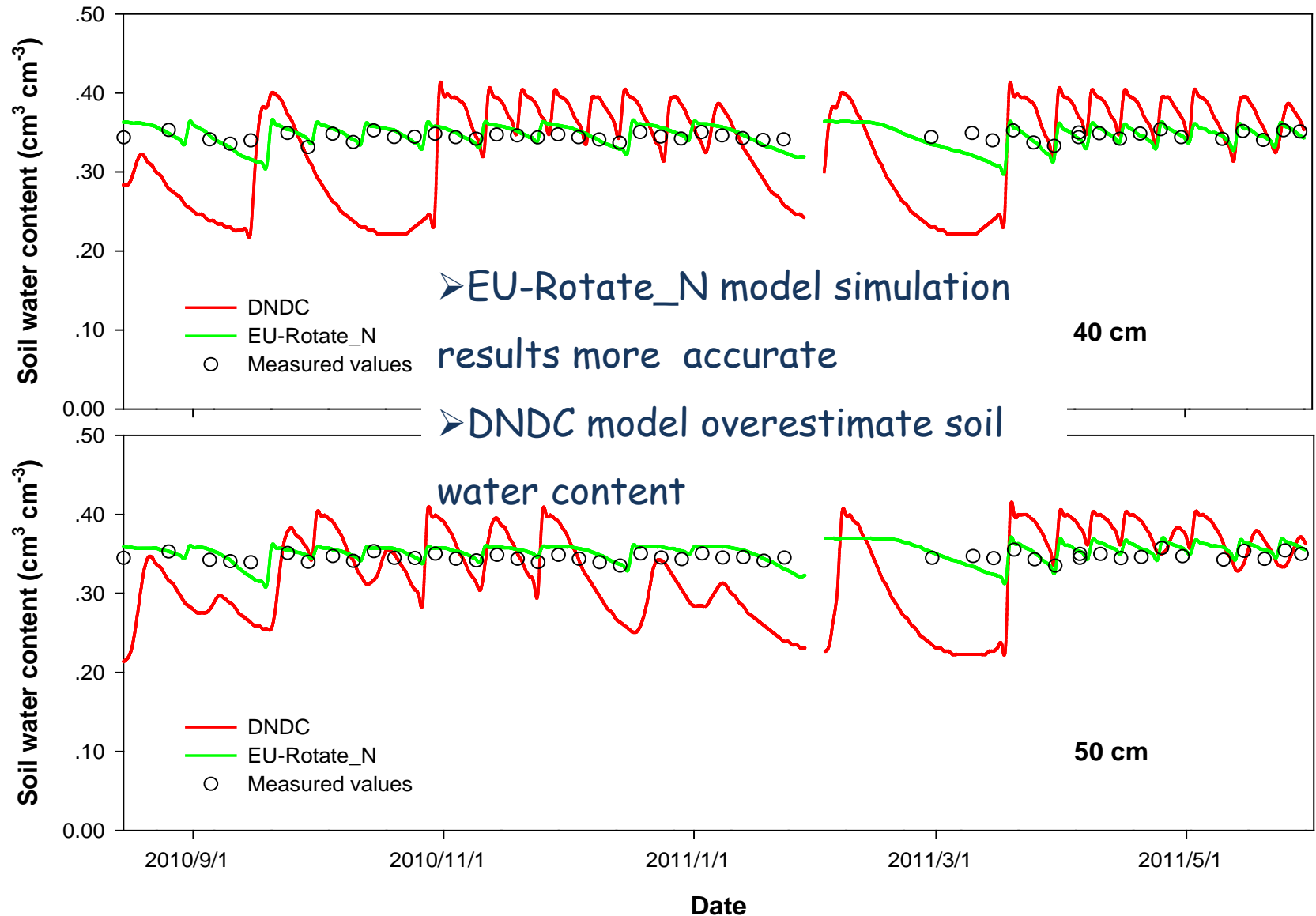


Comparison of simulated tomato yield with two models

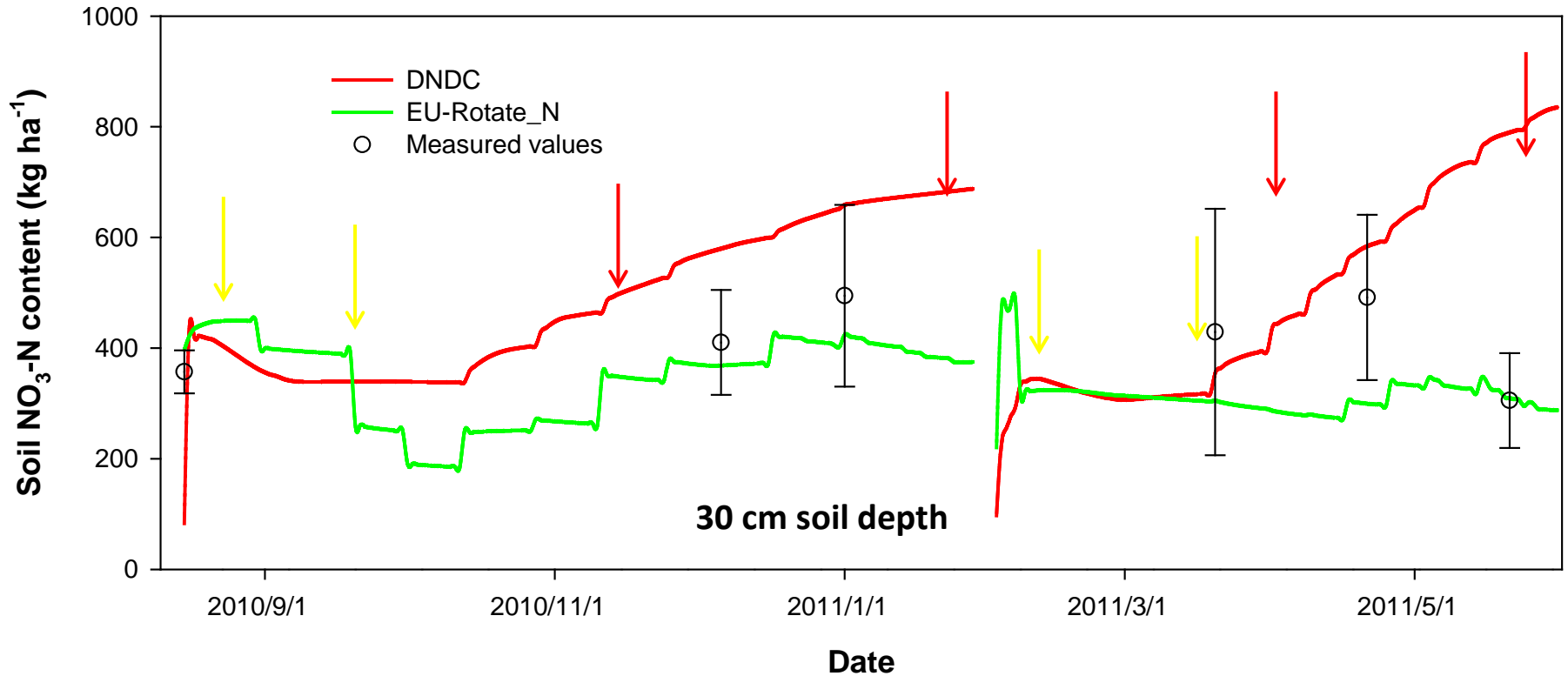


- DNDC and EU-Rotate_N models slightly underestimate tomato yield
- Compared with EU-Rotate_N model, DNDC model had poor simulation result

Comparison of simulated water content with two models



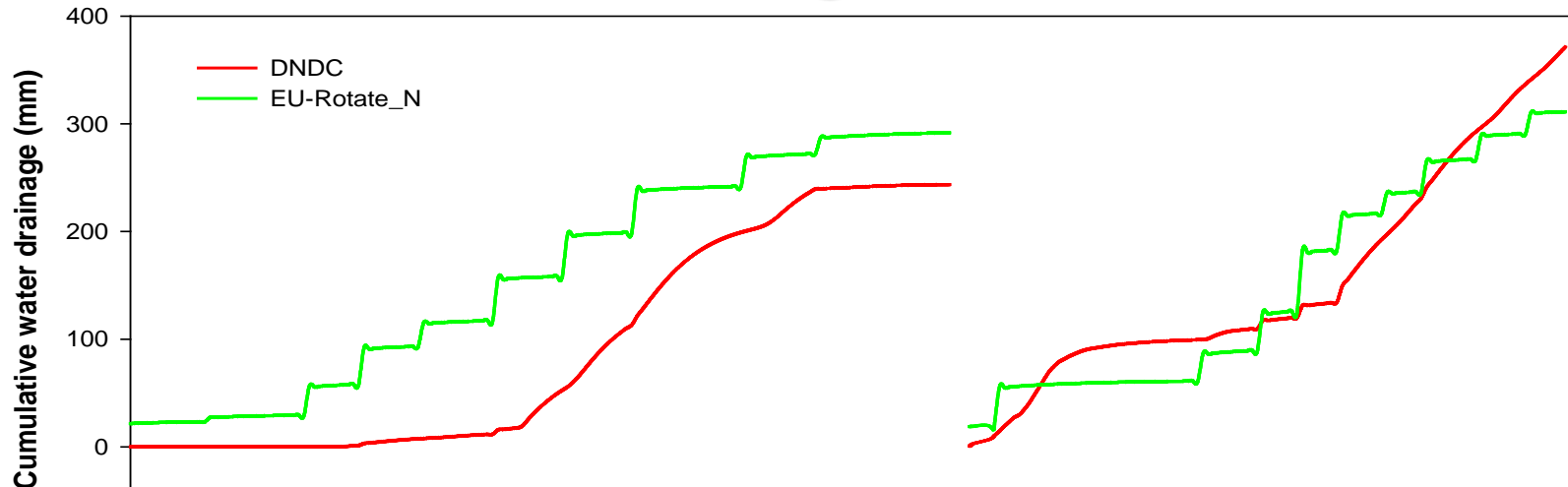
Comparison of simulated soil NO₃-N content with two models



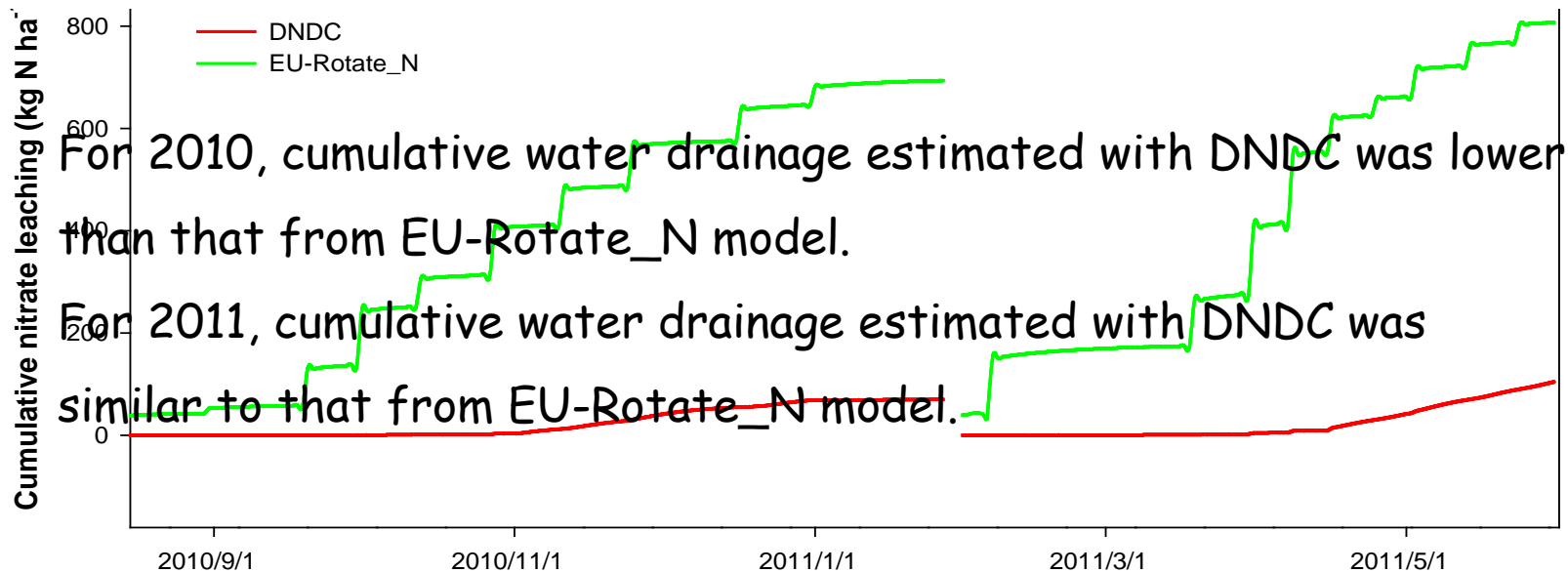
➤ At the beginning of each growing season, simulated NO₃-N contents by two models were similar.

➤ At later each growing season, simulated NO₃-N contents by DNDC models were overestimated.

Comparison of simulated cumulative water drainage and nitrate leaching with two models



Compared with EU-Rotate_N model, DNDC model underestimate nitrate leaching.



For 2010, cumulative water drainage estimated with DNDC was lower than that from EU-Rotate_N model.

For 2011, cumulative water drainage estimated with DNDC was similar to that from EU-Rotate_N model.

Further works

- ◆ Adjusting DNDC model parameters to make it work better in simulating soil $\text{NO}_3\text{-N}$ content and nitrate leaching for this study.
- ◆ Attempt to predict water and nitrogen loss in greenhouse vegetable field under different water and N-fertilizer management,
- ◆ Try to get the best management practices.

A photograph of a greenhouse filled with rows of cucumber plants. The plants have large, green, lobed leaves and some small yellow flowers. A dirt path runs down the center of the greenhouse, flanked by the plants. In the background, the greenhouse structure with its metal frame and translucent covering is visible. The text "Thank you!" is overlaid in the center of the image in a bright pink, bold, sans-serif font with a white outline.

Thank you!