

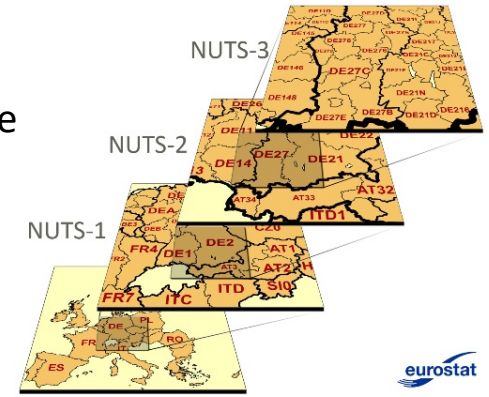
# Generating EU-wide endogenous crop yield responses to nitrogen to predict the impact of environmental policies on farm-level cropping systems

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# Overall goal: predict how farmers will alter cropping systems upon environmental policy incentives

Specific aim: generating endogenous yield response curves to N, applicable to individual farms of EU FADN (Farm Accountancy Data Network)

➔ Yield response curves at NUTS-2 level



Simulations on HSMU level = Homogeneous Spatial Mapping Unit (CAPRI model) based i.a. on European Soil Database

**GAMS**

EU-Rotate\_N  
*Rahn et al., 2010*



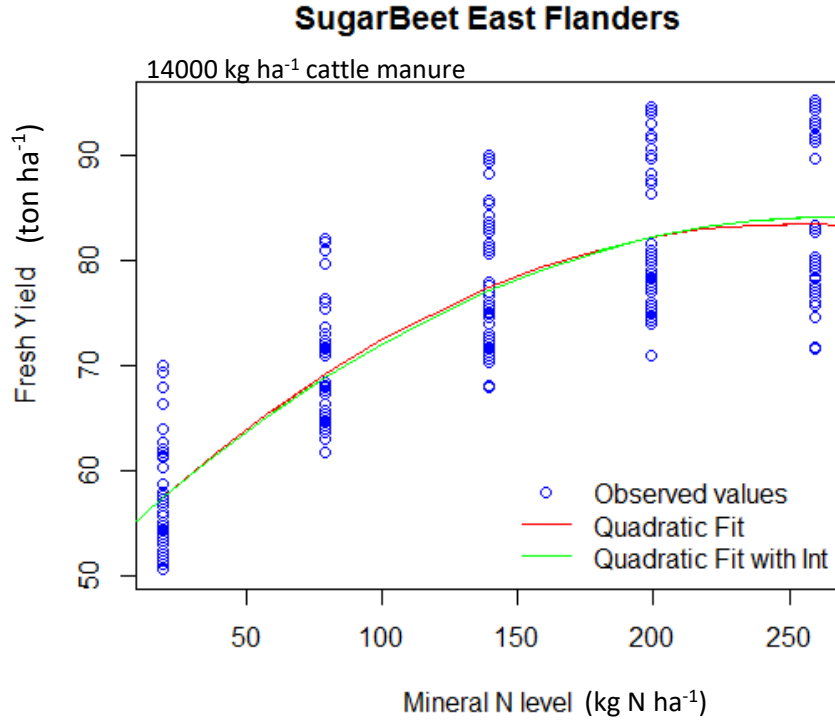
Planting and harvest dates from JRC-MARS Crop Calendar Dataset

Weather data on a NUTS-2 level from the European Climate Assessment & Dataset

Target yields: maximum attainable yields = 90% FADN quantiles per NUTS-2

Yield response to N fertilizer  
Mineral fertilizer =  $\text{KNO}_3$ : 0-240 kg N ha<sup>-1</sup>  
Organic fertilizer = cattle manure: 0-56000 kg ha<sup>-1</sup>

# Example: yield response curve for sugar beet in East Flanders (Belgium)



## Remarks

- No single best fitted regression function
- Yield functions most responsive to mineral N
- Overestimated response for grassland and potatoes in East-Flanders
- Underestimated response for wheat and potatoes in Mediterranean regions

## Regression

Simulation results weighted by the HSMU contribution to the total NUTS-2 crop area

- Linear function:

$$Yield = a + b * Nmin + c * Norg$$

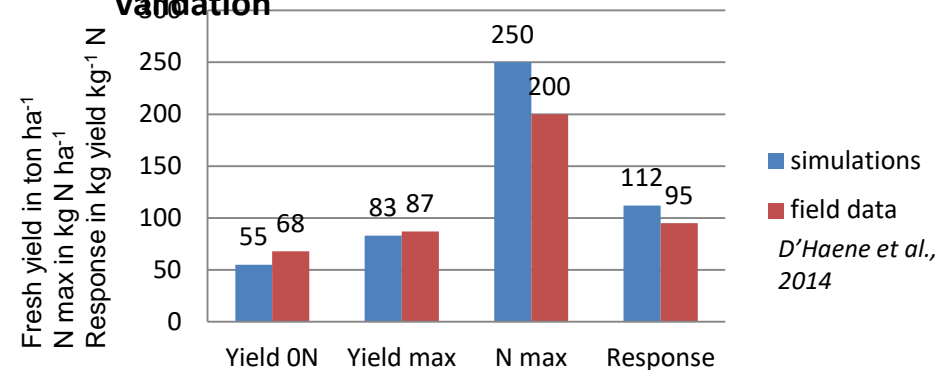
- Quadratic function:

$$Yield = a + b * Nmin + c * Norg + d * Nmin^2 + e * Norg^2$$

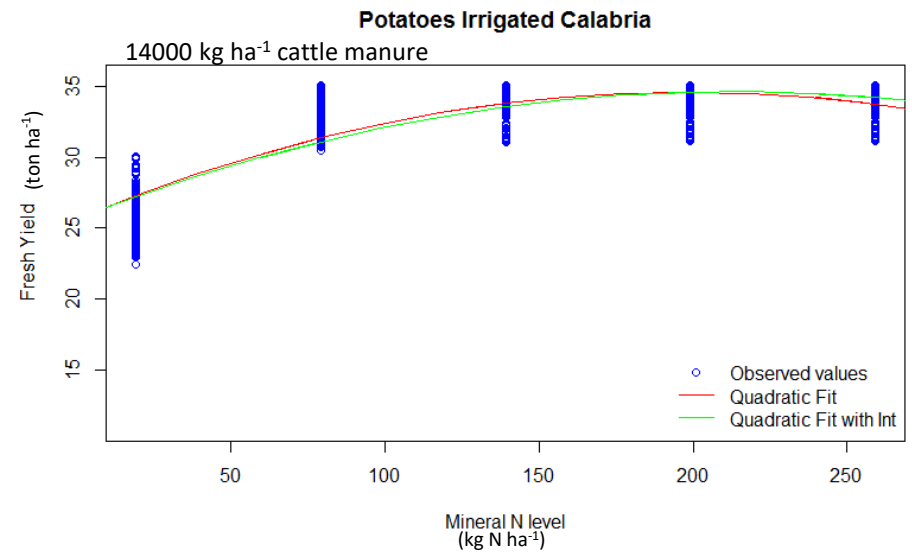
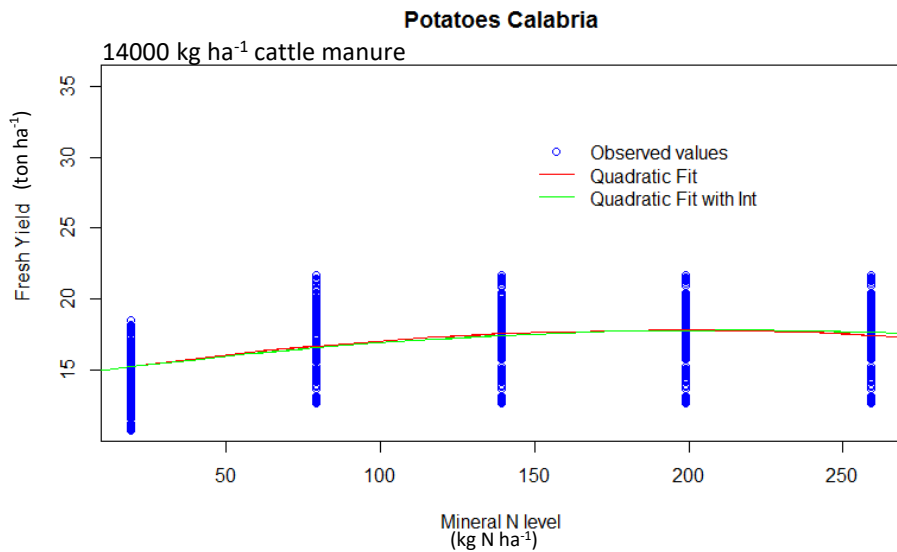
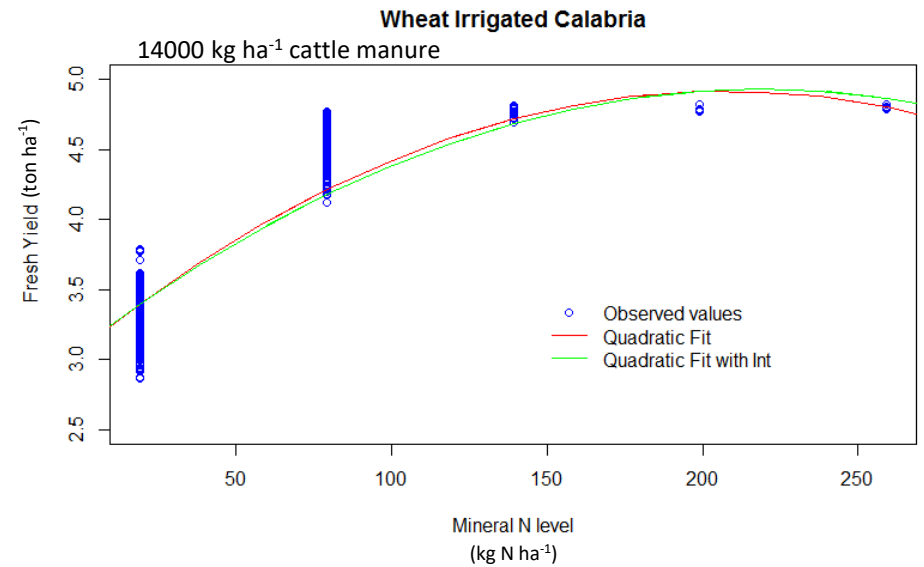
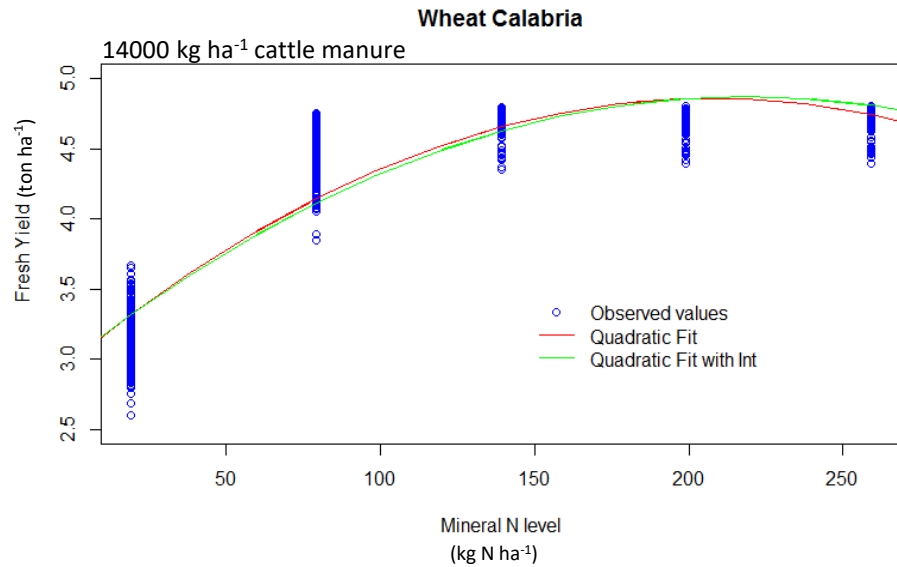
- Quadratic function with interactions:

$$Yield = a + b * Nmin + c * Norg + d * Nmin^2 + e * Nmin * Norg + f * Norg^2$$

## Validation



# Effect of irrigation on yield response curves for winter wheat and potatoes in Calabria (Italy)



# Thank you

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