Last Frontier of Agricultural BigData in Rotation?

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2018

Yield-Gap

Yield Gap

Potential Yield

Realized Yield

Improved varieties

Limiting Yield

Management

Sustainable intensification of food production

Water, Nutrients, Salinity, Pests and Weeds

Rotation-'Big'-Data

Participants (19)

**Cultures (2)
Starch potatoes & Sugar beet**

Variables (1400+)

**Time (7)
2010-2016**

RotationDB (~ 556)

BigData -> Empty space

Analysis:

- **Many variables**
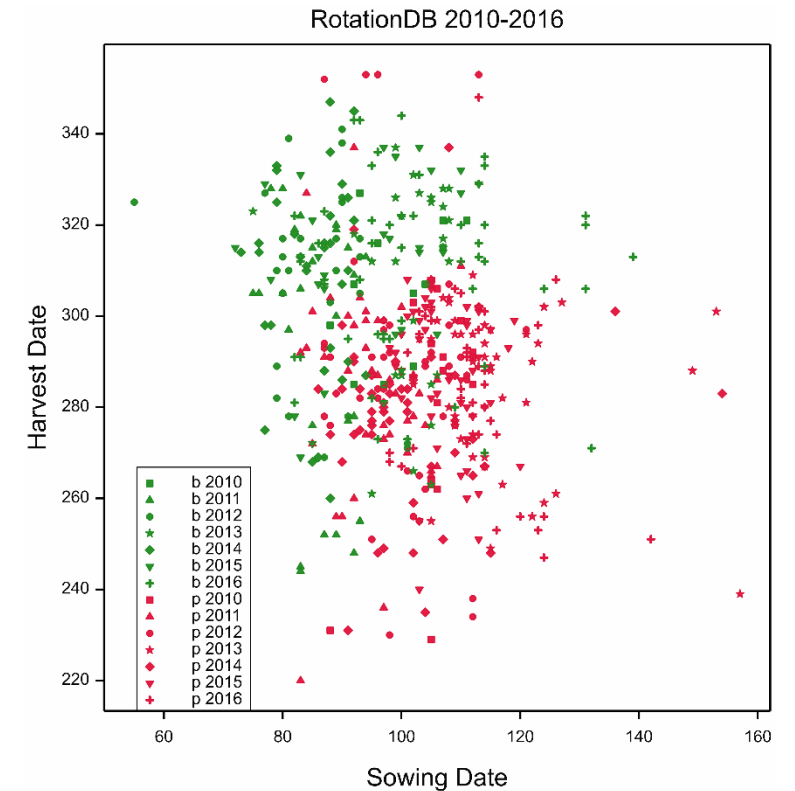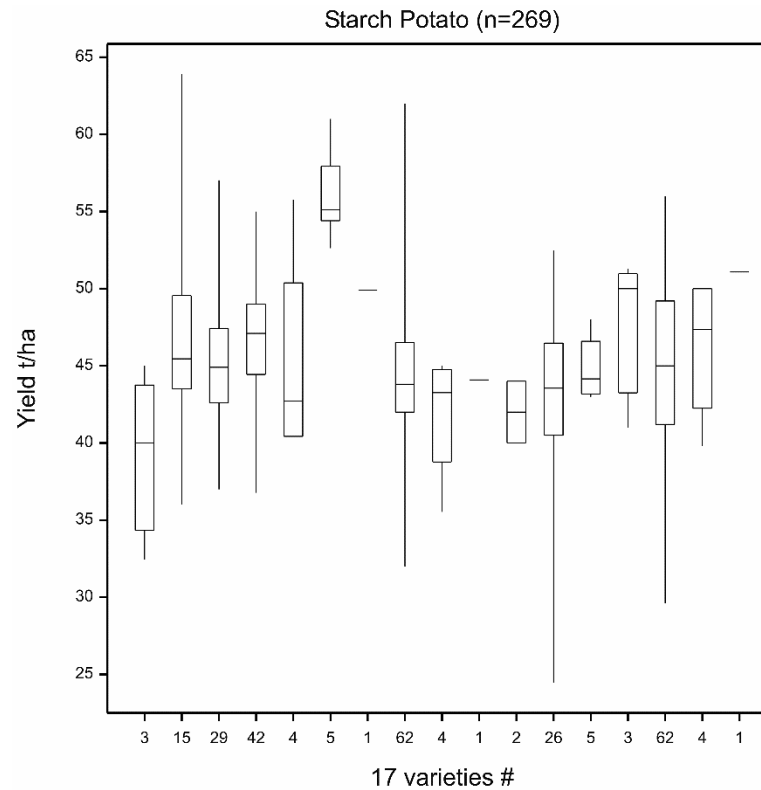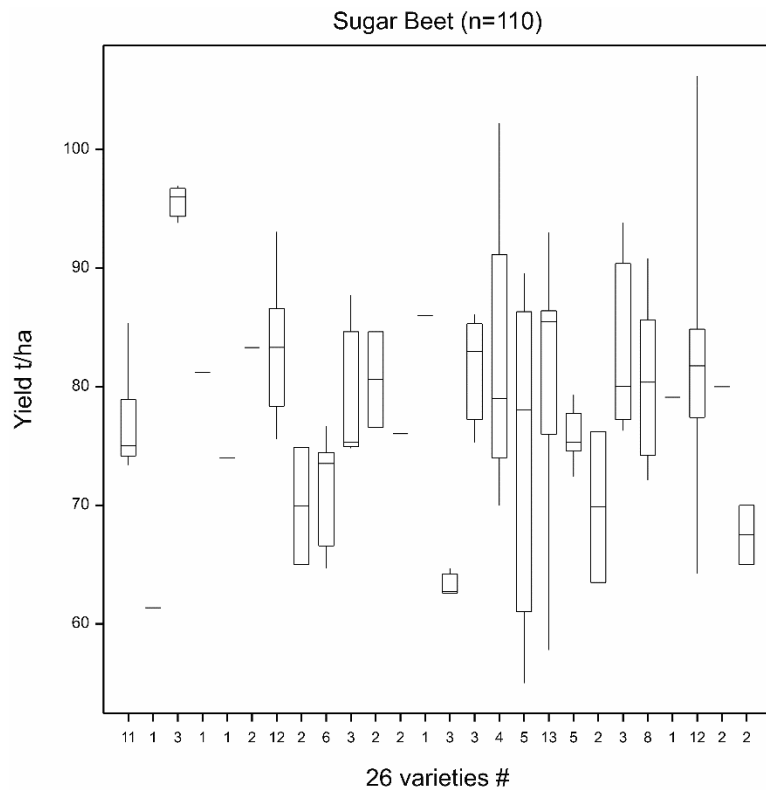- **Relevance**?
- **Relations**?

Data set

- **Observational set over consecutive years**
- **Weather** is 'spoiling' for analysis
- **Growth models** copes with a major variable part across time
  - Location
  - Crop
  - Area
  - Radiation
  - Temperature
  - Water Limited (Rainfall hardly integrated)
  - Growing period

Analysis -> Mixed Models
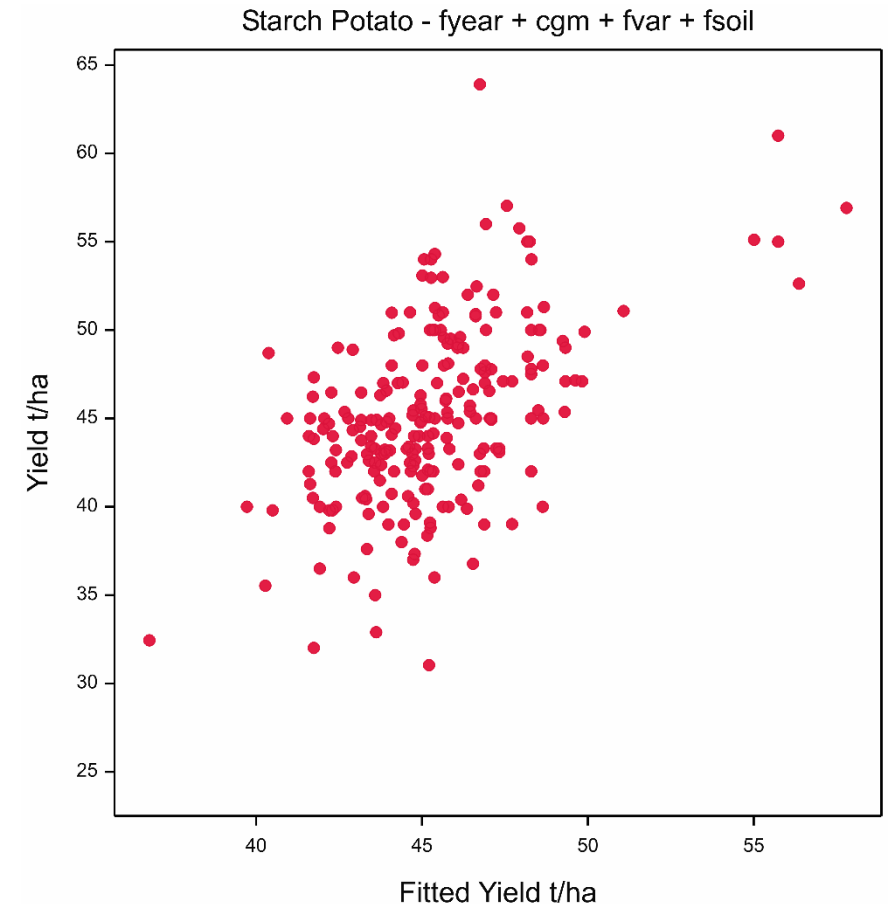
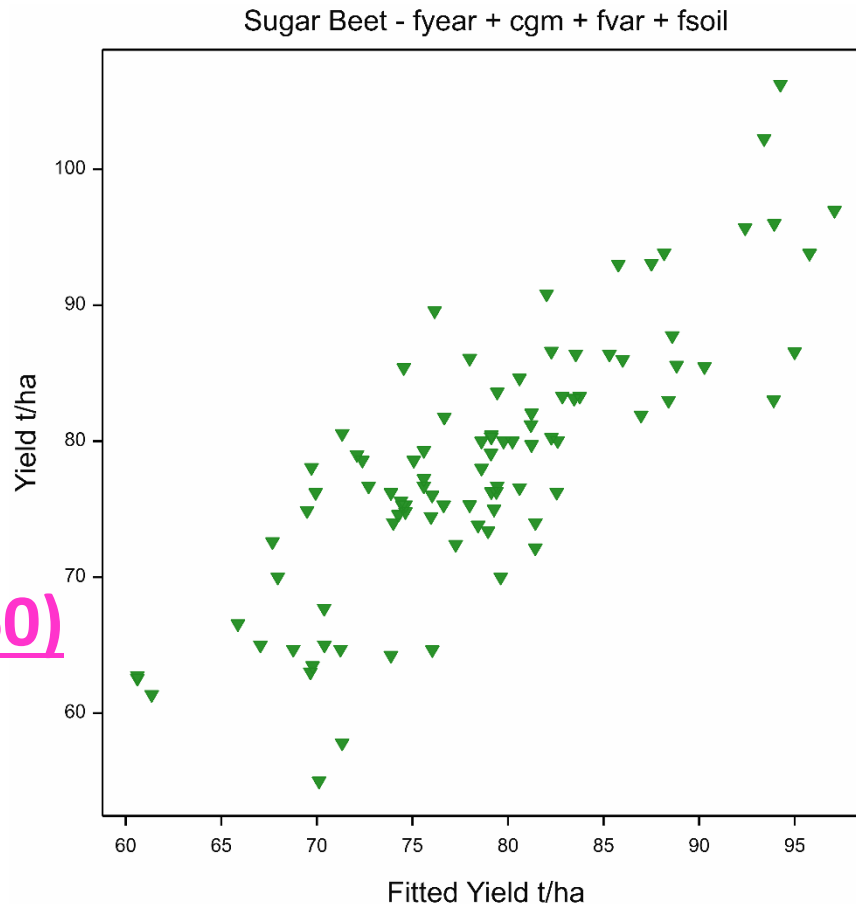- Basic data -> categorical and continuous variables

Linear Mixed Models

Model: **CropYield** = **μ** + **Year** + **Growth model** + **Variety** + **...** + **...** + **ε**

Variables ...

- **Soil**
- **Sowing date**
- **Harvest date**
- **Tillage (30)**
- ***Fertilizer (90)***
- **Protection (160)**
- **?**

Sugar Beet - fyear + cgm + fvar + fsoil

Starch Potato - fyear + cgm + fvar + fsoil
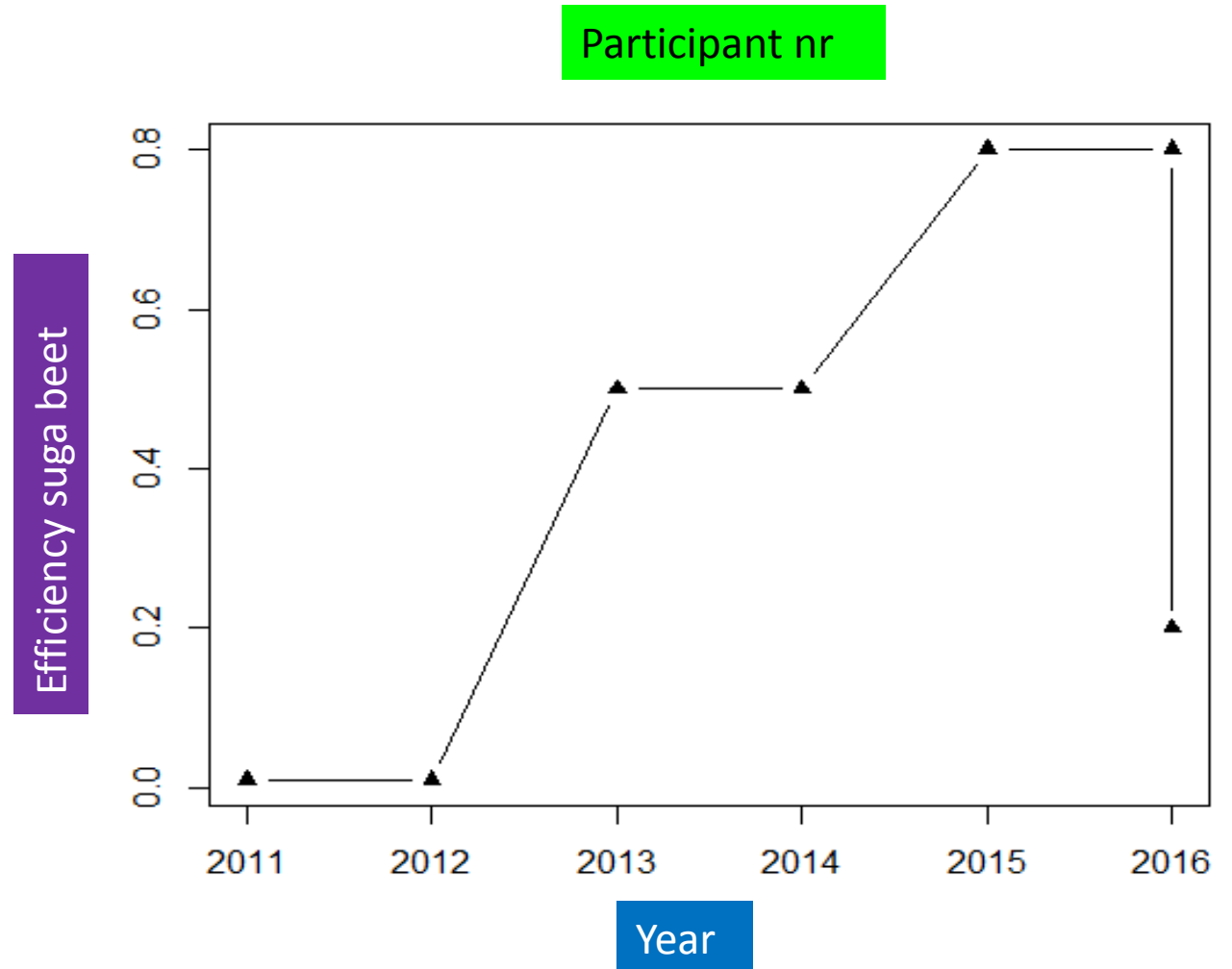
Stochastic Frontier Analysis (SFA)

Observed yield explained by year of starch potatoes
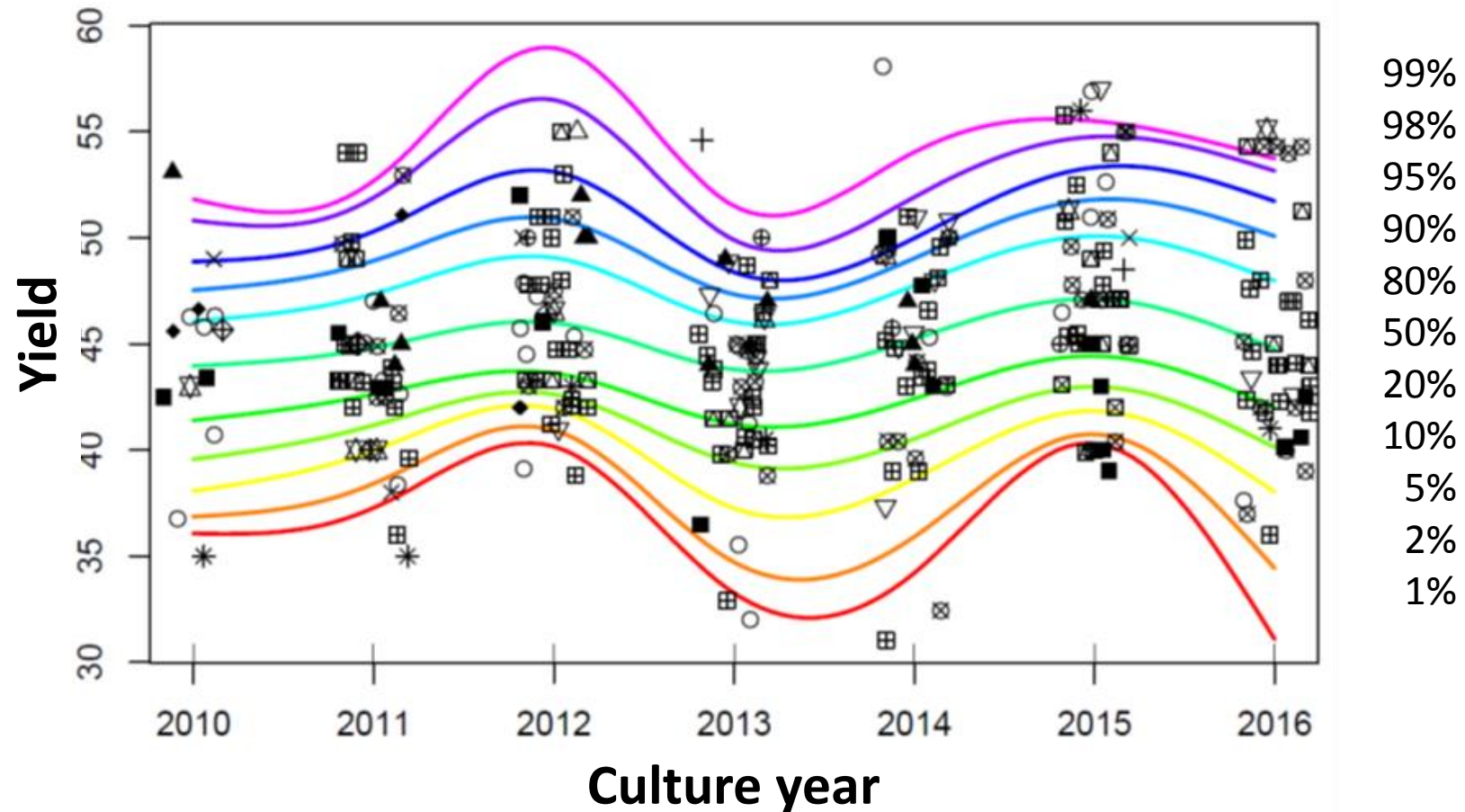
How efficient?

- Frontier Evaluation
  - Individuals
  - Important variables
- Optimal combinations of variables

What did we learn!

- Important variables: Year + Simulated_Yield + Variety + <u>Fertilizer</u>

- **L**inear **M**ixed **M**odels & **G**rowth-models & **S**tochastic **F**rontier **Analysis**

- **Tilling, <u>Fertilizing</u>** and **Protection** to model the **yield-gap**
  - Very diverse and a challenge to incorporate

- App development: input & feedback

- Sensors >> continuous and reliable

- Curation of collected Data

Future: Yield-Gap-APP

FAIR

Future of BigData an APP?