A Simulation Model for Asparagus Spear Growth Yield

Jan Graefe, Adolf Heißner, Carmen Feller, Matthias Fink, Monika Schreiner

Leibniz-Institute of Vegetable and Ornamental Crops, Germany

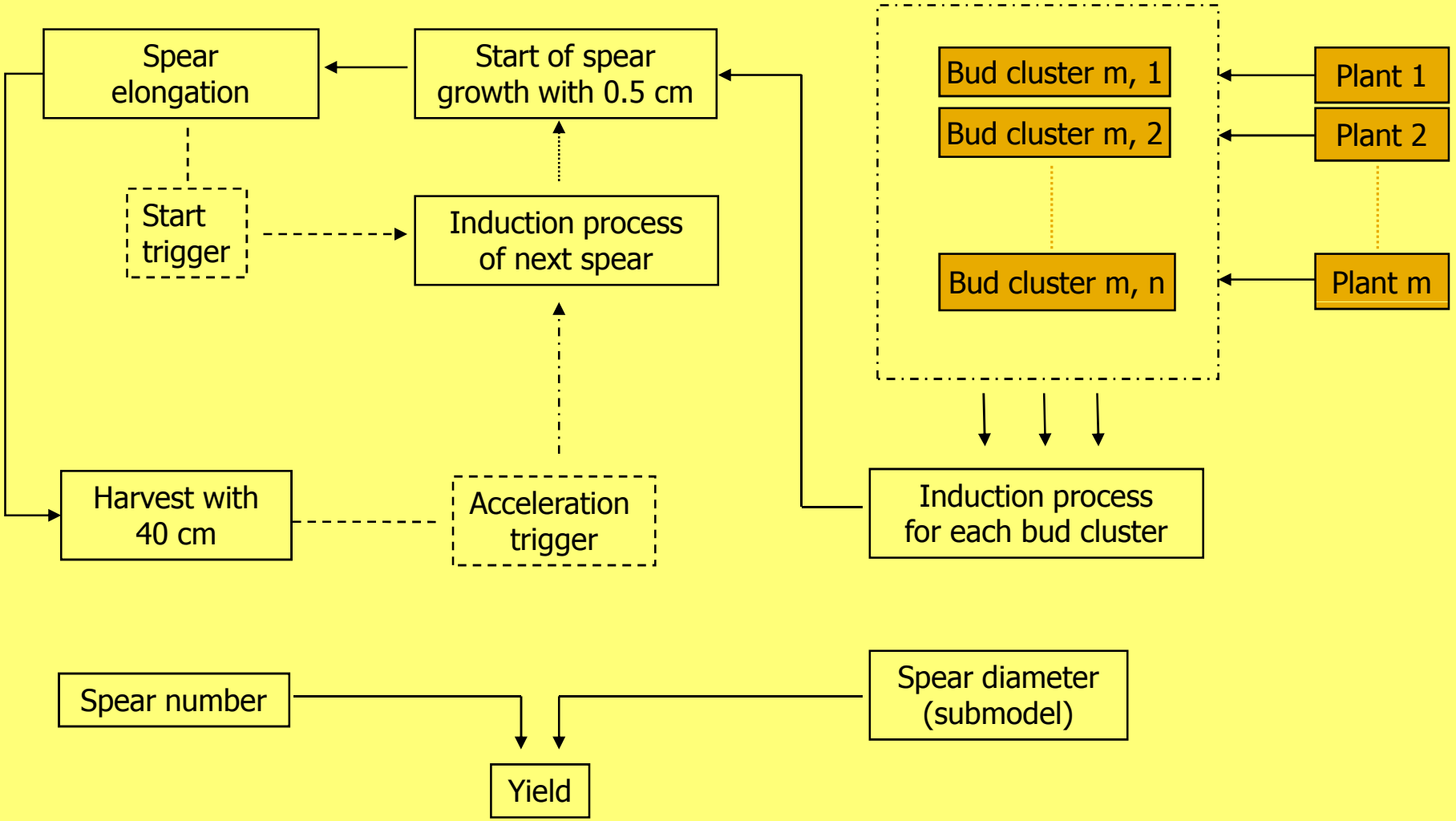
Peter-Jürgen Paschold

Geisenheim Research Center, Germany

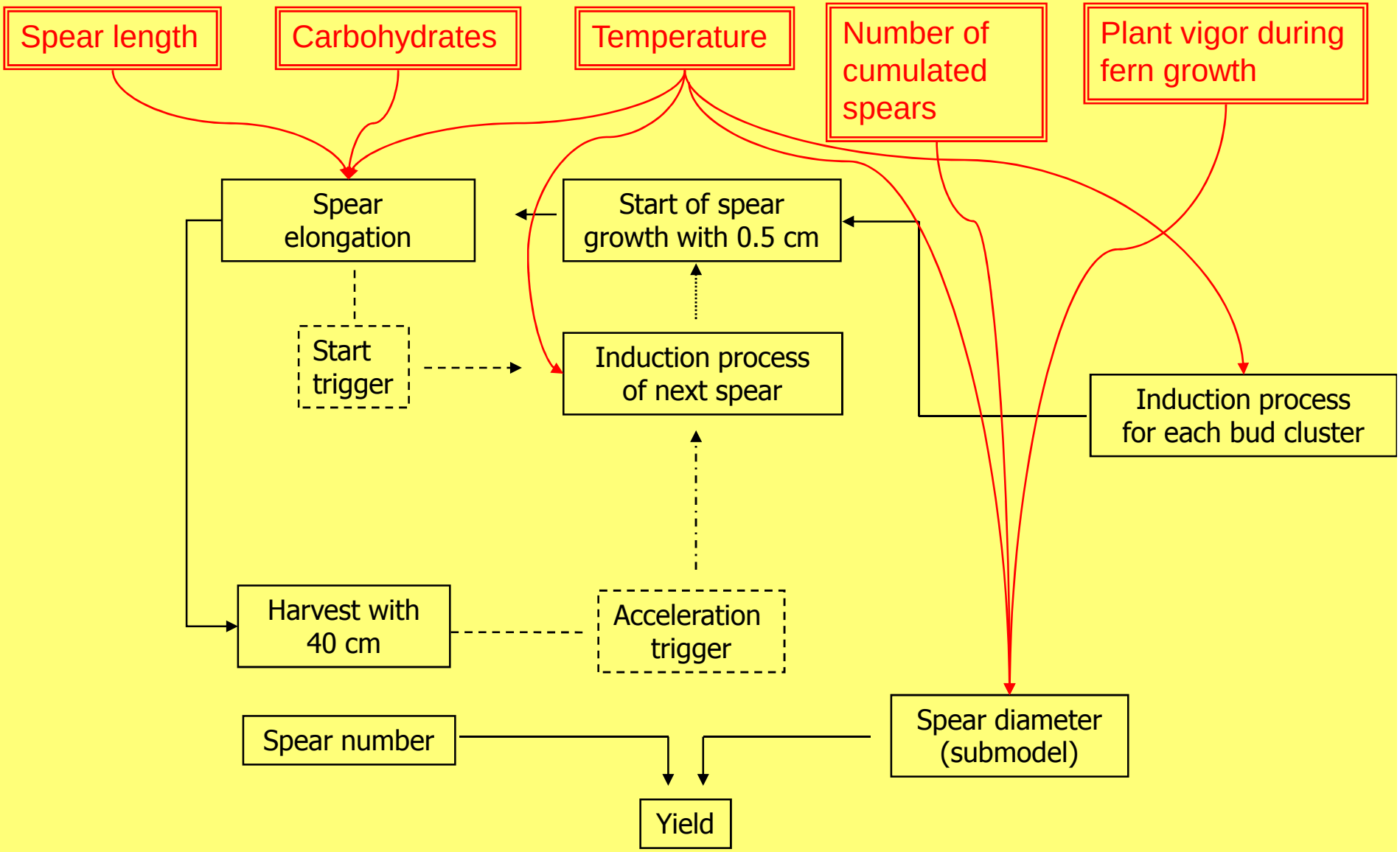
Why to work on yield forecast in Asparagus?

- Could be important for :
  - More sound recommendations for plastic cover application
  - Optimizing the usage of harvester machines
  - Definition of plant targets for crop improvement
  - Marketing decisions, price negotiations, labour planning

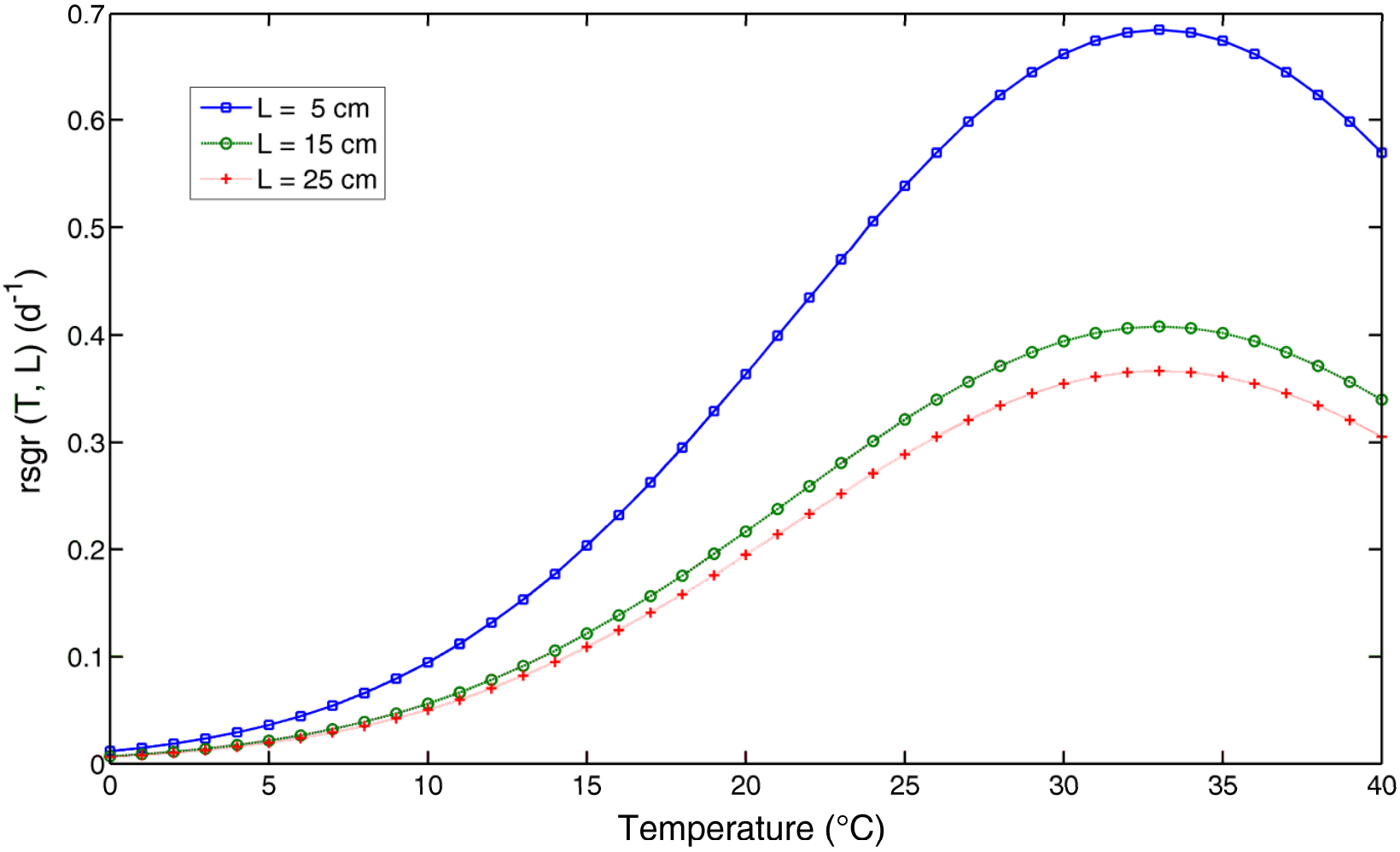
Model overview



Established and assumed causalities



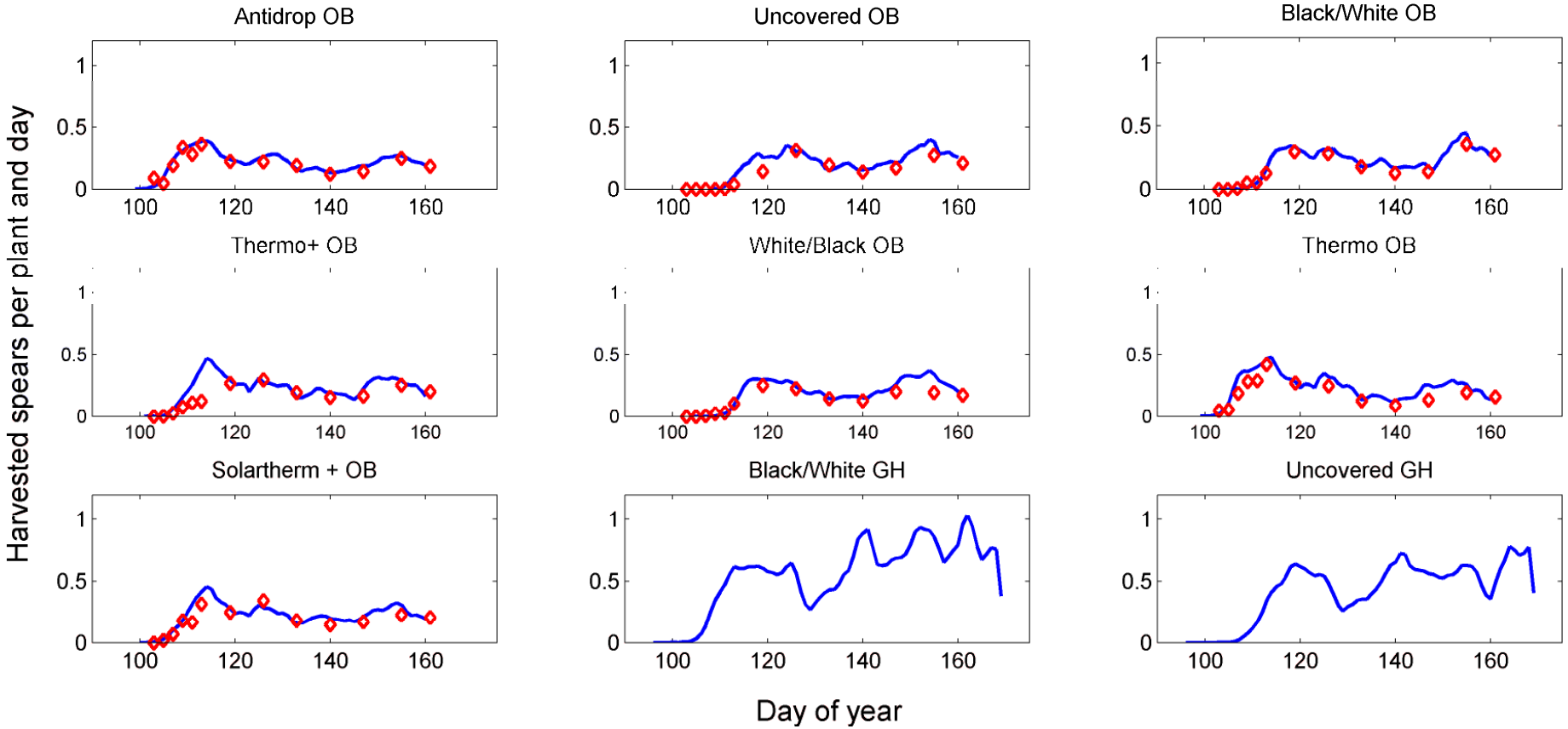
Relative spear length growth rate as function of temperature and spear length (cultivar Gijnlim)



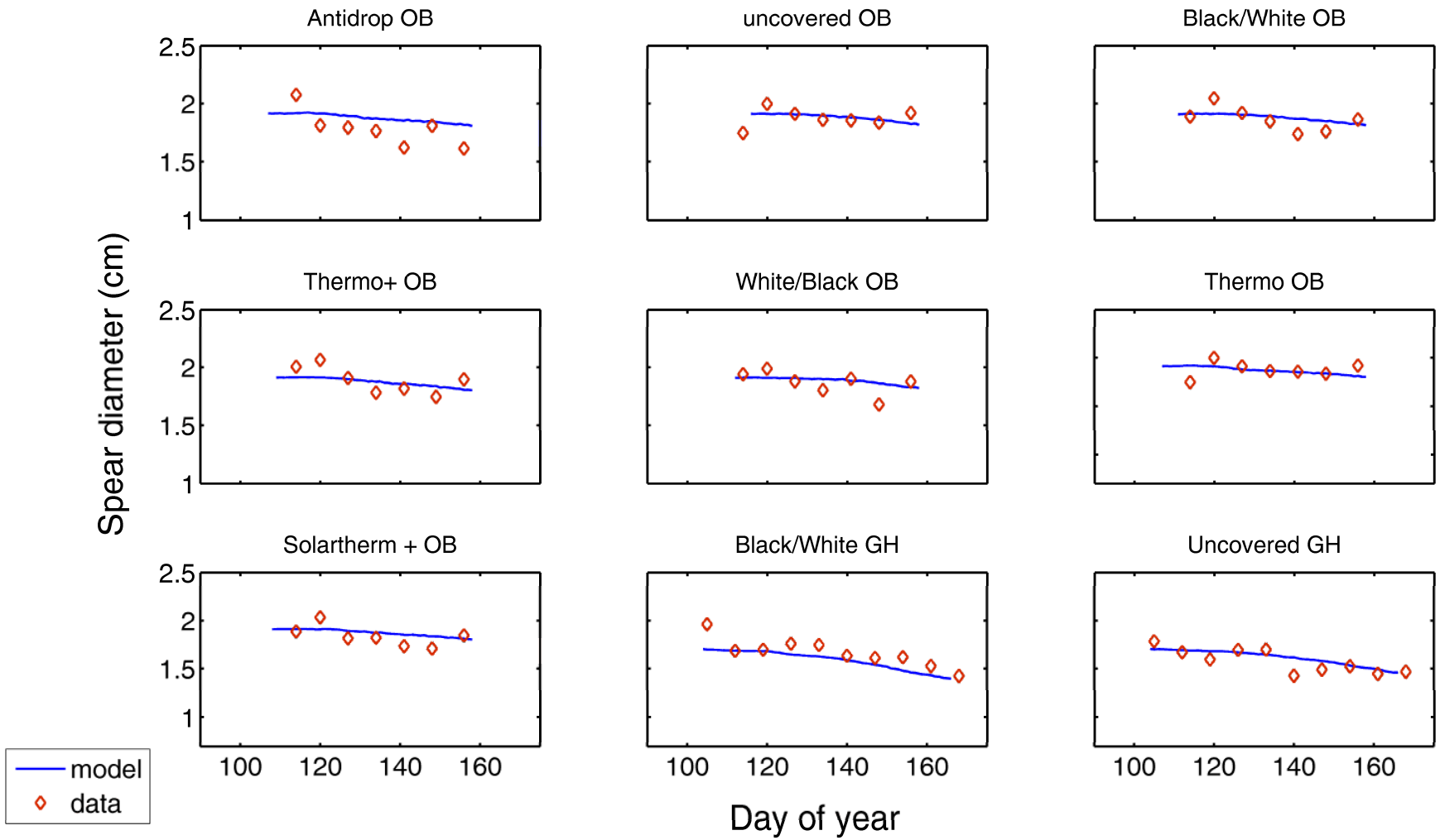
Model validation – cultivar Gijnlim

- Data sets:
  - "OB" - yield and spear number time series for 7 different plastic covers (humus rich sand, without irrigation)
  - "GH" - yield time series for 2 different plastic covers (loamy sand, with irrigation)
- Used inputs:
  - Soil temperatures in 3 depths
  - Mean spear diameter over harvest season
  - Storage root system size
  - Initial CHO concentration in storage root system

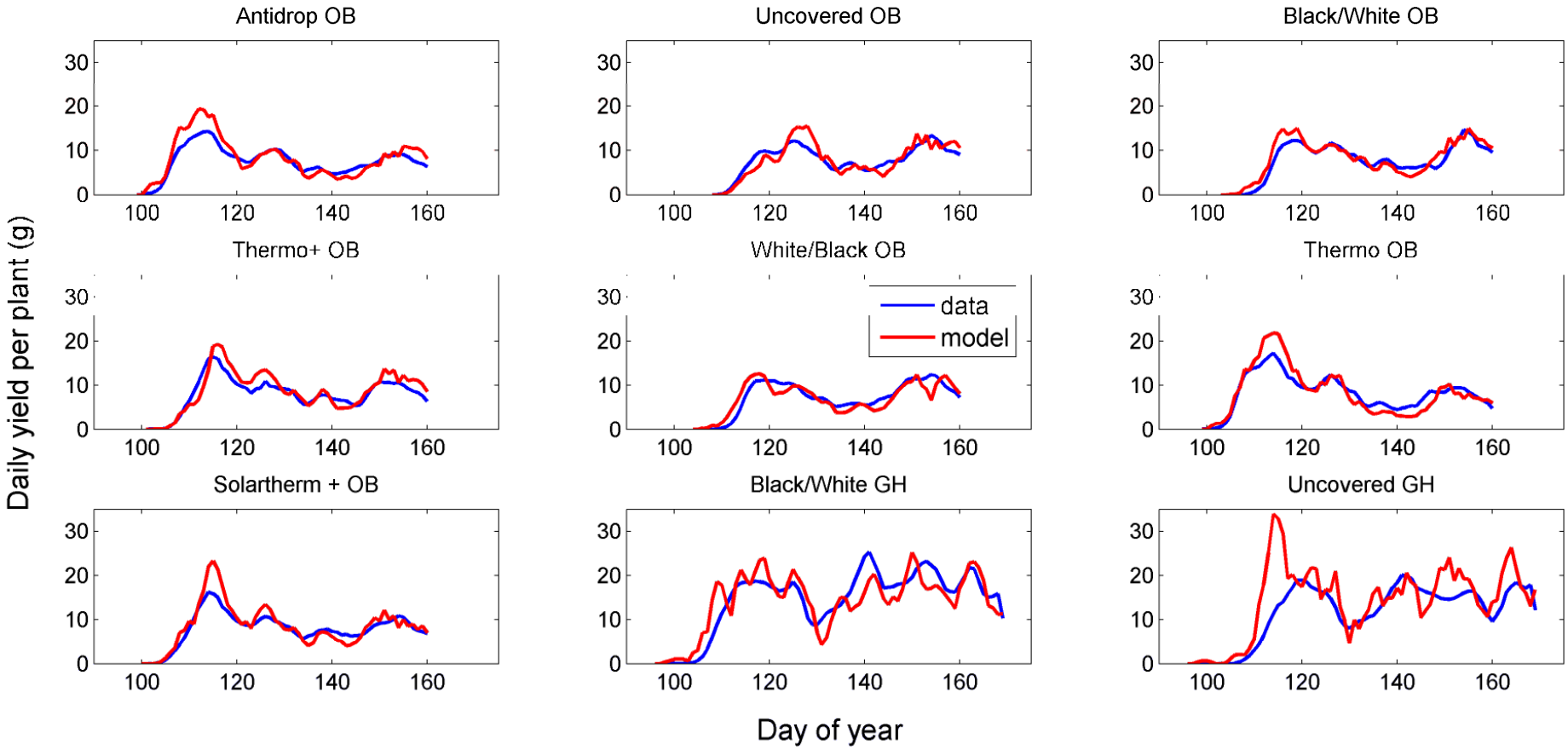
Simulated and measured spear numbers



Simulated and measured spear diameter



Simulated and measured yields



Some parameter estimates

Parameter	Value
Mean bud cluster number/plant (OB – unirrigated)	6.7
Mean bud cluster number/plant (GH - irrigated)	9.9
Mean temperature sum for bud cluster break	223 °Cd
Mean temperature sum for spear initation	663 °Cd

Conclusions

- Link between single plant physiology and field scale yield is established
- For „true" forecasts some parmeters must be specified in advance:
  - Mean bud cluster number per plants
  - Storage root system size of plants
  - Initial CHO content in the storage root system
  - Expected mean spear diameter over harvest season
- Further work needed to obtain parameters for different cultivars, fields and years