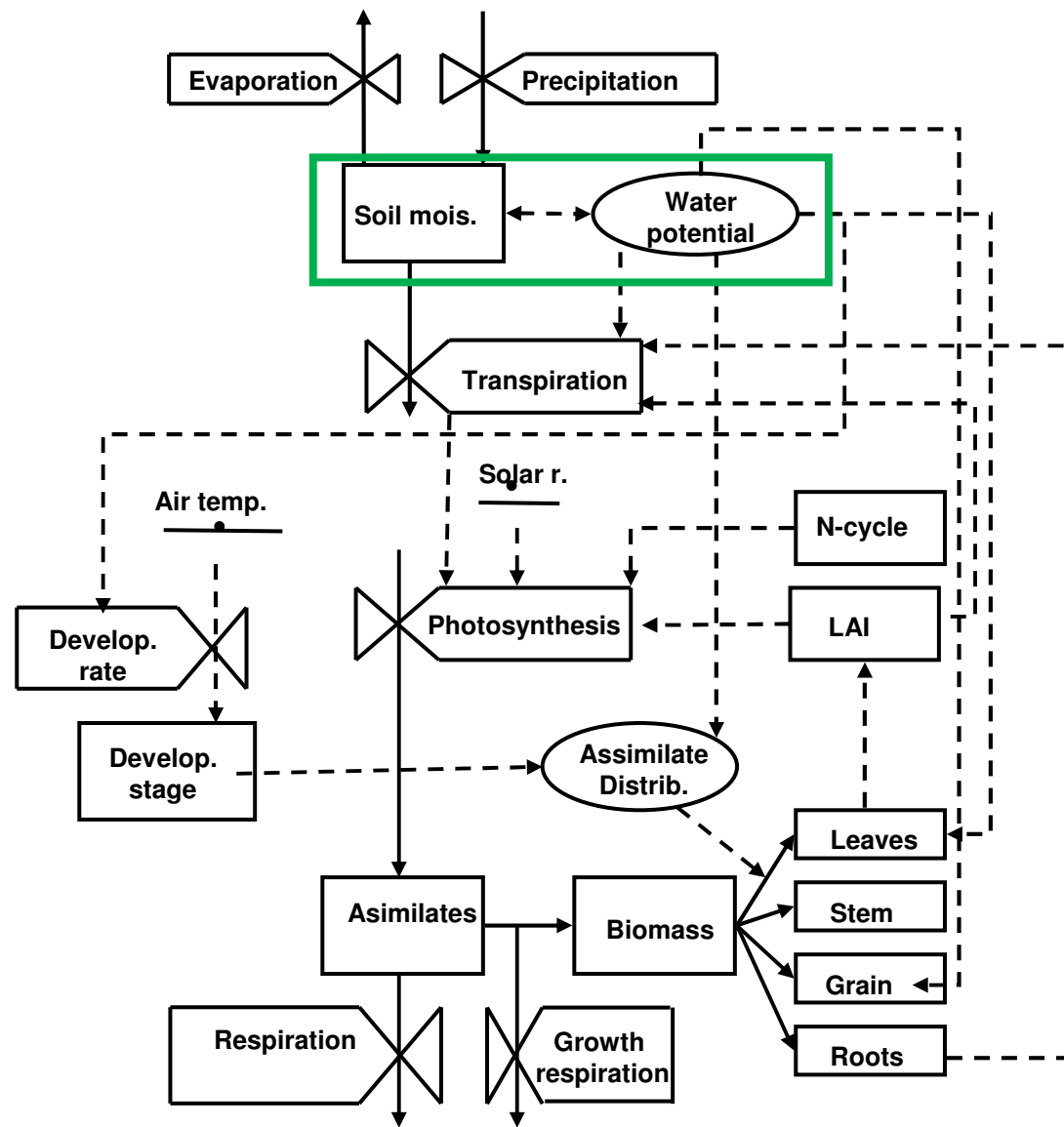


CERES model

November, 2008

CERES - basic scheme



Reasonably good at:

- Soil water balance
- Phenology
- Yield
- Seasonal/Regional differences

Could be much better:

- Nitrogen balance
- Yield parameters

Not very reliable :

- LAI
- Soil Temperature

CERES model MINIMUM DATA:

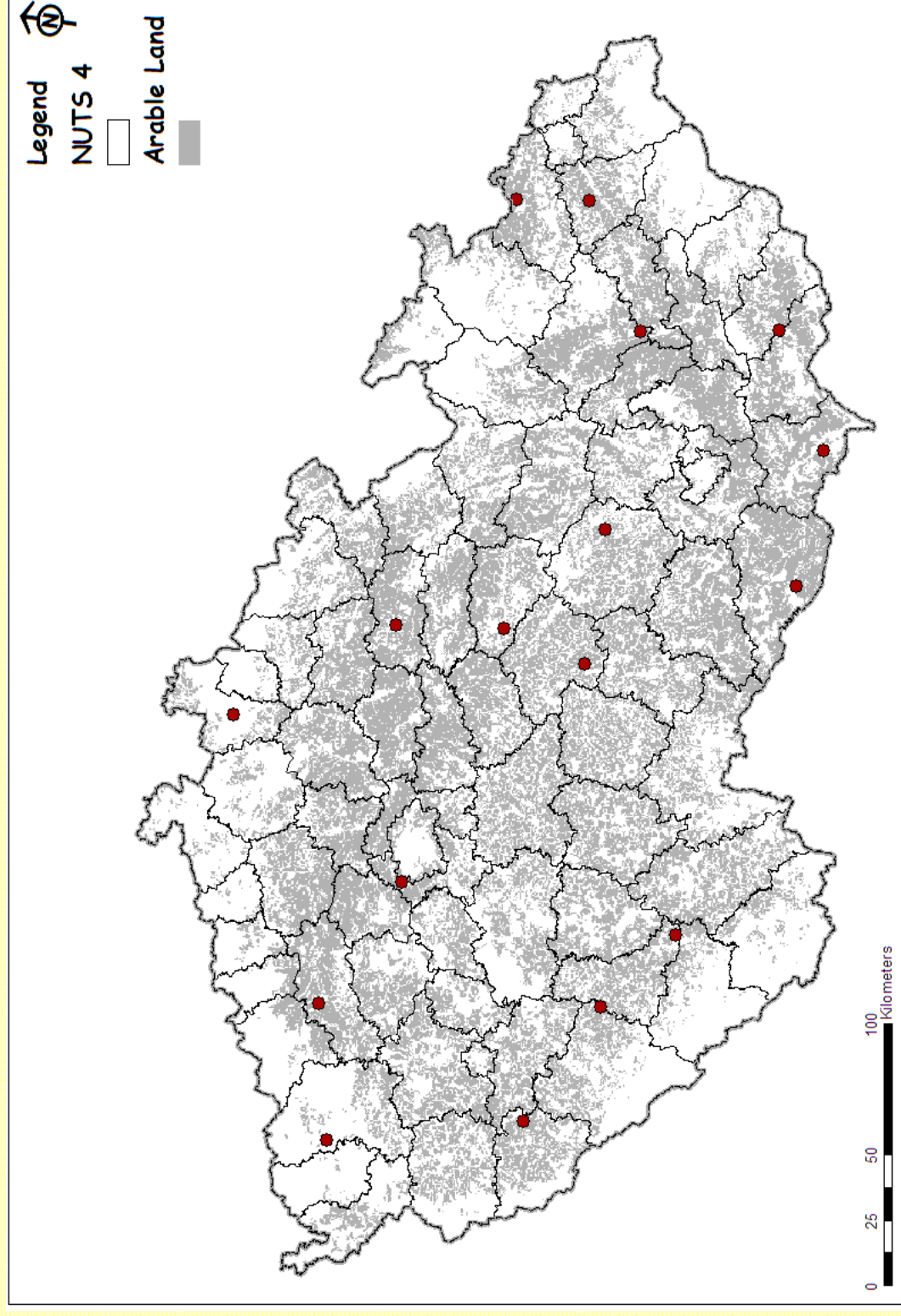
Type of the data	Data
	<i>CERES</i>
Management	cultivar parameters planting date plant population fertilizing and irrigation dates rooting depth (cm)
Climate	Longitude and latitude daily global radiation (MJ.m^{-2}) daily maximum and minimum air temperatures ($^{\circ}\text{C}$) precipitation (mm.d^{-1})
Soil (by layer)	Initial soil water content ($\text{cm}^3.\text{cm}^{-3}$) 0.33 and 15 bar soil water content soil texture and <u>cation exchange capacity</u>

CERES model „EFFECTIVELY NEEDED“ DATA:

- Daily weather : TMAX, TMIN, SRAD, RAIN
 - Soil data:
 - General: slope, runoff, percolation;
 - Layer specific: wilting point, field capacity, carbon content, NO_3 and NH_4 estimates per layer, rooting density
 - previous crop
 - N fertilization (date, type, amount)
 - tillage and ploughing (date, depth)
 - sowing (date, number of seeds)
 - harvest (date)
 - **Meta data**
- sowing (date, number of seeds)
 - emergence (date, number of plants)
 - heading or anthesis(date)
 - maturity (date)
 - harvest date
 - yield (kg/ha) – at 14%
 - number of productive tillers
 - WTS
 - Grains per ear
 - Optional: LAI, soil water content, above ground biomass

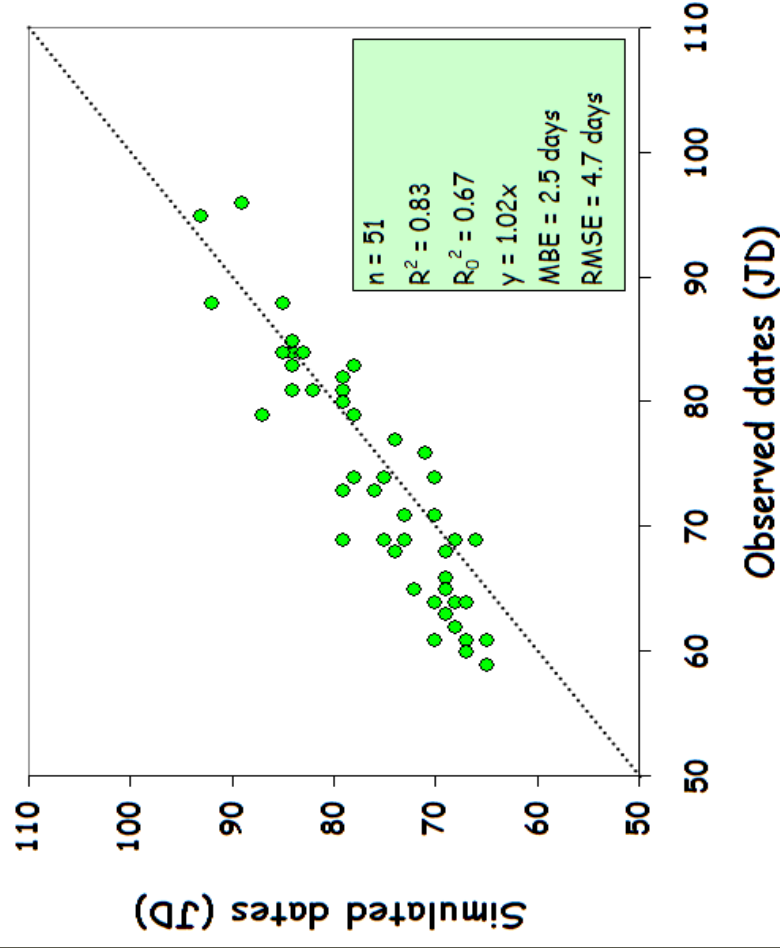
Crop growth model - CERES-Barley

- spring barley

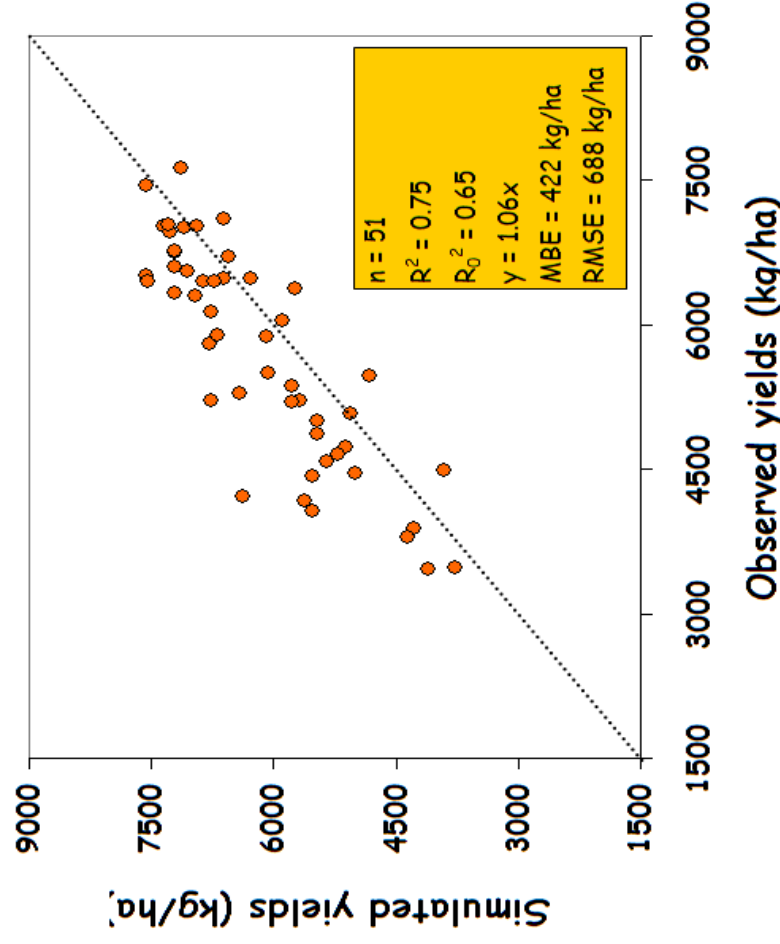


Calibration - 4 sites

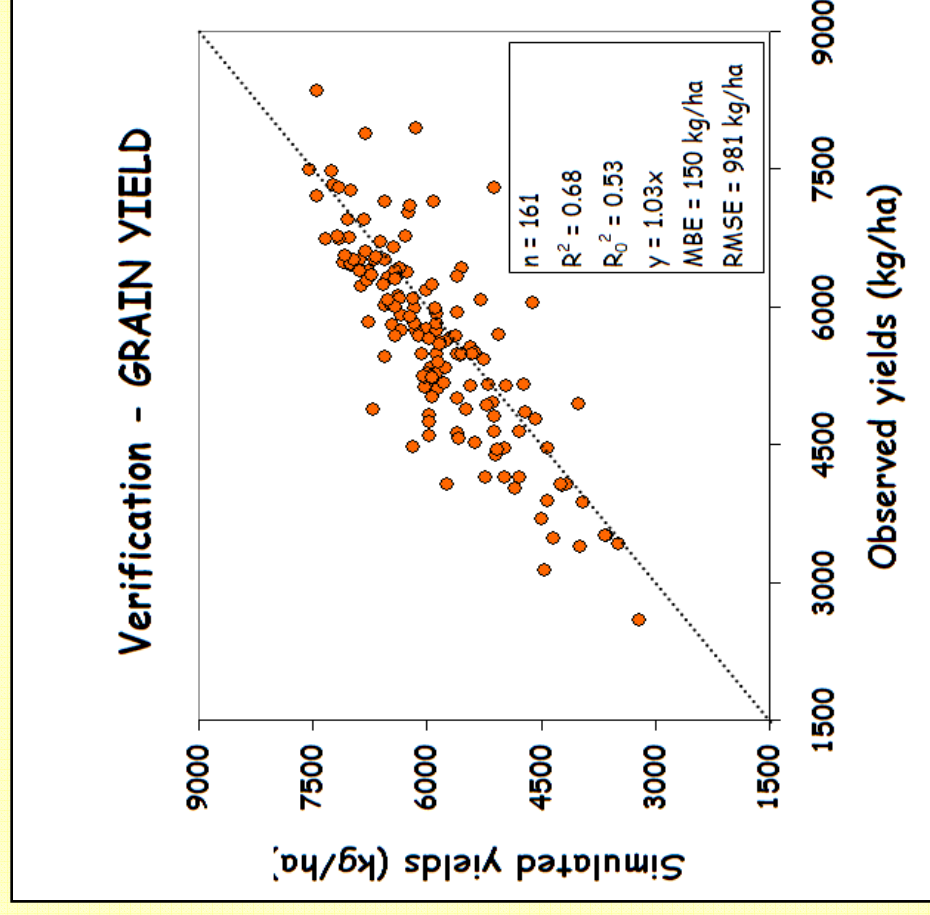
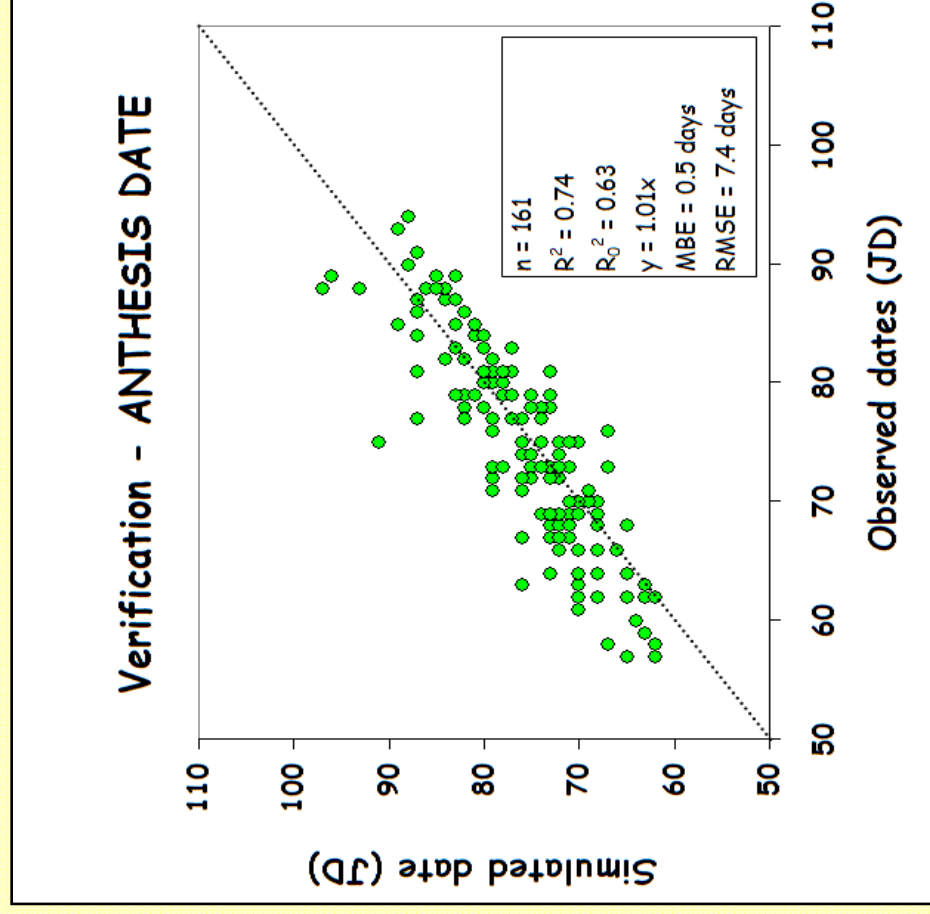
Calibration - ANTHESIS DATE



Calibration - GRAIN YIELD

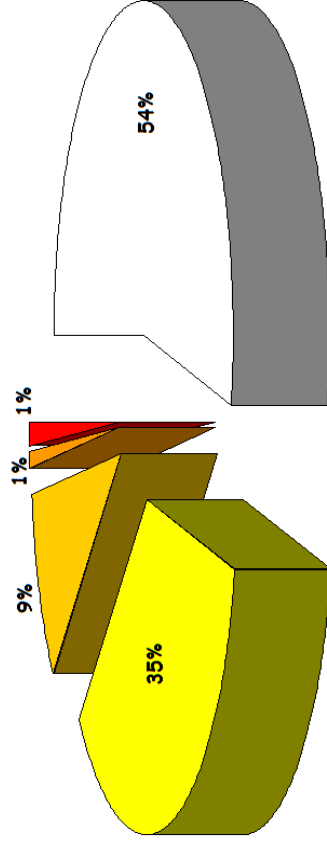


Verification 15 sites

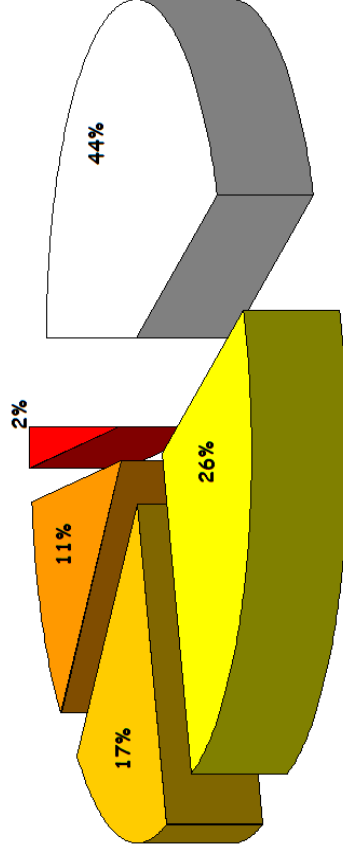


Complete evaluation results

Deviation in the date of ANTHESIS



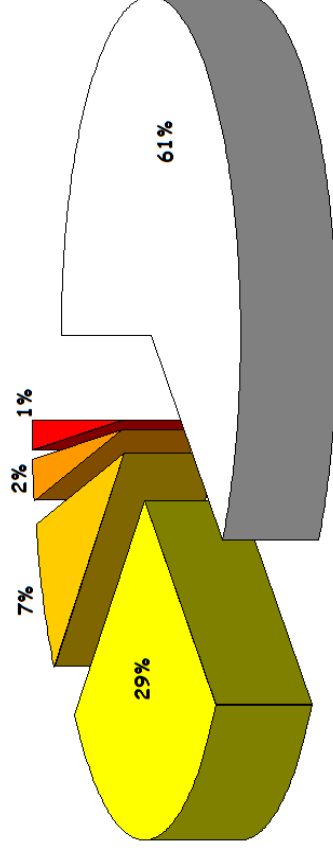
Deviation in the date of MATURITY



□ 0-3 days ■ 4-6 days ■ 7-9 days

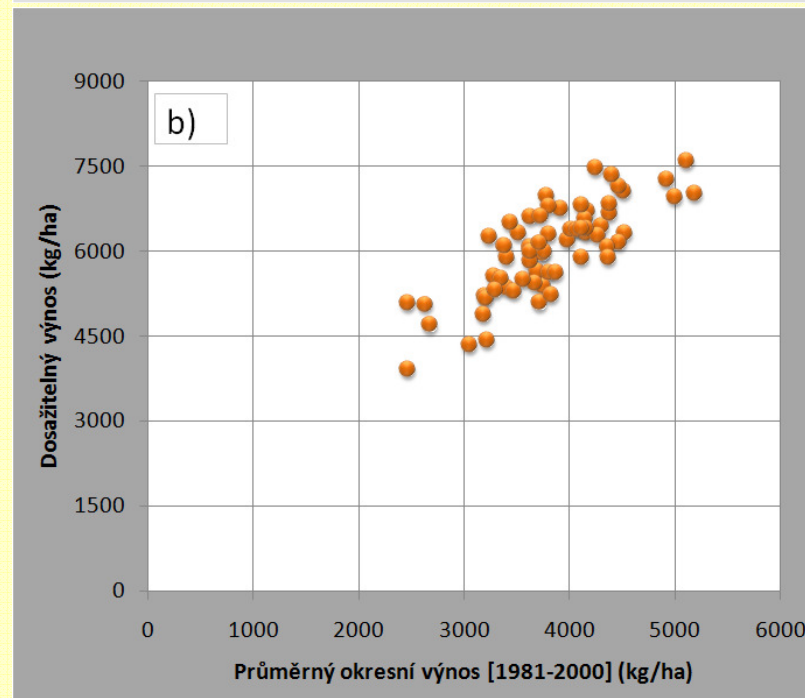
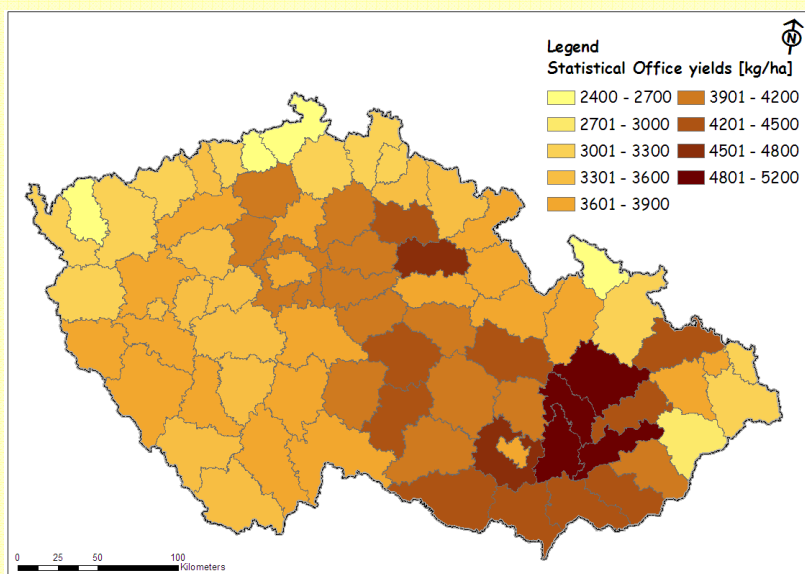
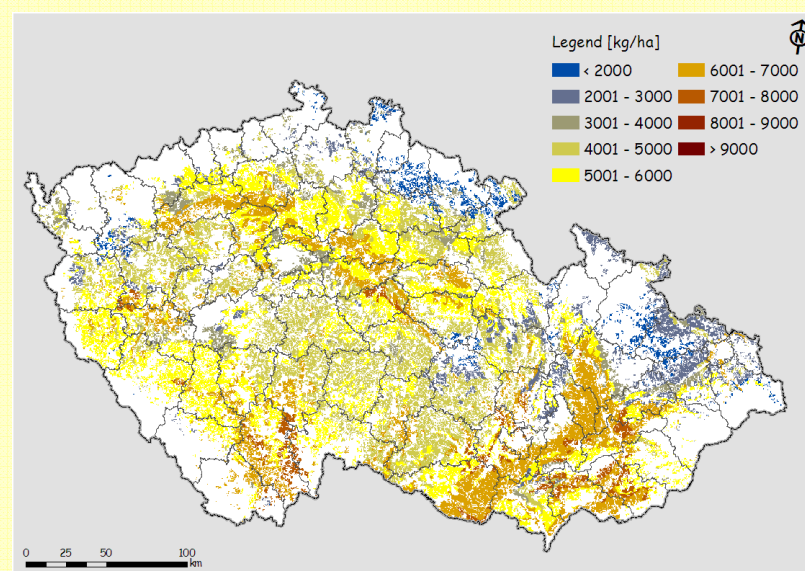
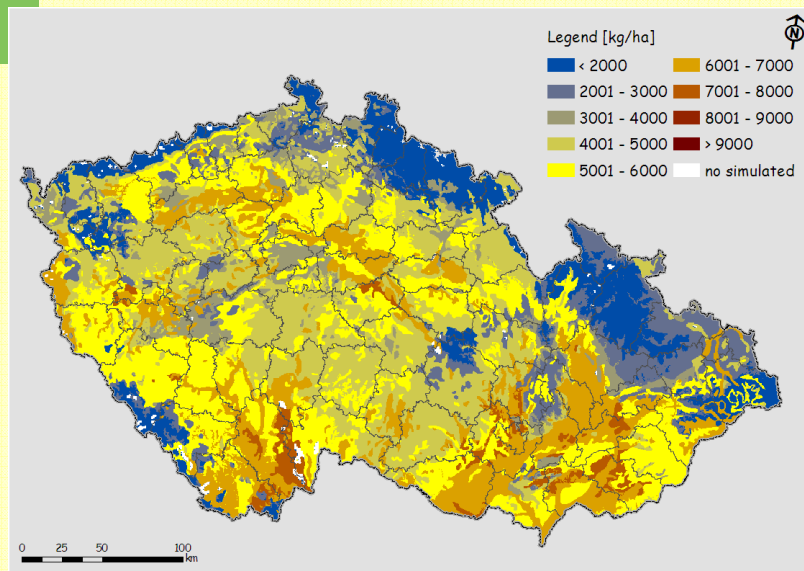
■ 10-12 days ■ > 13 days

Deviation of the GRAIN YIELD

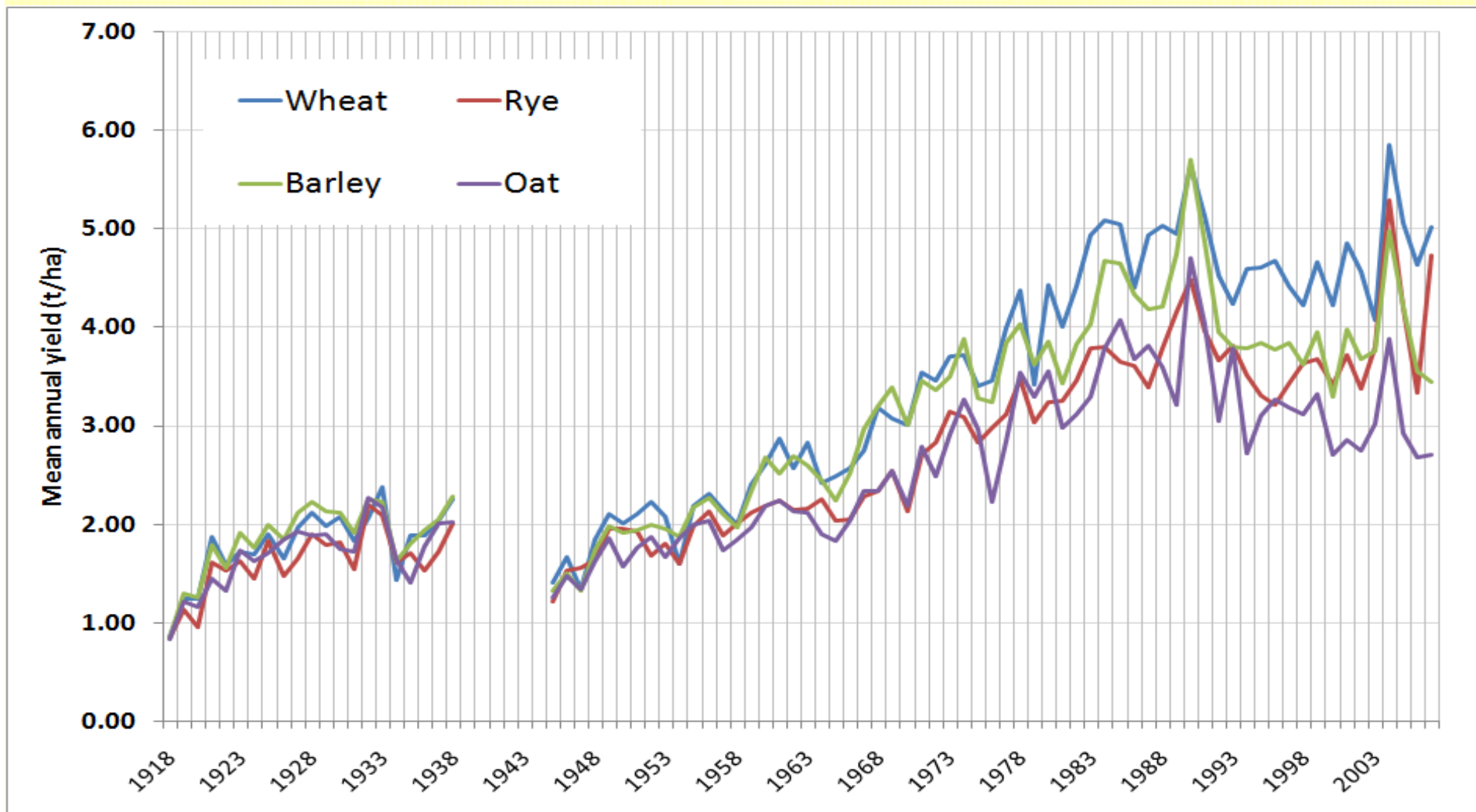


□ 0-10% ■ 10-20% ■ 20-30% ■ 30-40% ■ > 40%

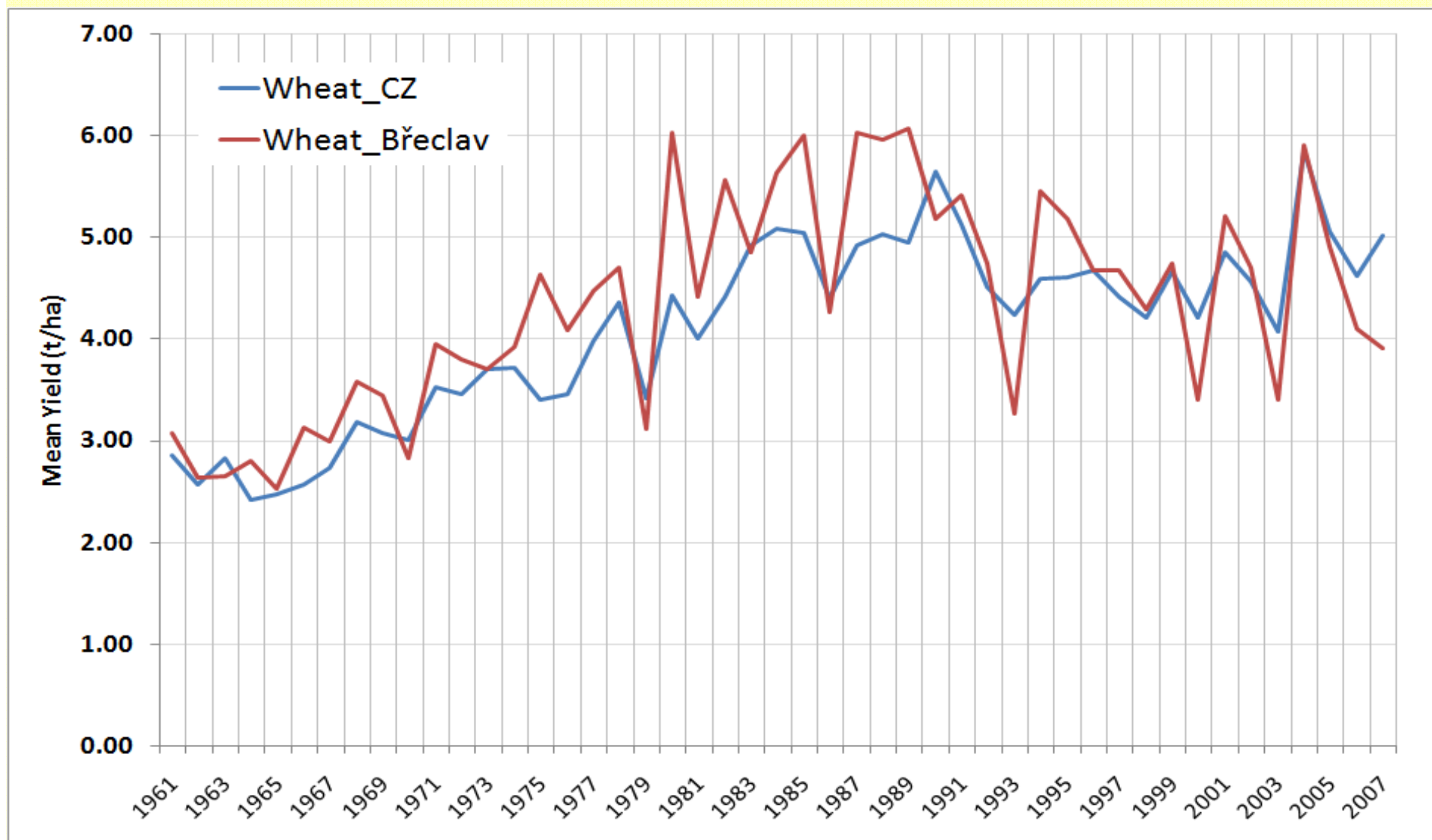
How good is CERES model?



Crop yields in past 79 years



Winter wheat yields in past 48 years



Spring barley yields in past 48 years

