



WP4: Model evaluation

Task T4.1: Model testing against historical data

Model: Wofost

Cropping system: one-year rotation of durum wheat cultivated at Foggia (Southern Italy)

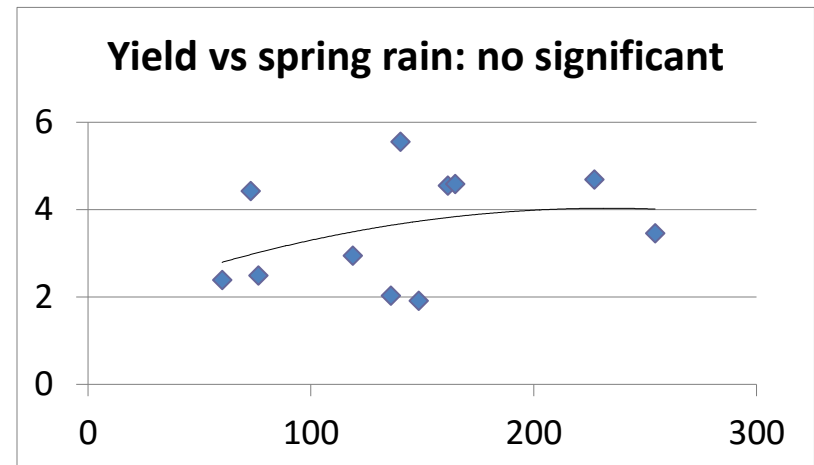
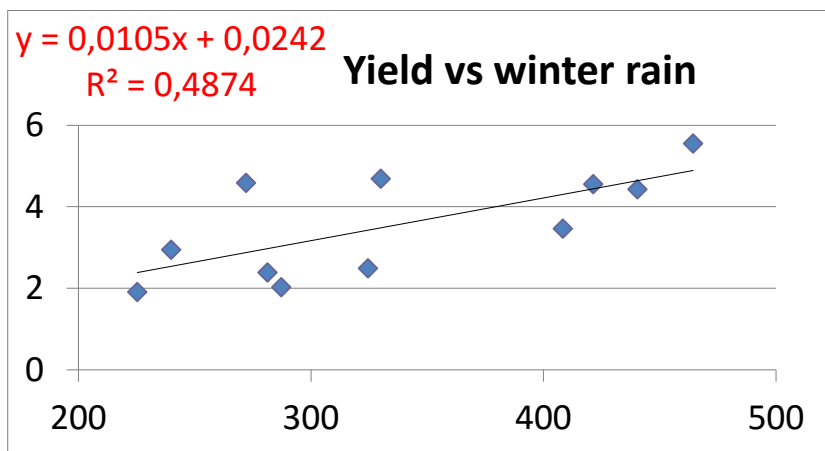
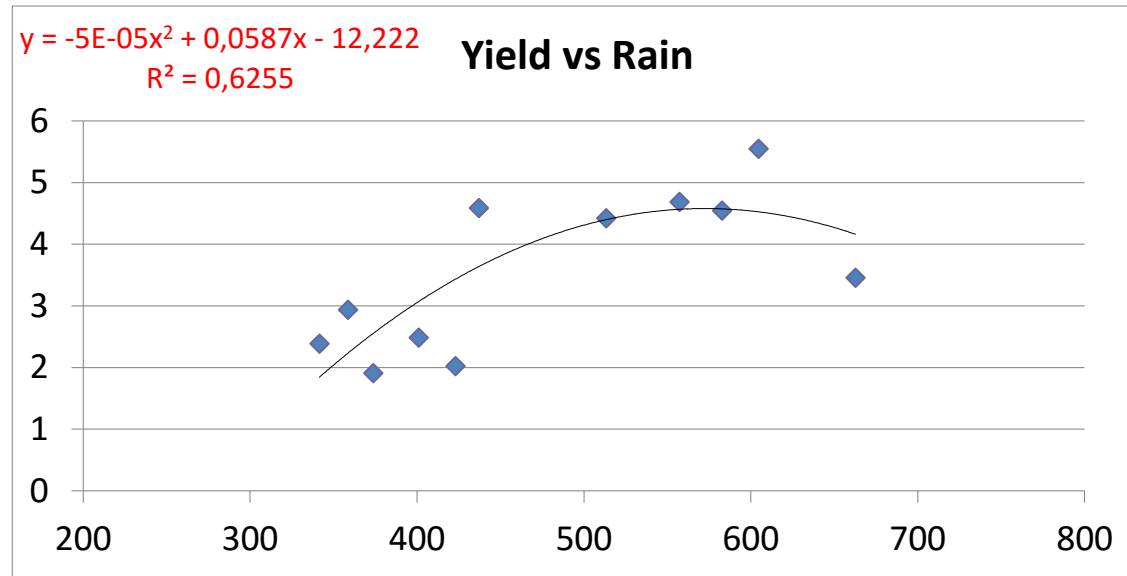
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- **Data set:** based on Long Term Experiment
- **Considered period:** 1996-2013
- **Selected treatment:** monoculture of durum wheat, cv. Simeto, consisting on incorporation of crop residues (CR) and N fertilization = 50 kg ha<sup>-1</sup> of Urea before CR incorporation and 50 kg h<sup>-1</sup> NH<sub>4</sub>NO<sub>3</sub> in spring
- **Location:** Foggia (northern part of Puglia – Southern Italy)
- **Available data:** daily meteorology, phenology, agronomy

# The rain (mm) and soil water availability as important limiting factor on wheat yield (t ha<sup>-1</sup>) in Southern Italy



Calibration of Wofost and Wofost-Modextreme for durum  
wheat in Southern Italy:

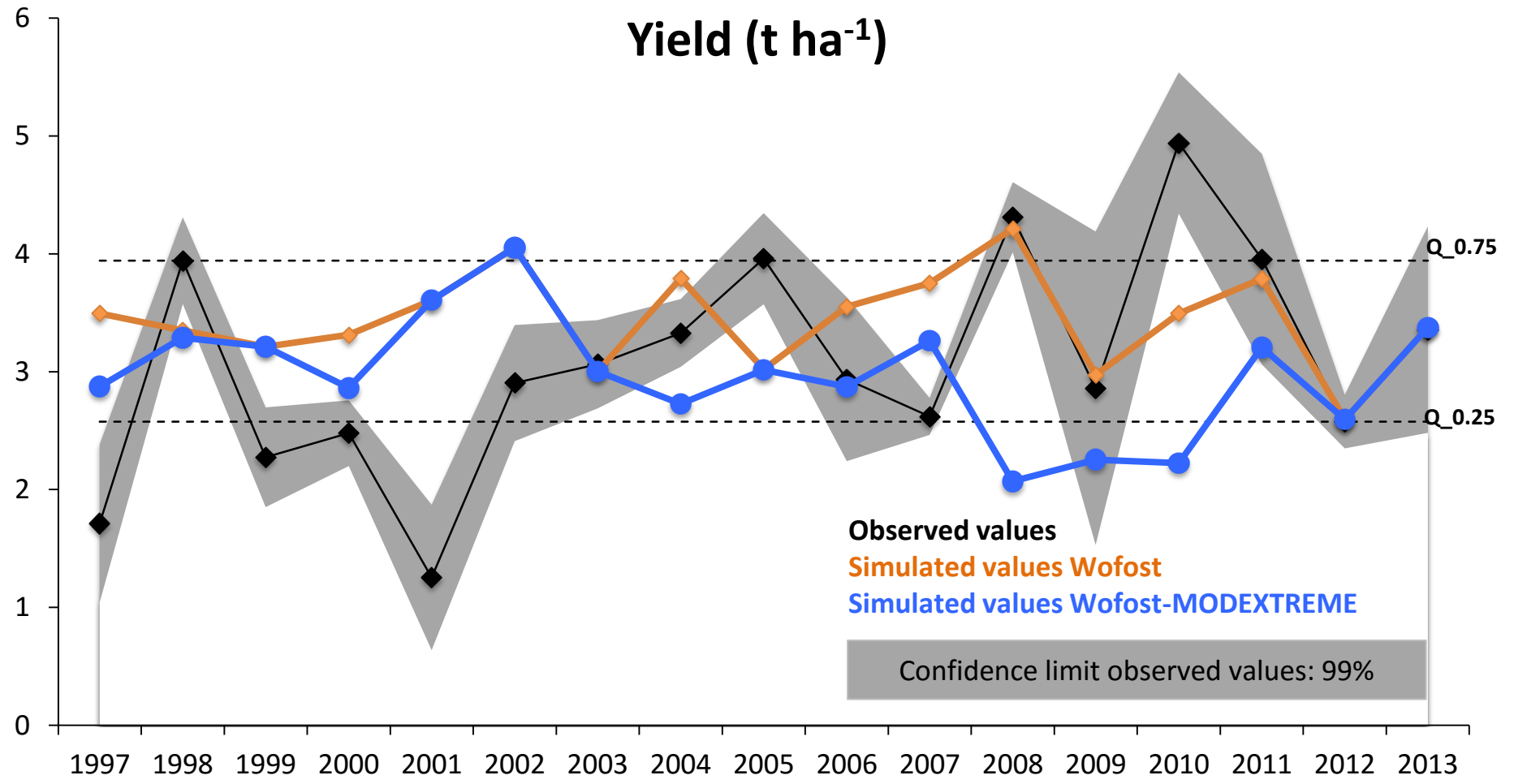
1) Phenology

2) Wofost growth parameters: Yield and Biomass

3) Wofost-Modextreme growth parameters: Yield and  
Biomass

4) Re-calibration of Wofost parameters

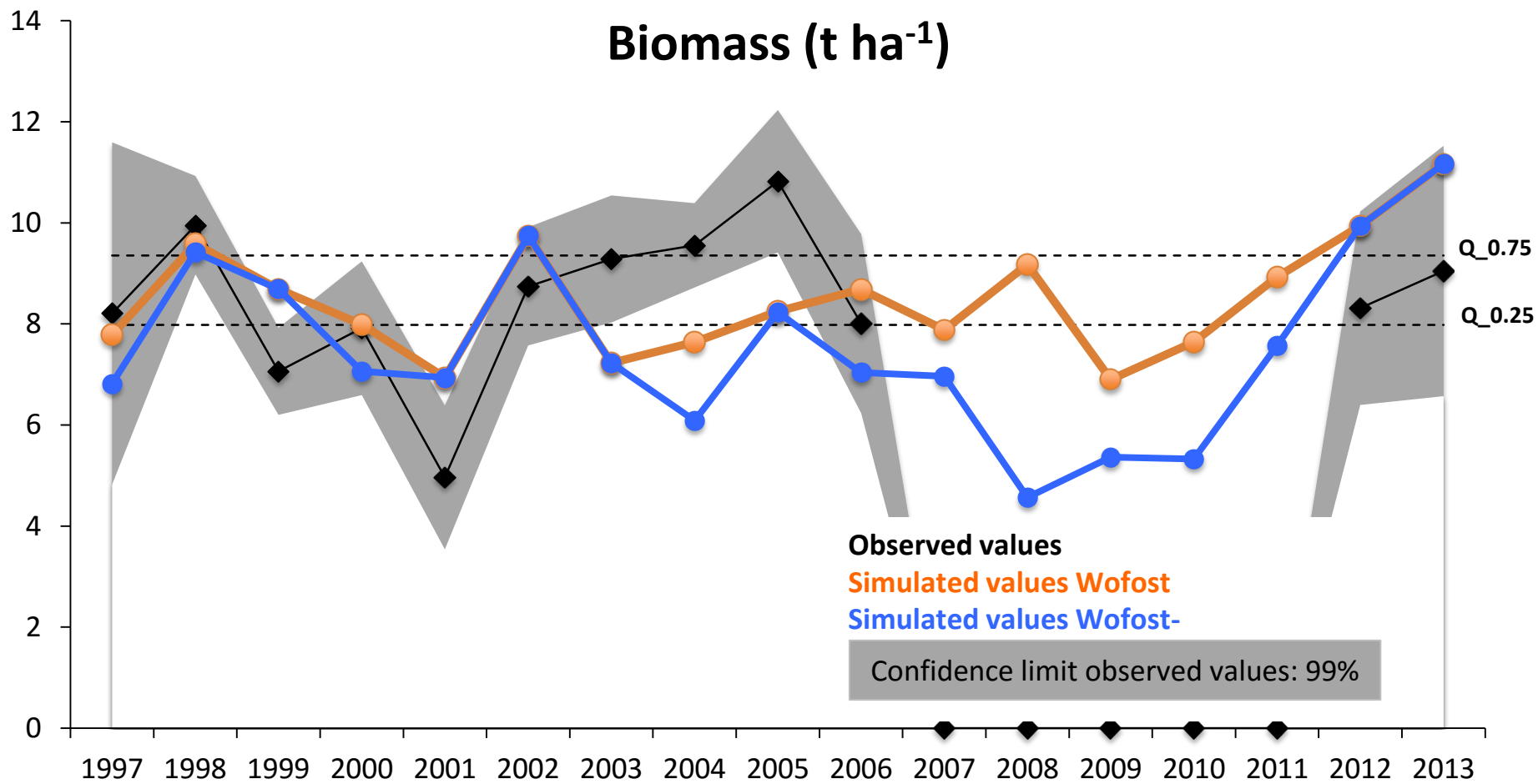
# Yield (t ha<sup>-1</sup>)

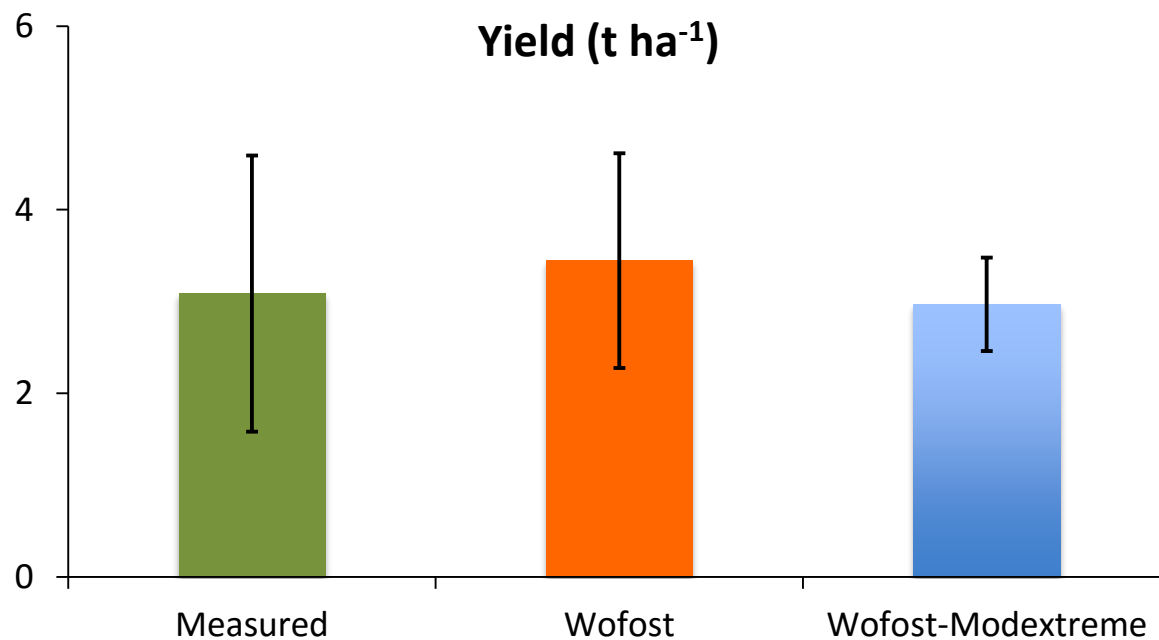


**Observed values**  
**Simulated values Wofost**  
**Simulated values Wofost-MODEXTREME**

Confidence limit observed values: 99%

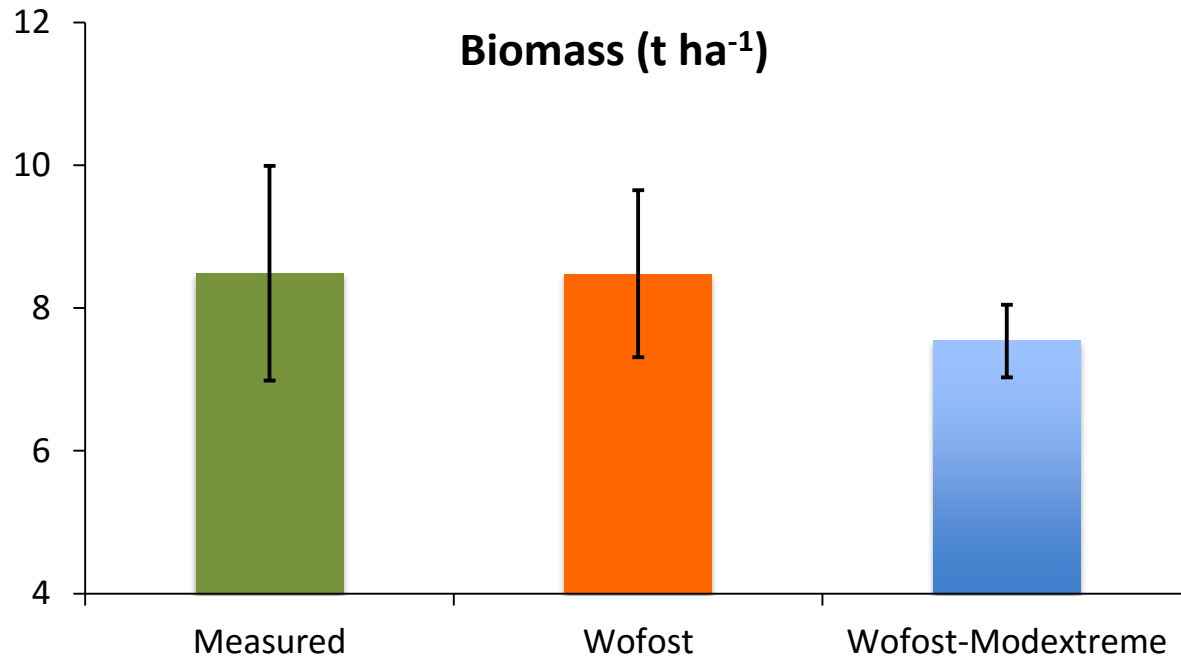
Q<sub>0.75</sub>  
Q<sub>0.25</sub>





**YIELD (t ha<sup>-1</sup>)**

Indicator	Wofost	Wofost-Modextreme
Mean error (%)	-11.66	3.75
RMSE	0.40	0.49
EF	-0.19	-0.74
Pearson	0.18	-0.40
Index agreement	0.45	0.17



**BIOMASS (t ha<sup>-1</sup>)**

Indicator	Wofost	Wofost.modextreme
Mean Error (%)	0.10	11.20
RMSE	0.23	0.27
EF	-0.21	-0.67
Pearson	0.30	0.23
Index agreement	0.56	0.51



Wofost calibrated parameters of durum wheat – Foggia\_1. In bold the parameters as suggested by Roberto Confalonieri et al.

Parameter	Key	Default	Calibrated
KDIFTB	-	0.5	0.6
<b>EFFTB</b>	-	1	0.45
TDWI		50	210
<b>AMAXTB</b>	0	35.83	35.83
	1	35.83	40
	1.3	35.83	36.5
	2	4.48	4.48
MPFTB	0	0.01	0.01
	10	0.6	-
	15	1	0.6
	25	1	1
	30	-	1
	35	0	0.1
	40	0	0
TMNFTB	0	0	0
	3	1	1.1
TEFFMX	-	40	30
RGRLAI	-	0.009	0.00817
SPAN	-	50	30
TBASE	-	11	1
TBASEM	-	10	-10

Wofost calibrated parameters of durum wheat – Foggia\_2. In bold the parameters as suggested by Roberto Confalonieri et al.

Parameter	Key	Default	Calibrated
Death Leaves rate ( <b>Water stress</b> )	-	0.01	0.1
TSUMEM	-	0	340
RDM	-	30	125
TSUM EMER-ANTH	-	1200	1300
TSUM ANTH-MAT	-	970	800
CVR	-	0.754	0.694
CVL	-	0.754	0.4
<b>CVS</b>	-	0.754	0.4
CVO	-	0.648	0.35
RMR	-	0.01	0.015
RML	-	0.02	0.08
RMO	-	0.003	0.005
<b>FOTB</b>	0.95	0	0.1

# Wofost-Modxtreme calibrated parameters of durum wheat: harvest index modulation

Parameter	Default	Calibrated
Lower Critical Temperature Harvest Index Pollination	20	30
No-Damage Temperature Harvest Index Pollination	20	30
Critical Temperature Harvest Index Flowering	-4	-3
No-Damage Temperature Harvest Index Flowering	-1	0
Critical Temperature Harvest Index Ripening	-6	-1
No-Damage Temperature Harvest Index Ripening	-2	0
No-Damage Temperature Heat Harvest Index Reproductive	30	20
Critical Temperature Heat Harvest Index Reproductive	40	35
Critical Fraction Of Transpiration Extreme <b>Water Stress</b>	0.7	0.6

# Wofost-Modxtreme calibrated parameters of durum wheat: LAI modulation

Parameter	Default	Calibrated
Critical Temperature LAI Emergence	-6	-16
No-Damage Temperature LAI Emergence	-2	-10
Critical Temperature LAI Tillering With Hardening	-20	-21
No-Damage Temperature LAI Tillering With Hardening	-15	-18
Critical Temperature LAI Tillering No Hardening	-6	-20
No-Damage Temperature LAI Tillering No-Hardening	-2	-6
Critical Temperature LAI Stem Elongation	-6	-15
No-Damage Temperature LAI Stem Elongation	-2	-5
No-Damage Temperature LAI Flowering	-2	-4
Critical Temperature LAI Ripening	-6	-8
No-Damage Temperature LAI Ripening	-5.5	-6
No-Damage Temperature LAI Emergence To Maturity	-1.5	-2

# Next steps for durum wheat in Southern Italy before 31-12-2015

- Improving the WOFOST/WOFOST-MODEXTREME calibration interacting with Roberto Confalonieri
- Calibration of Cropsyst/CropSyst-Modextreme