University of Thessaly
Department of Agriculture, Crop Production &
Agricultural Environment
Laboratory of Agronomy and Applied Crop Physiology
(UTH) Greece

BioKenaF:
A crop growth simulation model for kenaf

September “27-30” 2006

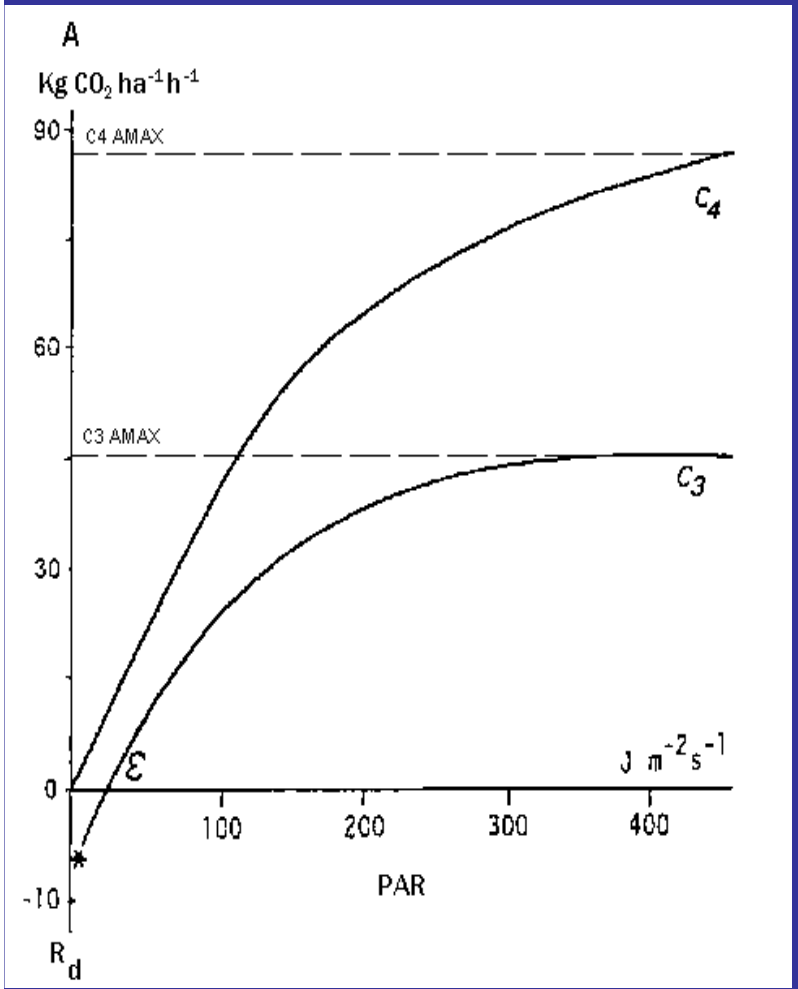
Madrid, Spain

“A Crop Growth Dynamic Simulation Model for Kenaf”

Model structure

- Leaf Photosynthesis
- Canopy Photosynthesis
- Respiration
- Dry Matter distribution
- Water balance routine

Leaf Photosynthesis



The relation between available radiation and CO_2 gross assimilation by a single leaf is described by an asymptotic exponential relation

FG = AMAX * (1 – EXP(– EFF*PAR/AMAX))

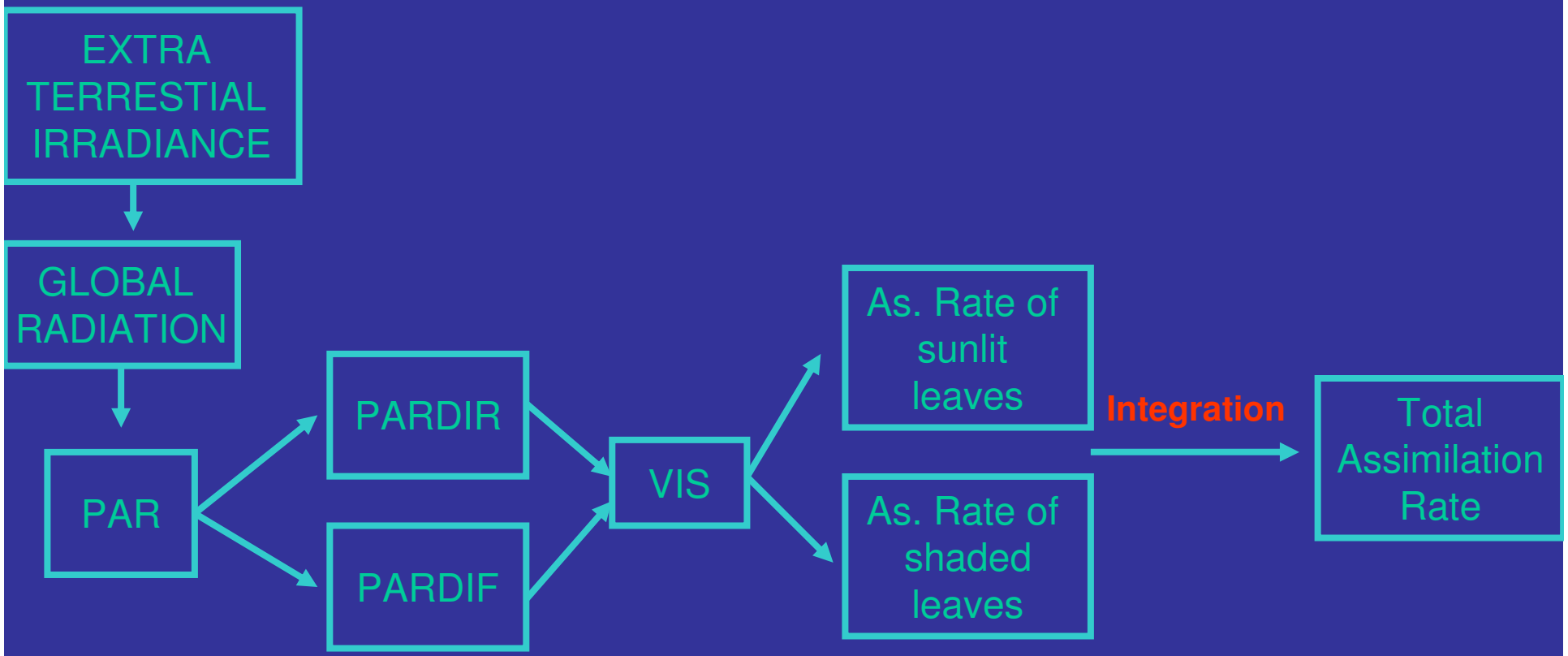
FG: assimilation in kg(CO_2)ha^{-1}(leaf)h^{-1}

PAR: photosynthetically active radiation(J $m^{-2}s^{-1}$)

EFF: is the light use efficiency in
kg $ha^{-1}h^{-1}$/J $m^{-2}s^{-1}$

AMAX: maximum rate of CO_2 assimilation in kg(CO_2)ha^{-1}(leaf)h^{-1}.

Canopy Photosynthesis



Respiration

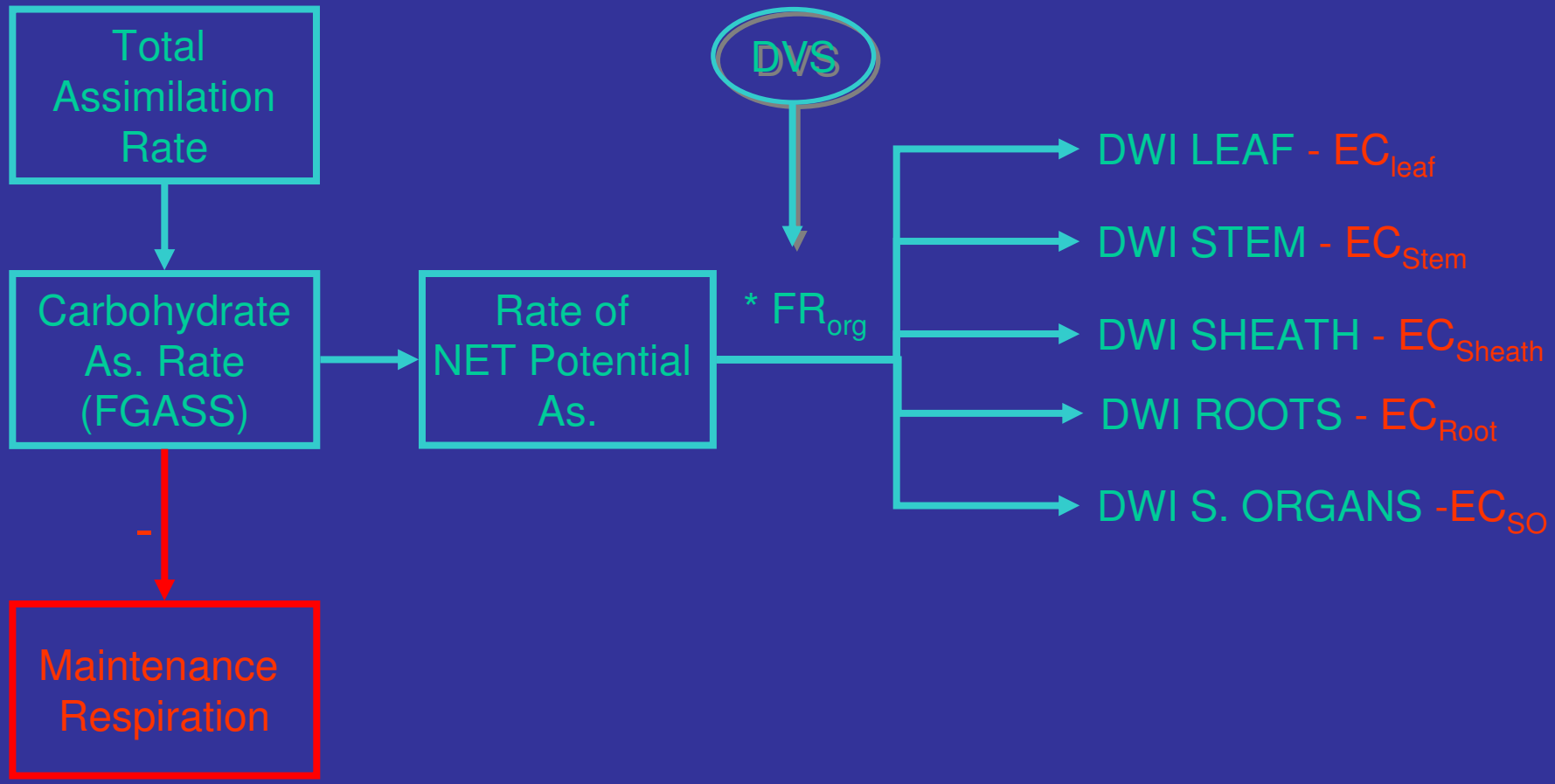
Maintenance respiration (MRR): Energy consumed to meet maintenance requirements.

$$MRR_{org} = R_{org} * S_{org}$$

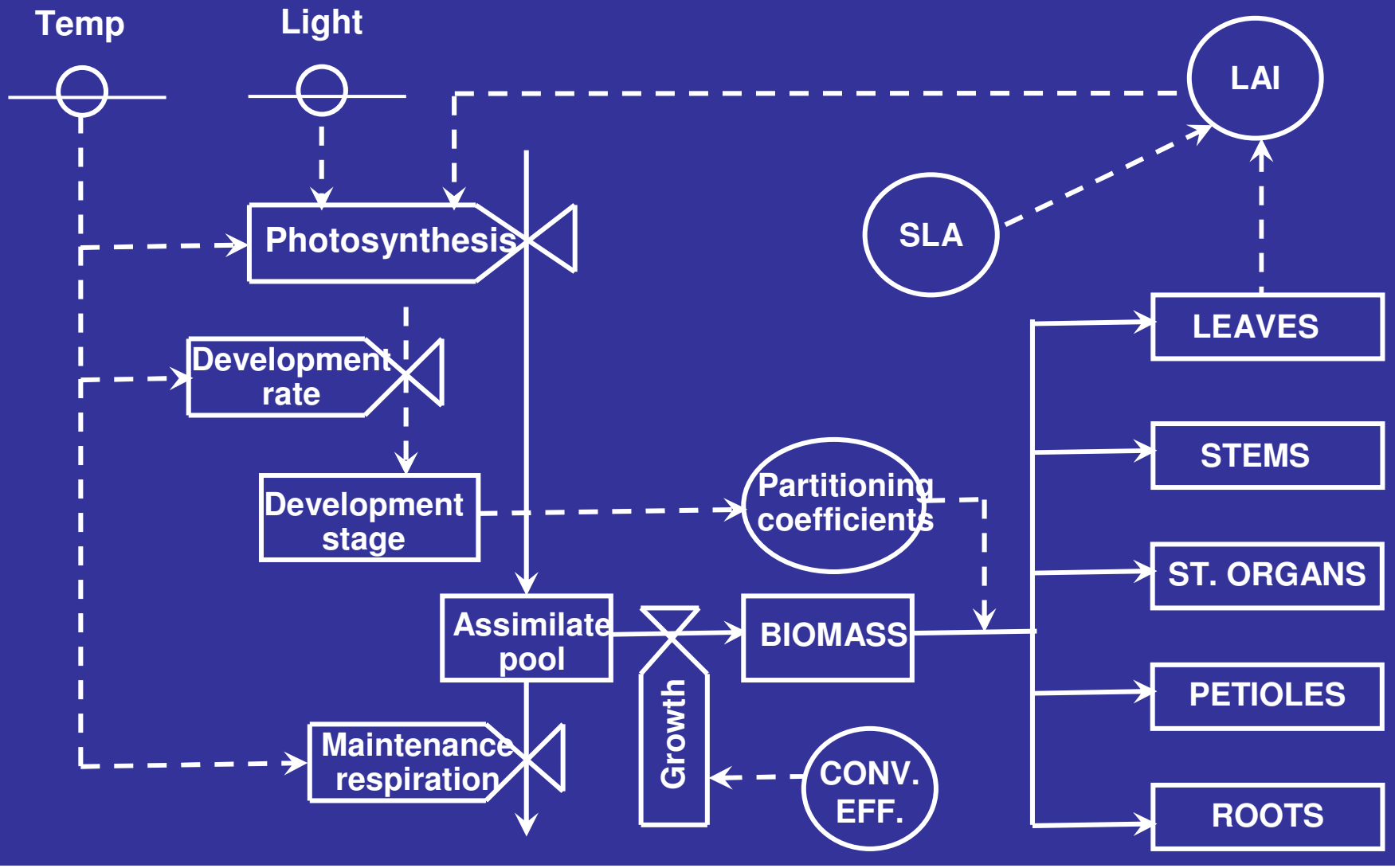
Growth respiration (EC): Respiration providing energy for the conversion of primary photosynthesis into structural plant materials like, proteins, cellulose, fats, lignin.

$$DWI_{org} = DailyGain_{org} * EC$$

Dry matter distribution (Daily basis)



BioKenaF: Relation diagram



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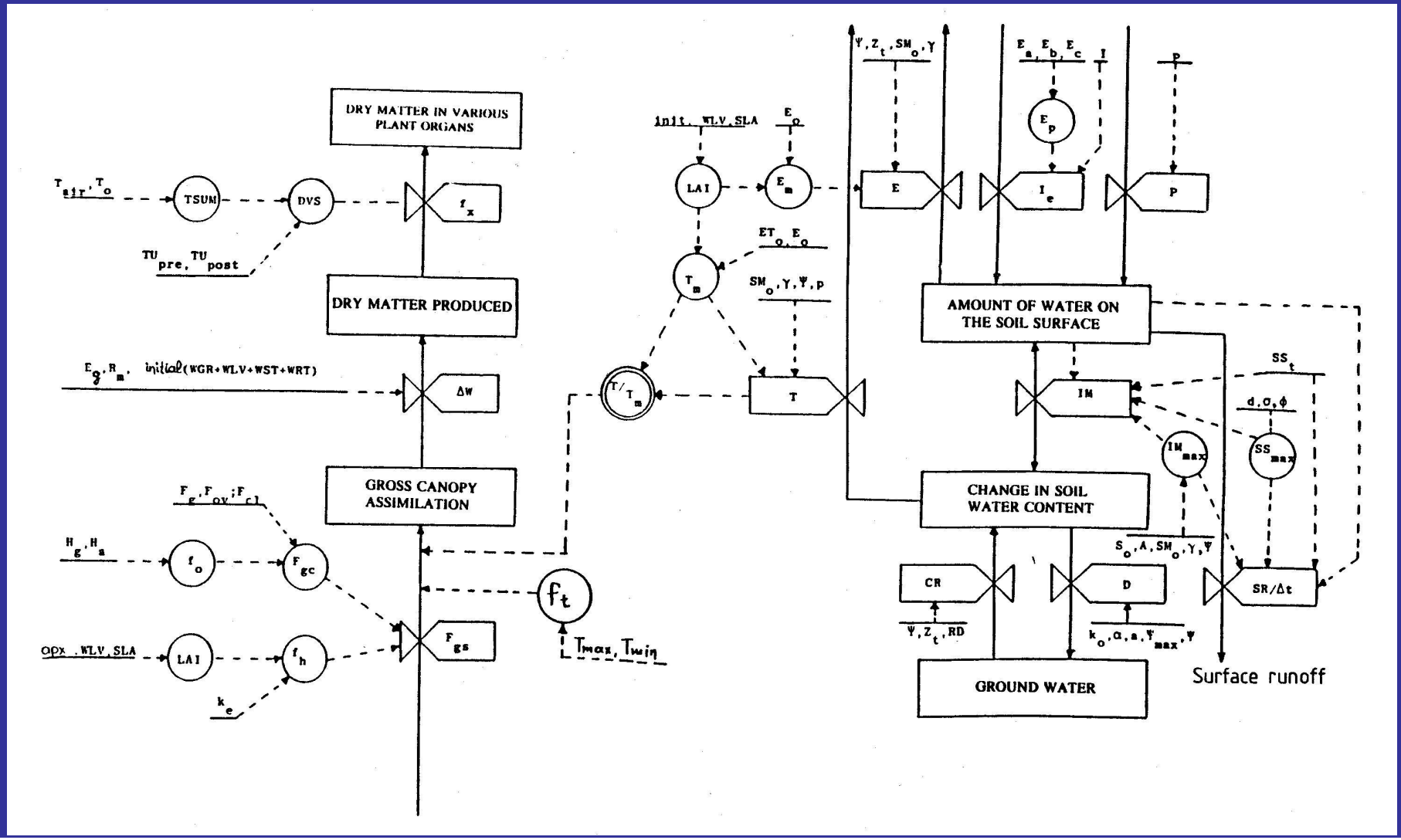
BioKenaF: Relation Diagram



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Application

HARDWARE

- Processor: AMD ATHLON XP 2800+
- Motherboard: Gigabyte 7N400-Pro
- RAM: 1 GB 400 Mhz
- Hard disk: W.Digital 160 GB
- Graphics: GA 6600 GT 128 MB Ram

SOFTWARE

- Microsoft Visual Basic 6
- Microsoft Excel 2000
- Helexis Icon Catcher v3.0
- Microsoft Paint for windows XP

SIMULATION TIME

4 sec

13 sec including exportation to MS Excel

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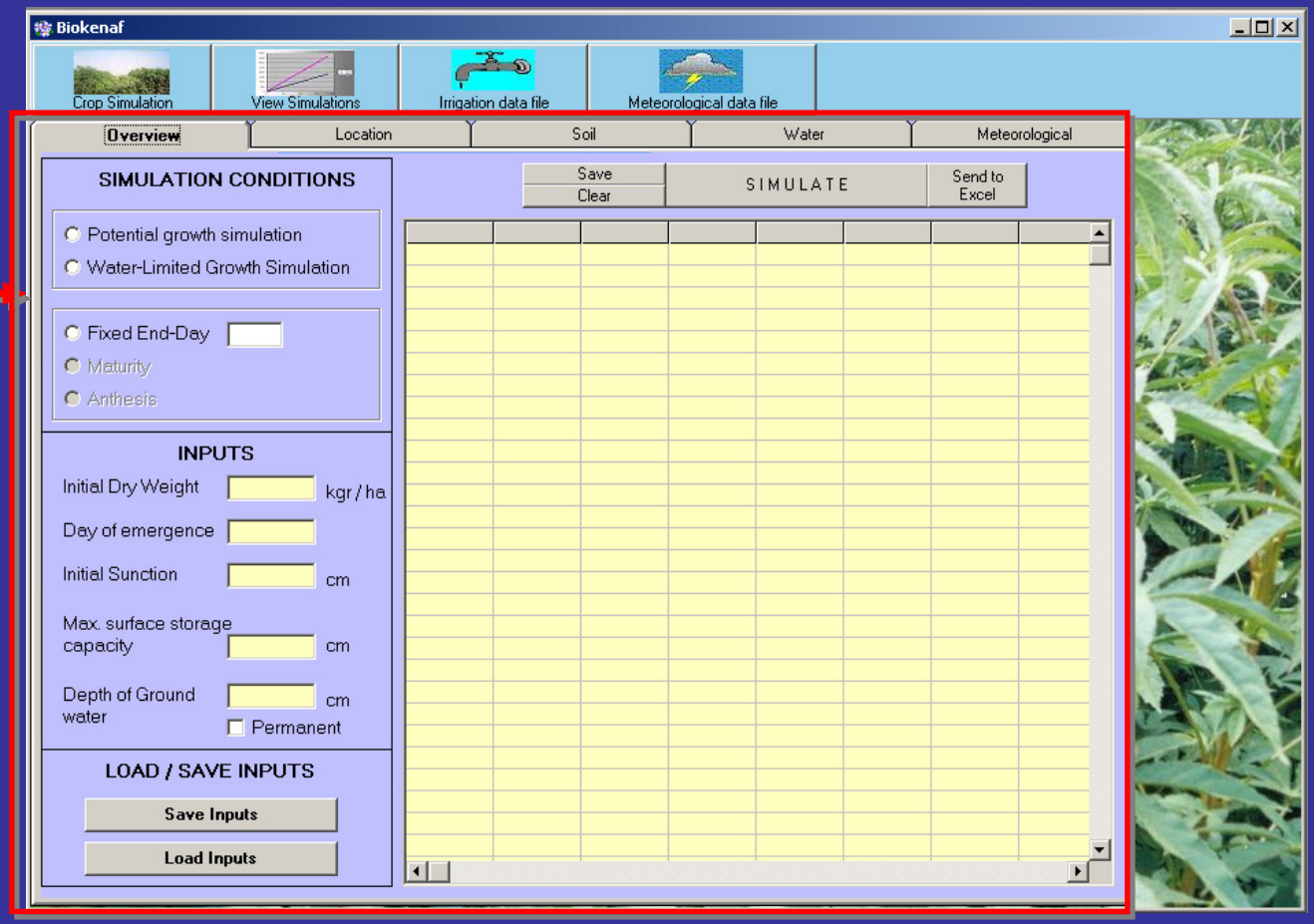
BioKenaF application

Interface

Input Form



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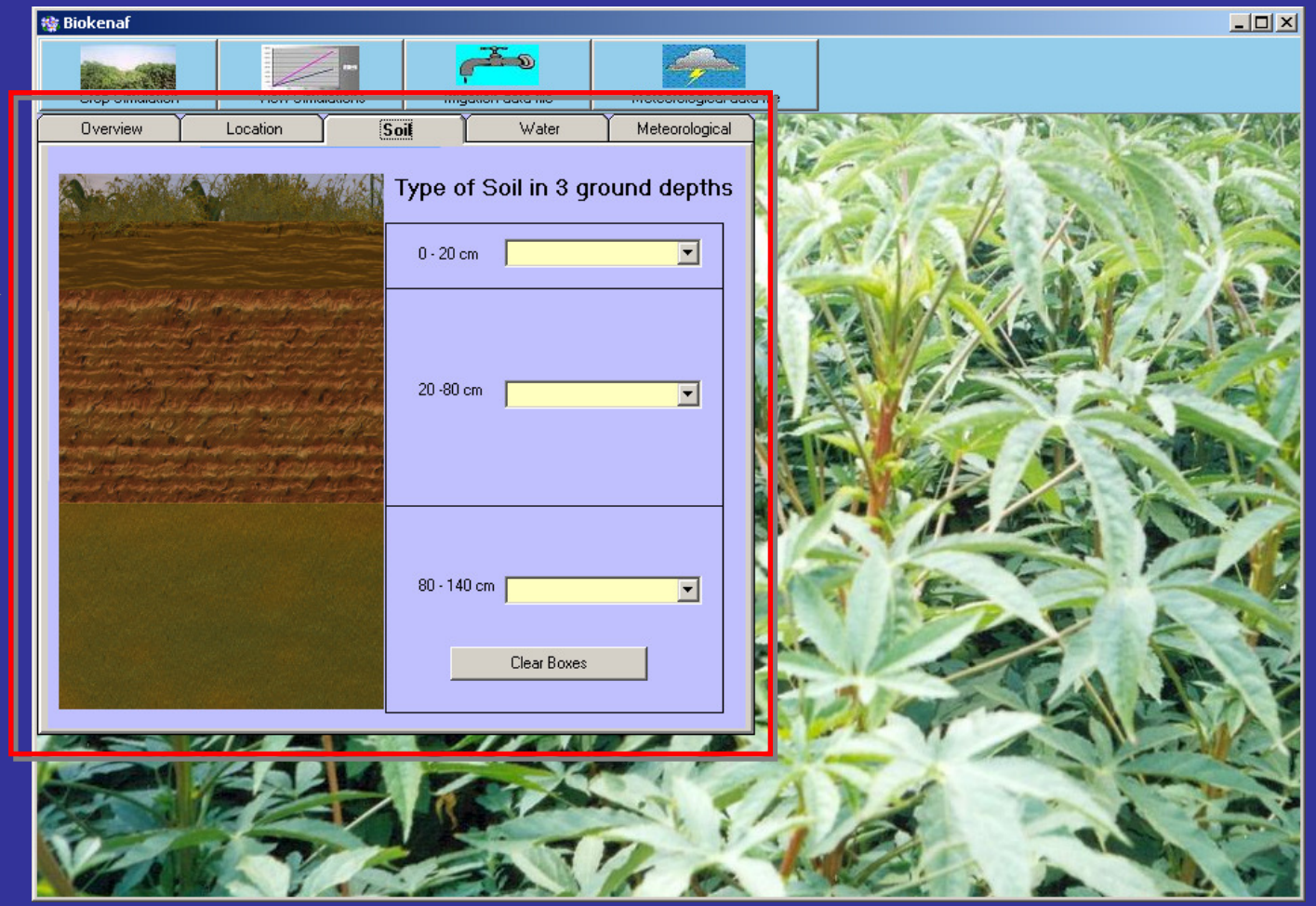
BioKenaF application

Soil Type
Input Form



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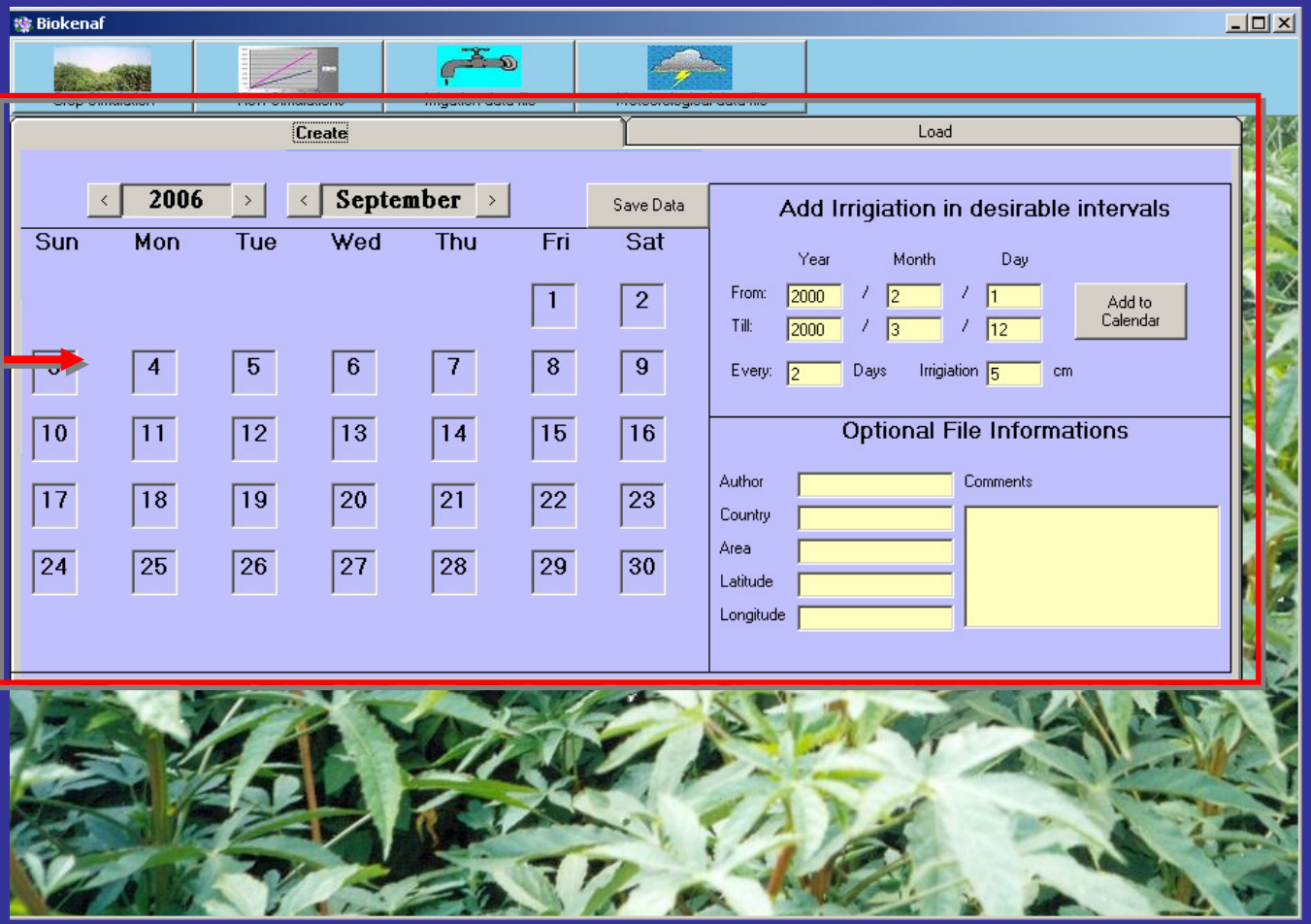
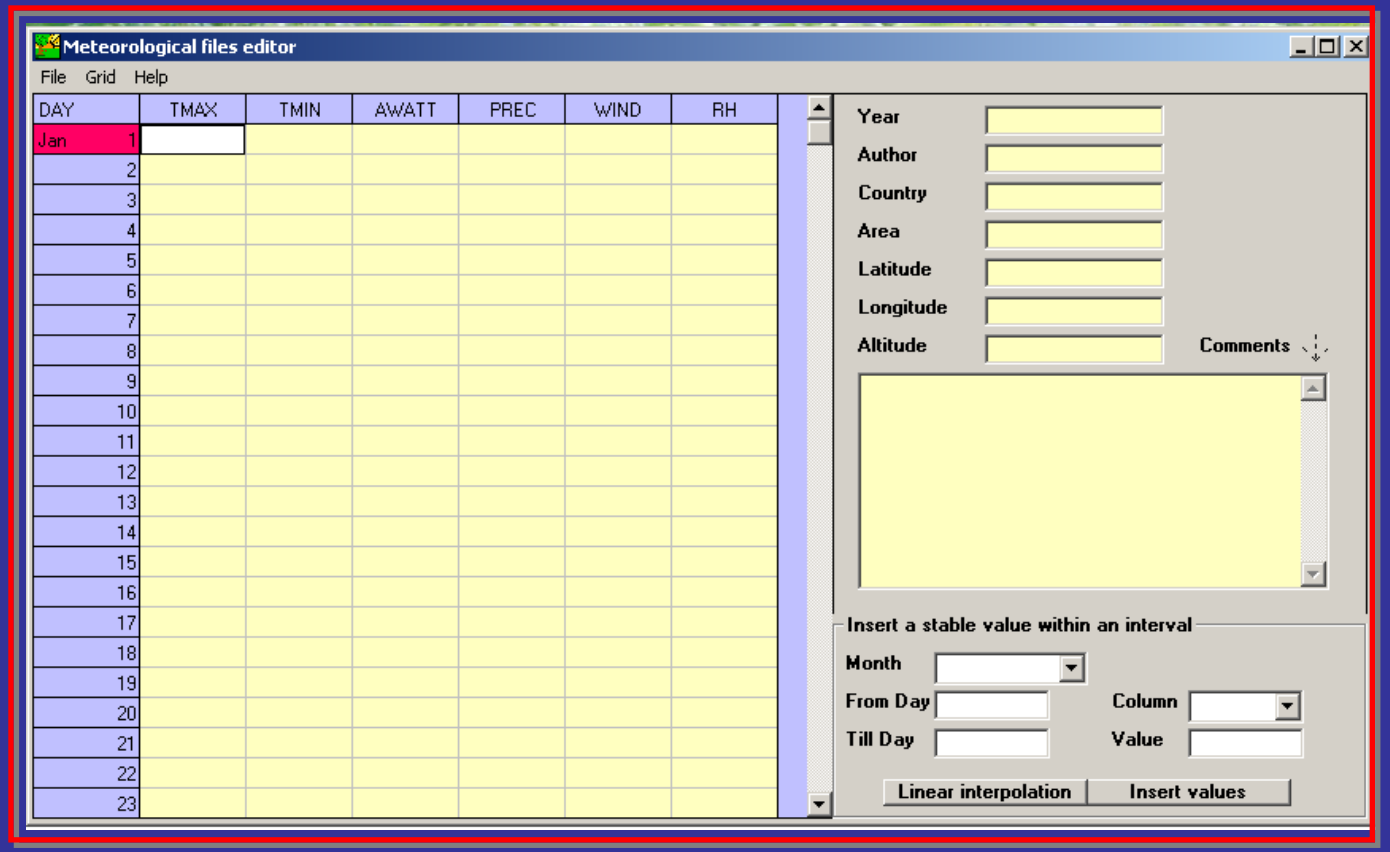
BioKenaF application

Irrigation Data Manager



BioKenaF application

Editor of Meteorological Data Files



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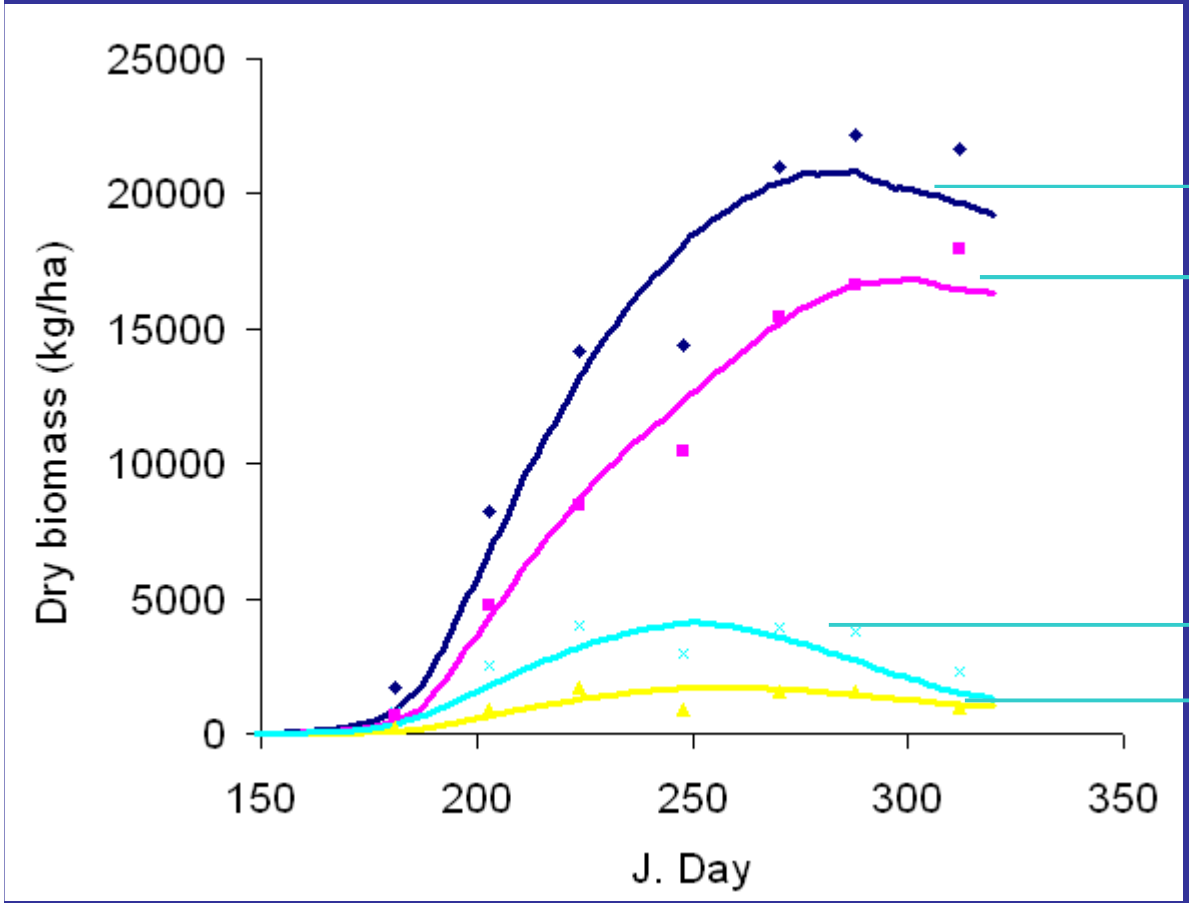
Results



total

stem

leaves

petioles

Palamas- Karditsa (Greece) Year 2003, 100% Irrigation

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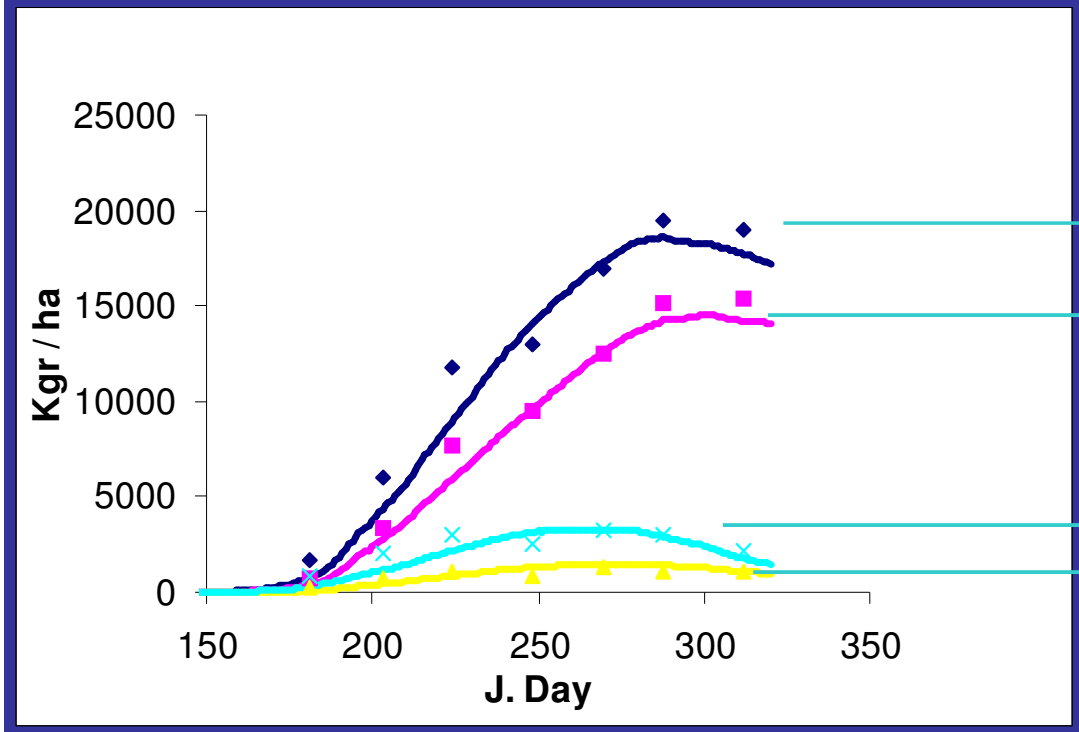
Results



total

stem

leaves

petioles

Palamas- Karditsa (Greece) Year 2003, 50% Irrigation

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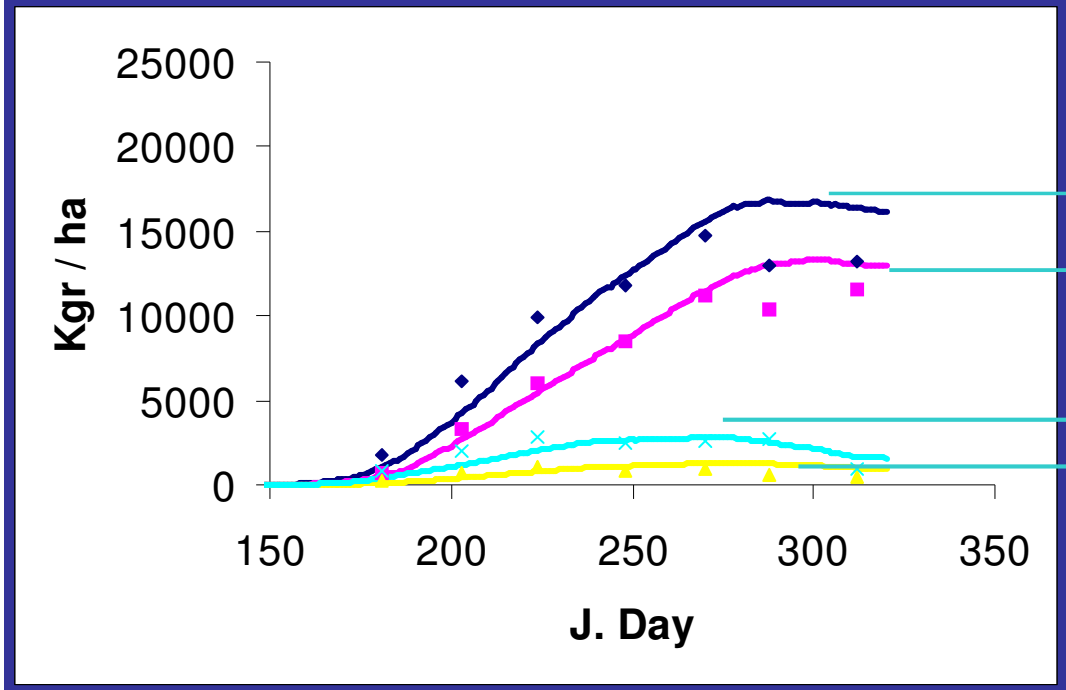
Results



total

stem

leaves

petioles

Palamas- Karditsa (Greece) Year 2003, 25% Irrigation

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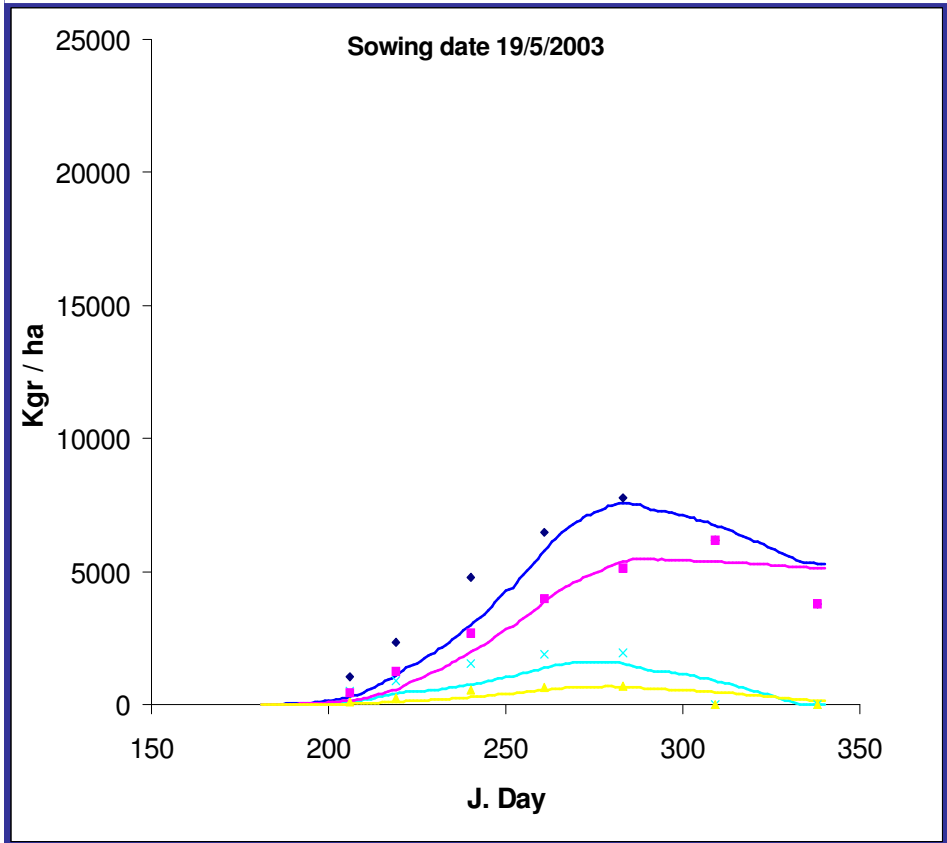
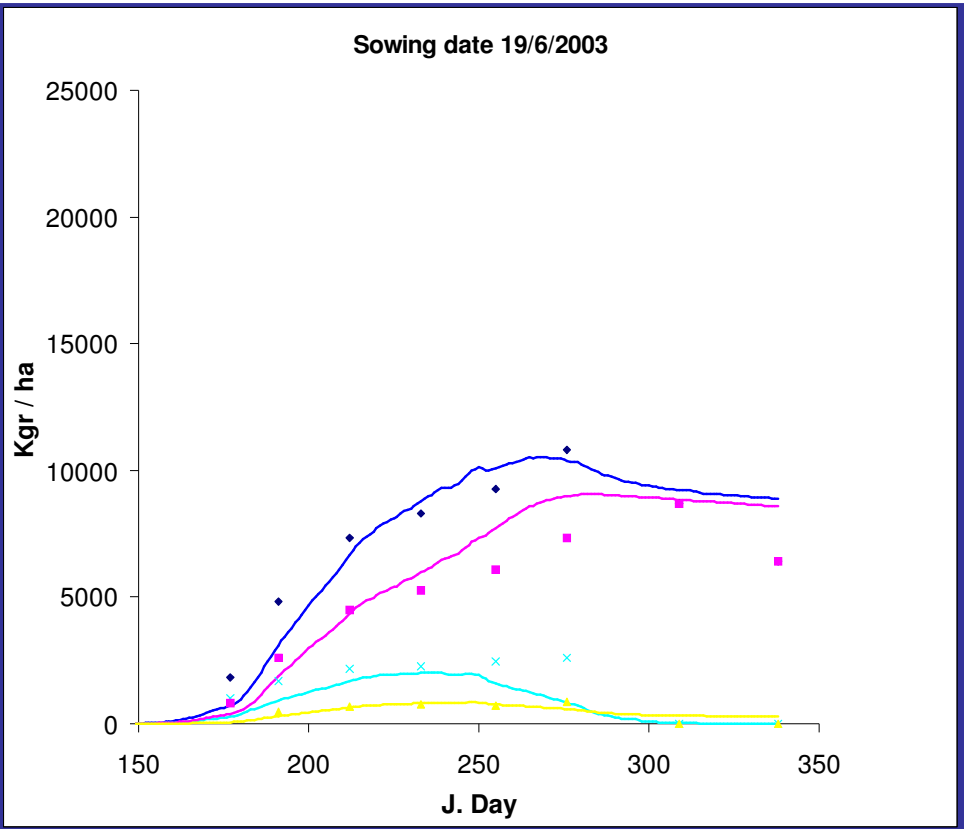
Results





Italy Bolognia Year 2003, potential productivity

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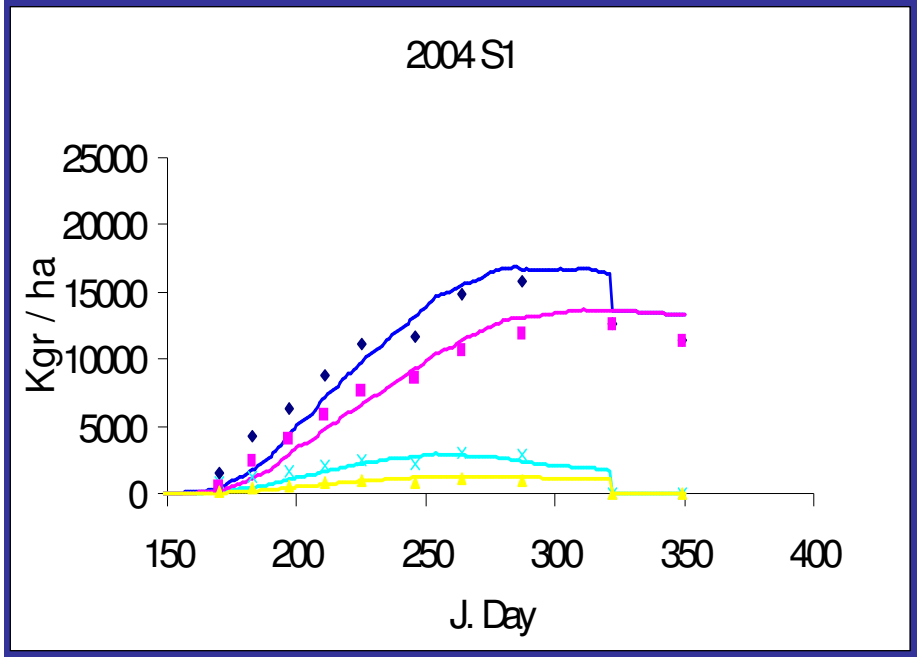
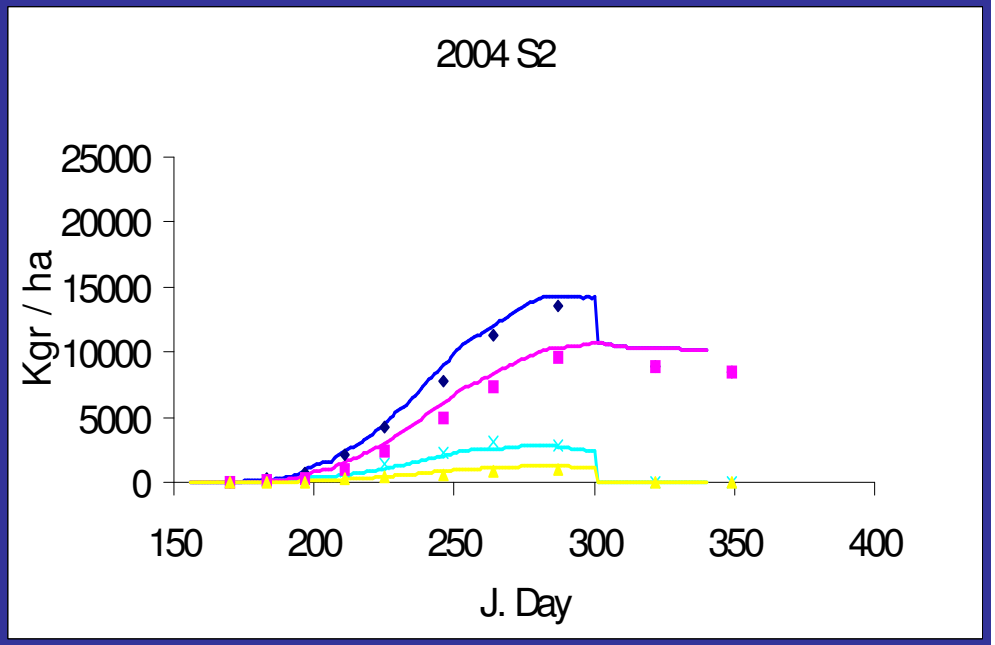
Results





Italy Bolognia Year 2004, potential productivity

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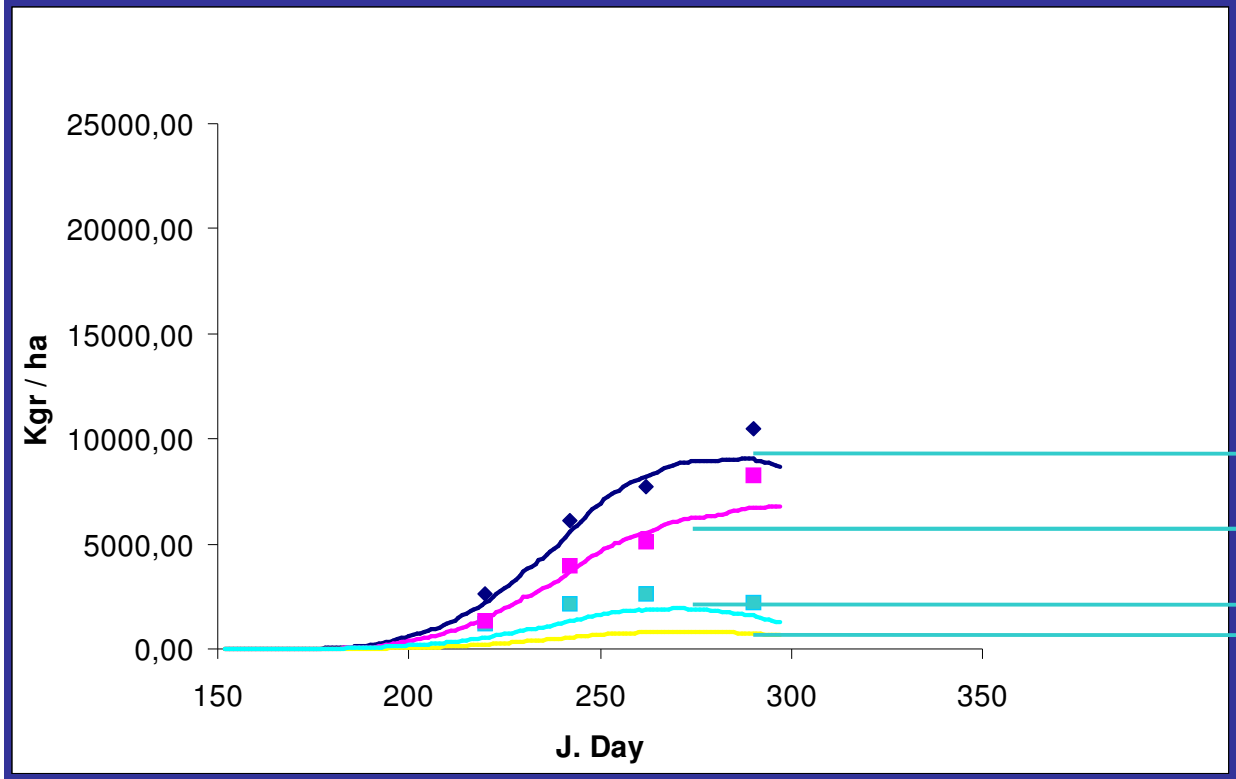
Results



total

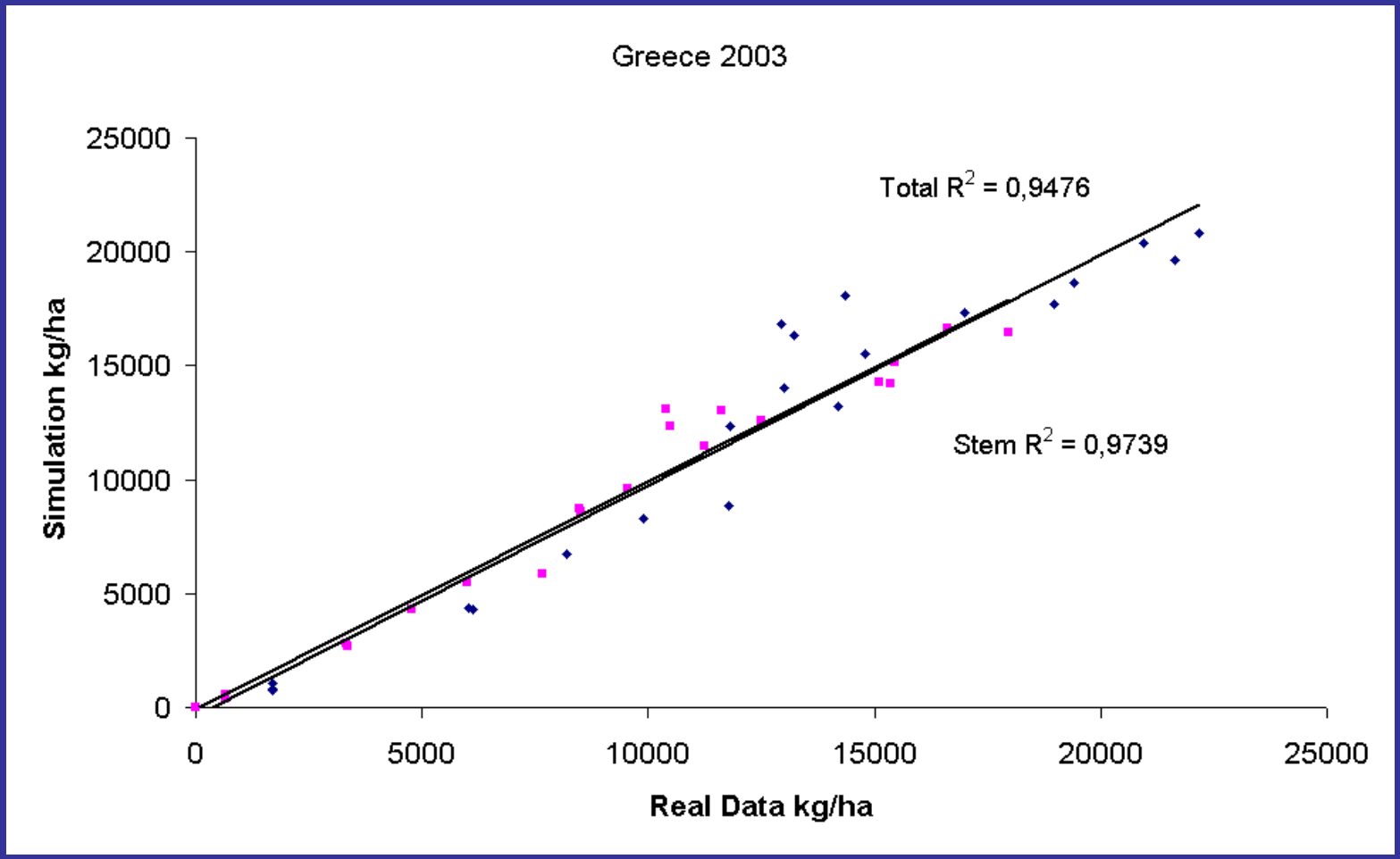
stem

leaves

petioles

France- Nicae Year 2005, potential productivity

Results



Greece Year 2003

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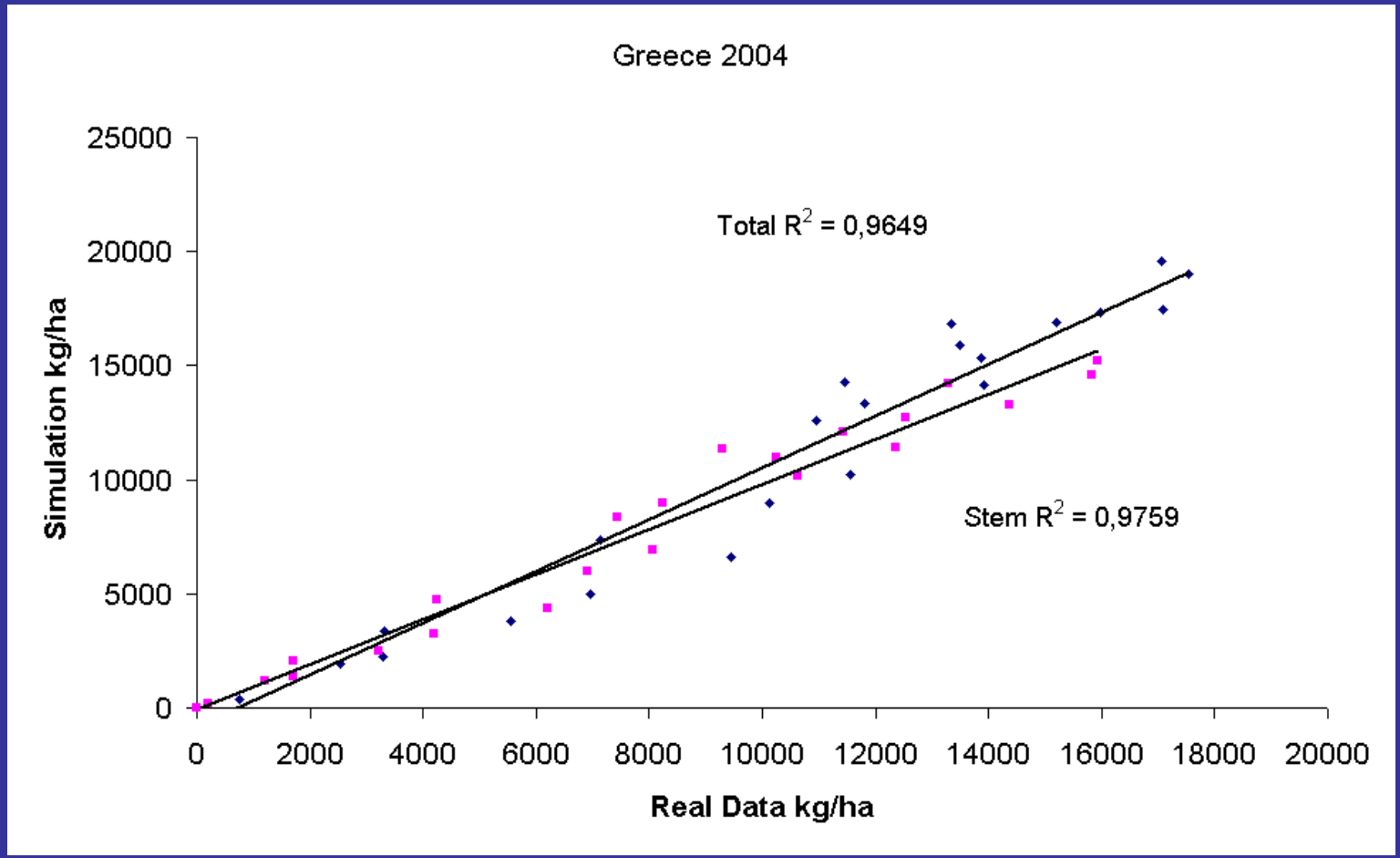
Results



Greece Year 2004

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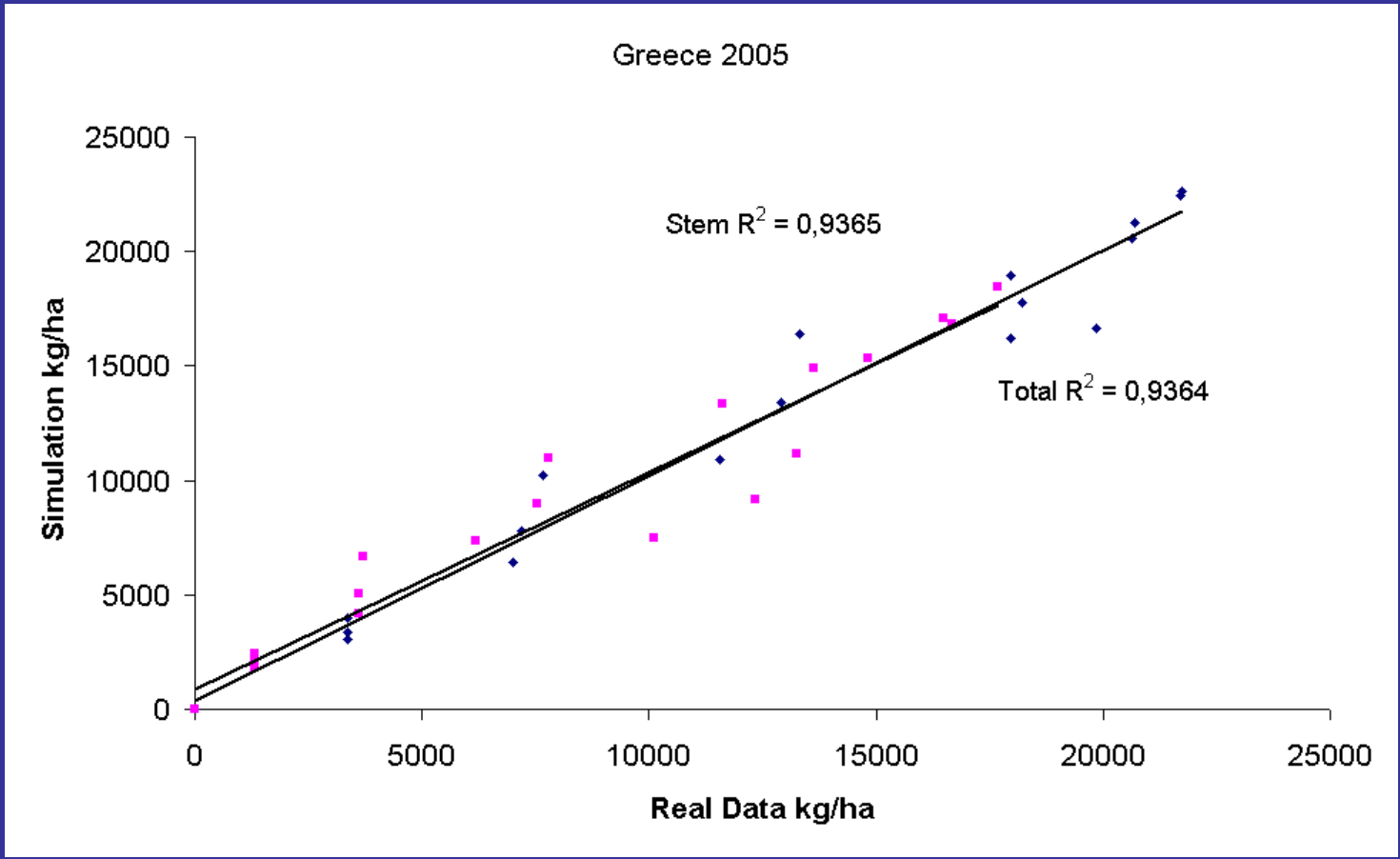
Results



Greece Year 2005

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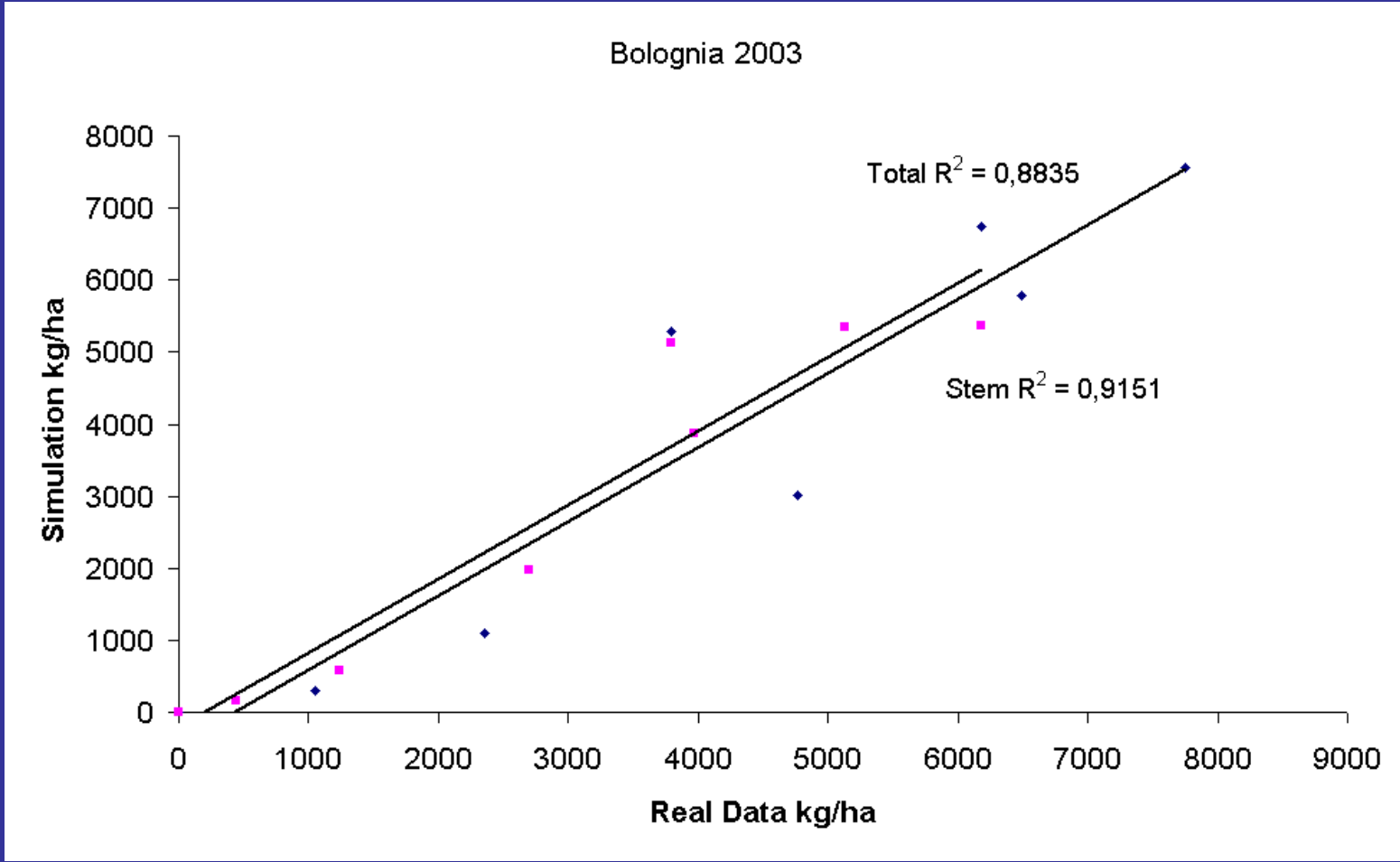
Results



Bolognia Year 2003

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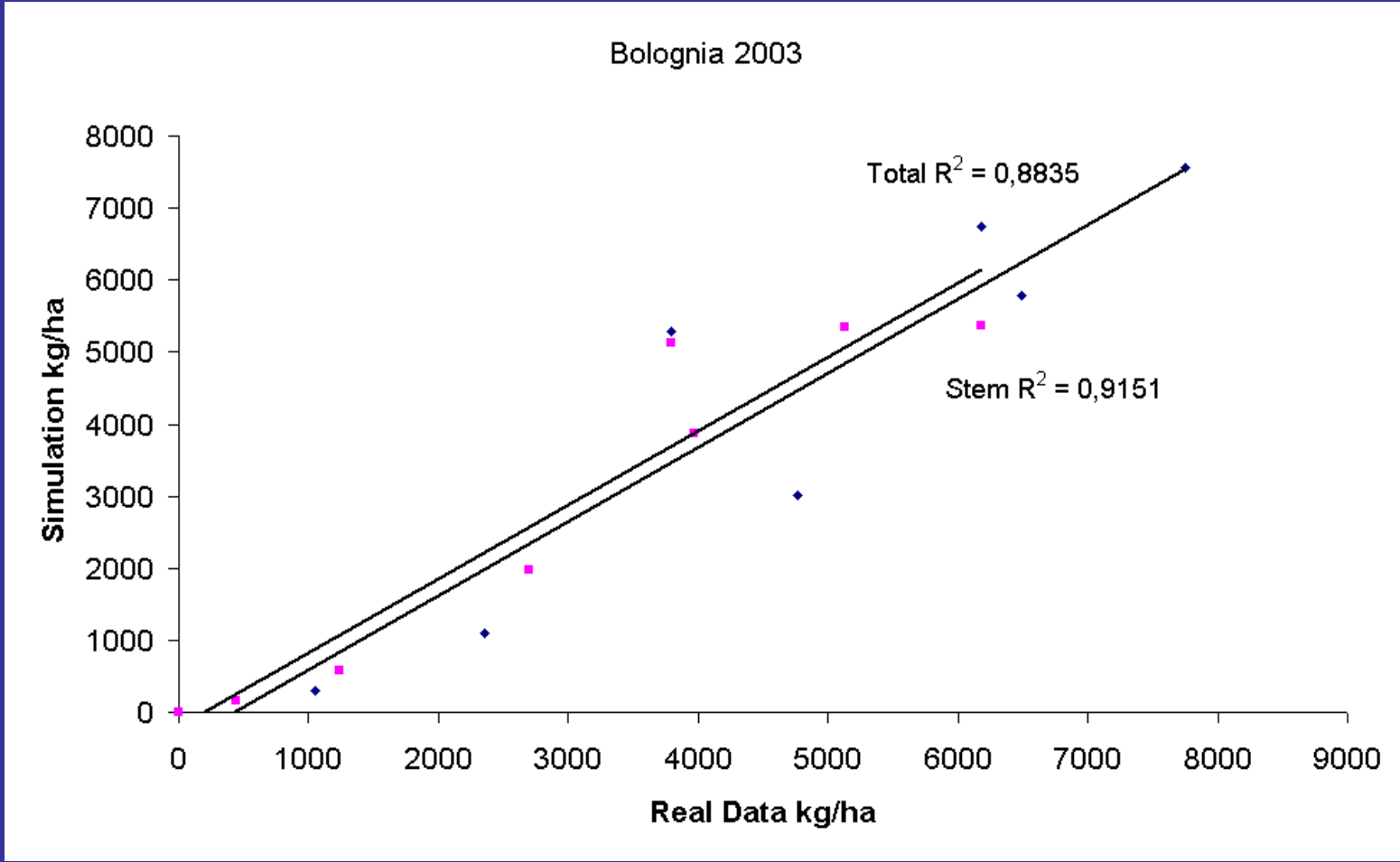
Results



Bolognia Year 2003

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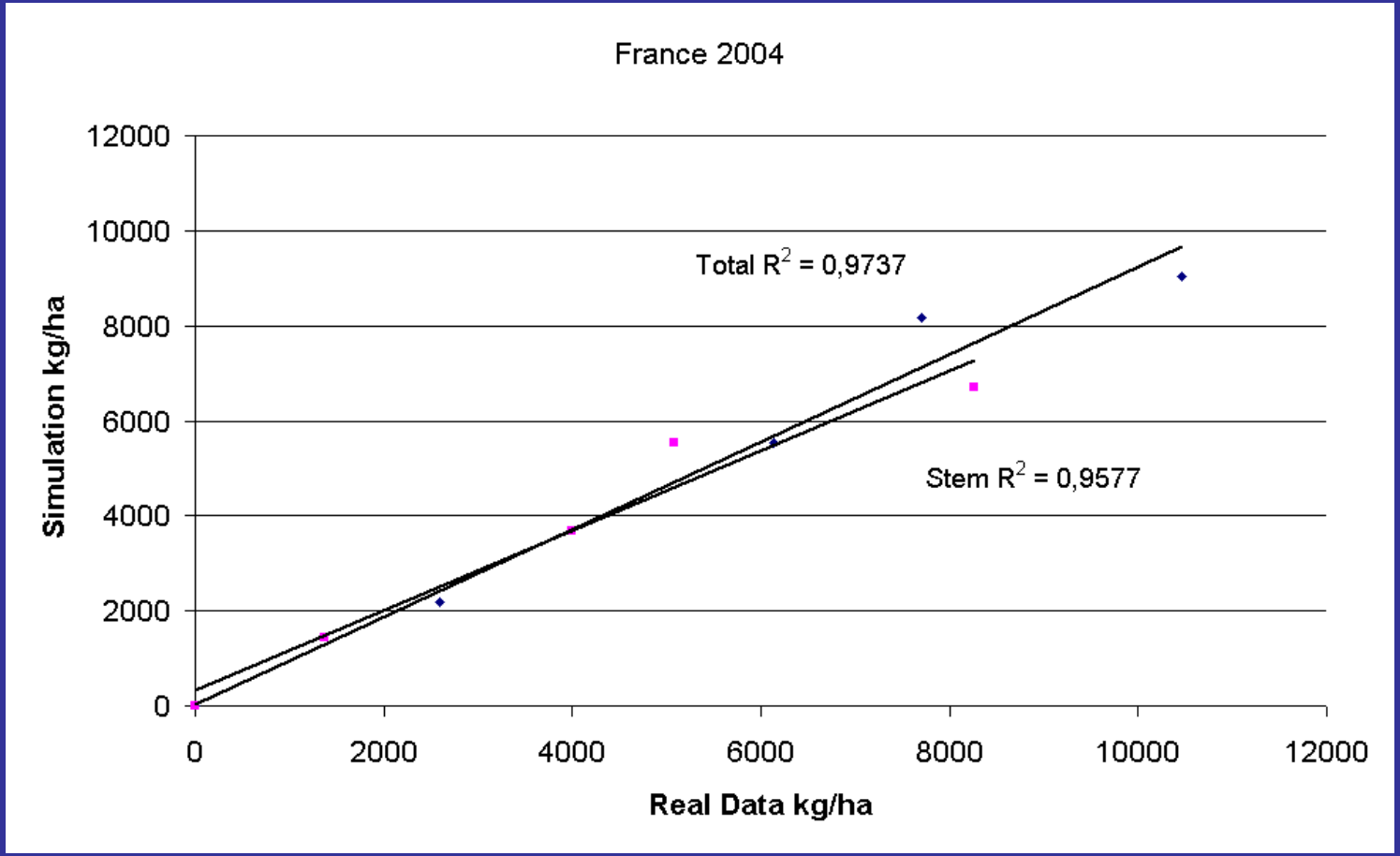
Results



France Year 2004

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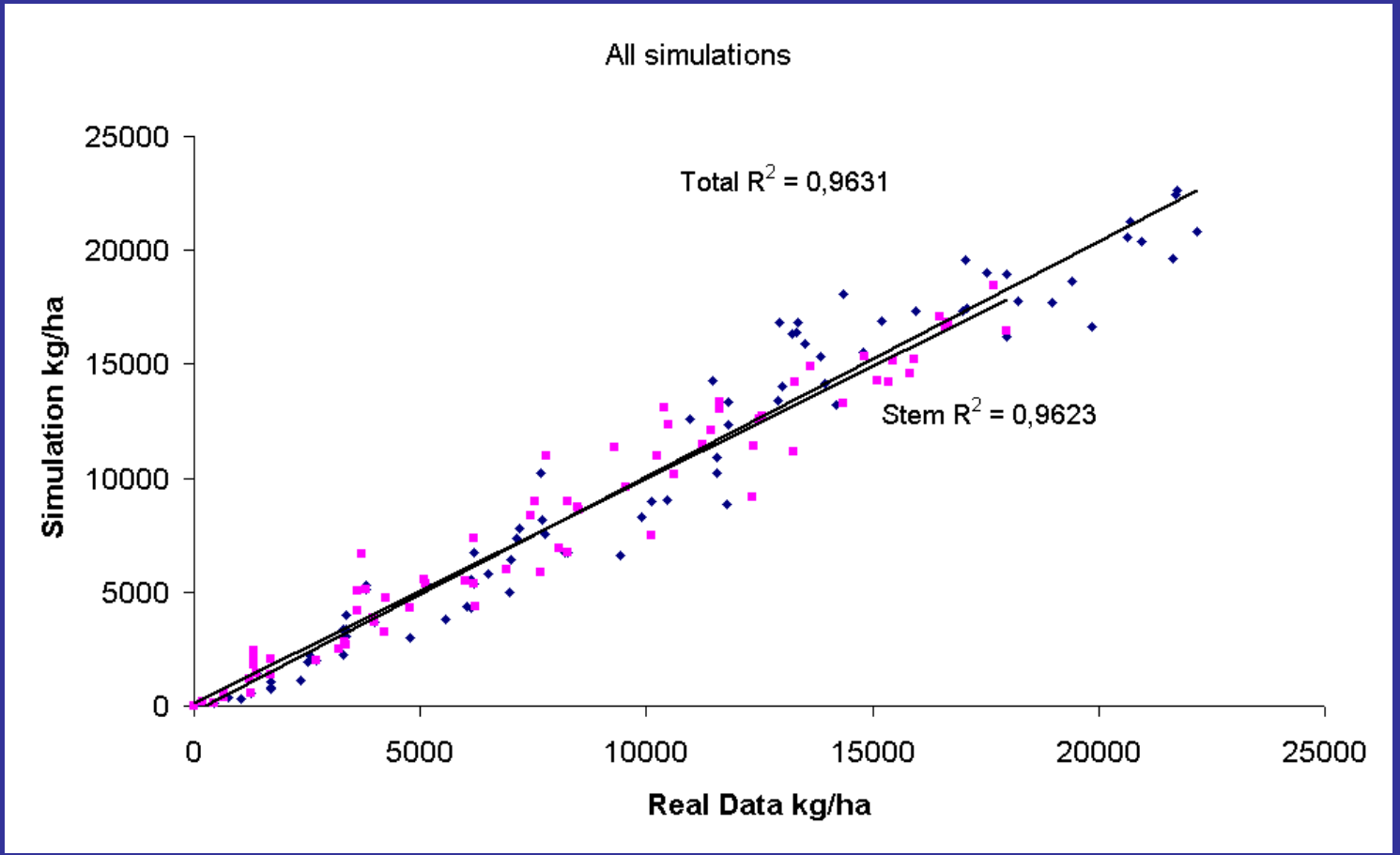
Results



Summary

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Missing Data

		Wheather										
Location	Year	TMAX	TMIN	Radiation	Precipitation	Wind	RH	Day of Emer.	Harvests	Irrigation	Soil Type	G. Water
Portugal	2003	X	X	X	X	X	X	X	X	X	X	X
	2004	X	X	X	X	X	X	X	X	X	X	X
	2005									X	X	X
Catania	2003			X		X					X	X
	2004			Problem							X	X
	2005										X	X
Spain	2003			X		X		X		X	X	X
	2004			X		X		X		X	X	X
	2005			X		X		X		X	X	X
Greece CETA	2003			?				X	X	X	X	X
	2004			?				X		X	X	X
	2005	X	X	?	X	X	X	X		X	X	X
France	2003	X	X	X	X	X	X	X	X		X	X
	2004	X	X	X	X	X	X	X	X		X	X

Thank you for your attention !

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