



UNIVERSITY OF BOLOGNA

DiSTA – Department of Agroenvironmental Science and Technologies –

GRiCI – Research Group on Industrial Crops –



Viale Fanin 44, 40127 Bologna, ITALY. Tel: 0039 051 2096652. Fax: 0039 051 2096241. G.Ri.C.I. website: <http://137.204.42.130/grici/index.php>

BioKenaf Project

Contract No: QLK5-CT2002-01729

Fourth technical meeting

September 22 - 23, 2004

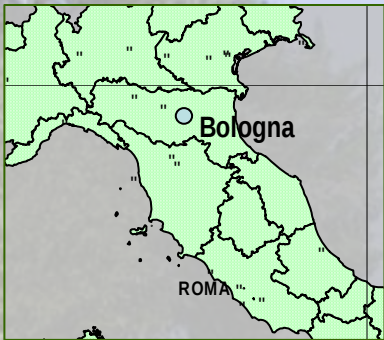
Lisbon

Collected Data 2004

(WP2 - Task 2.2 _ 2.3)



Experimental Farm of Bologna University, Cadriano (Northern Italy)

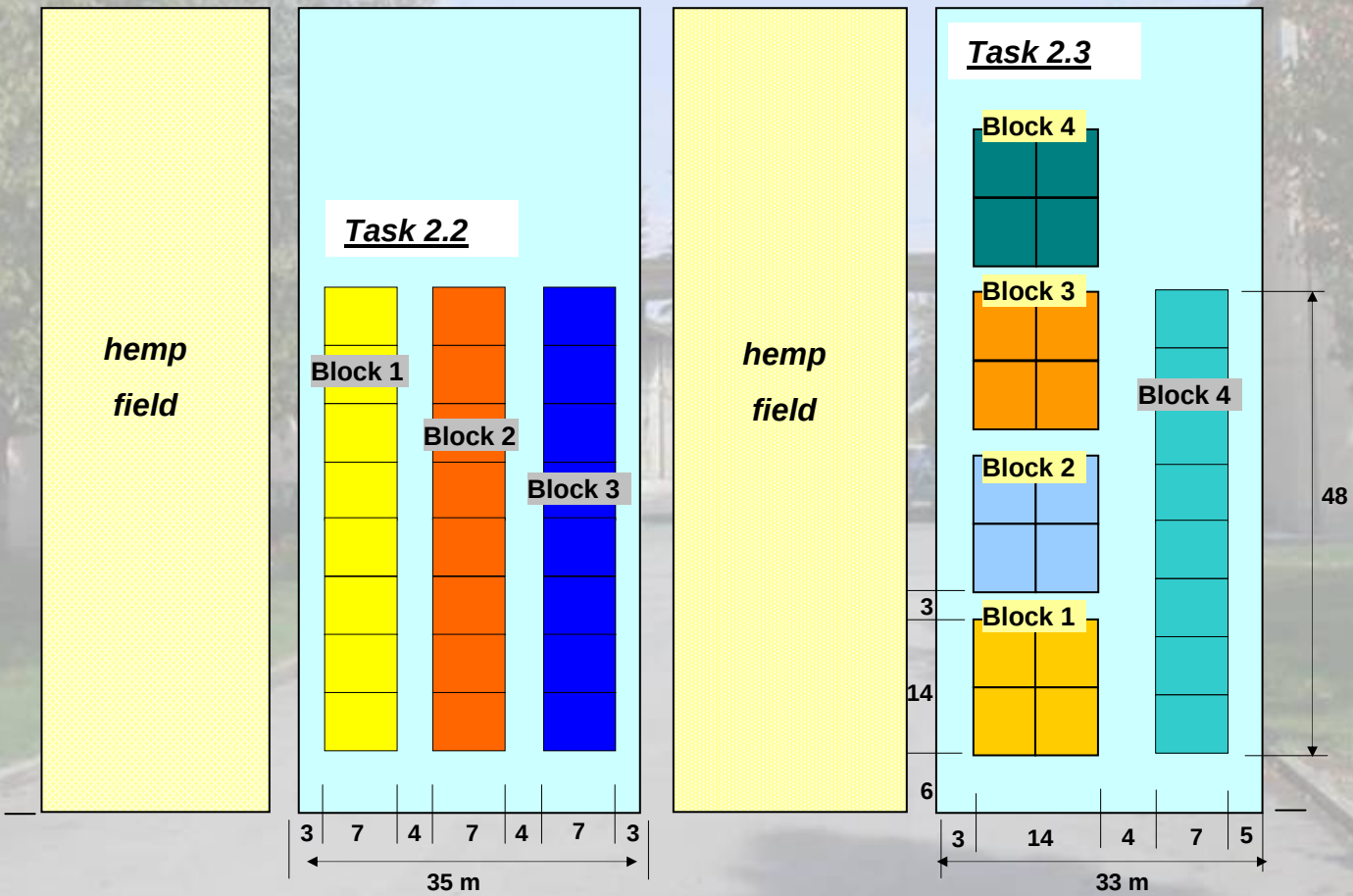


44° 33' N, 11° 21' E

altitude: 32 m a.s.l.
soil slope: 0%
organic matter = 1.9%
pH = 7.14

farm soil typology:
Udic Ustochreps fine silty, mixed mesic

sand = 19%
silt = 53%
clay = 28%



Experimental layout Task 2.2

Sowing time and Plant populations

Complete randomized blocks

	Block 1	Block 2	Block 3	Block 4
8	S1V2D1	S2V2D1	S2V2D2	S1V2D1
7	S1V2D2	S2V1D1	S1V1D1	S2V1D2
6	S2V2D2	S1V1D2	S1V2D1	S1V2D2
5	S2V2D1	S1V1D1	S2V1D2	S1V1D2
4	S2V1D2	S1V2D2	S2V1D1	S2V2D1
3	S1V1D2	S2V2D2	S2V2D1	S2V2D2
2	S2V1D1	S1V2D1	S1V1D2	S1V1D1
1	S1V1D1	S2V1D2	S1V2D2	S2V1D1

S1: First sowing date

S2: Second sowing date

D1: 20 p m²

D2: 40 p m²

V1: TAINUNG2

V2: EVERGLADES41



First sowing date:

7th May 2004

Tot. emergence:

5 days



Second sowing date:

9th June 2004

Tot. emergence:

6 days



**Woven non woven
tissue**

**Irrigation after sowing
to help emergence**



Field at 26/08/2004

Experimental layout Task 2.3

Nitrogen fertilisation rates

Complete randomized blocks

Block 4	N1	N0
	N3	N2
Block 3	N3	N1
	N2	N0
Block 2	N0	N1
	N2	N3
Block 1	N2	N3
	N0	N1

genotype: Tainung2

density: 20 plant/m²

N0: no fertilization

N1: 50 kg N/ha

N2: 100 kg N/ha

N3: 150 kg N/ha



sowing date:

21th May 2004

Tot. emergence:

5 days



Fertilization:

4th June 2004



Field at 26/06/2004



Field at 26/08/2004

Data collecting

Meteorological data like ...

- Daily maximum/minimum air temperature (°C)
- Precipitation (mm)
- Air humidity (%)
- Evaporation (glass A panel)
- Sunshine hours
- Water table

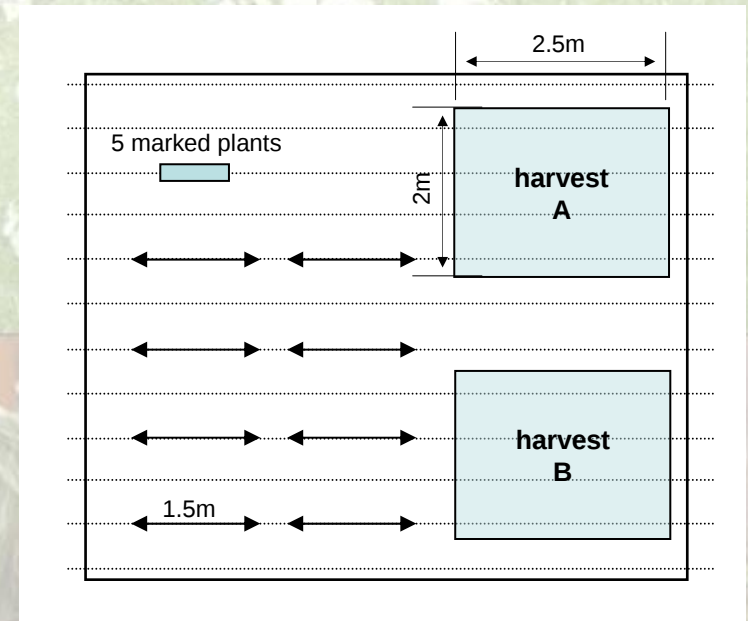
Soil typical data before sowing

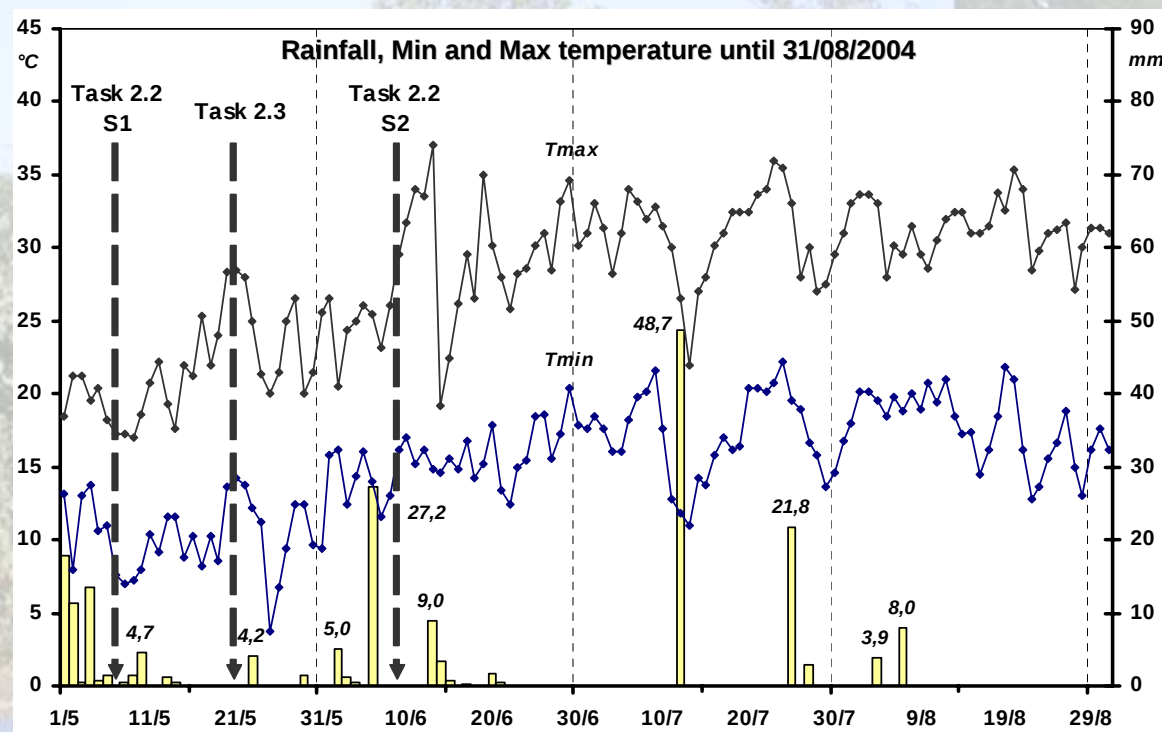
Repeated harvests (rows of 1,5 m)

- Fresh weight of harvested row
- Number of plants
- Height (cm) and Base Stem Diameter (mm)
- Fresh / dry weight of stems, leaves and petioles
- Leaf area (cm²)

Repeated harvests time table

harvest date	18/6	1/7	15/7	29/7	12/8	3/9	20/9	14/10	Novemb	Decemb
Harvest n	I	II	III	IV	V	VI	VII	VIII	IX	X
DAE - Task 2.2 S1 -	38	51	65	79	93	114	-	-	-	-
DAE - Task 2.2 S2 -	4	17	31	45	59	80	-	-	-	-
DAE - Task 2.3 -	24	37	51	65	79	101	-	-	-	-

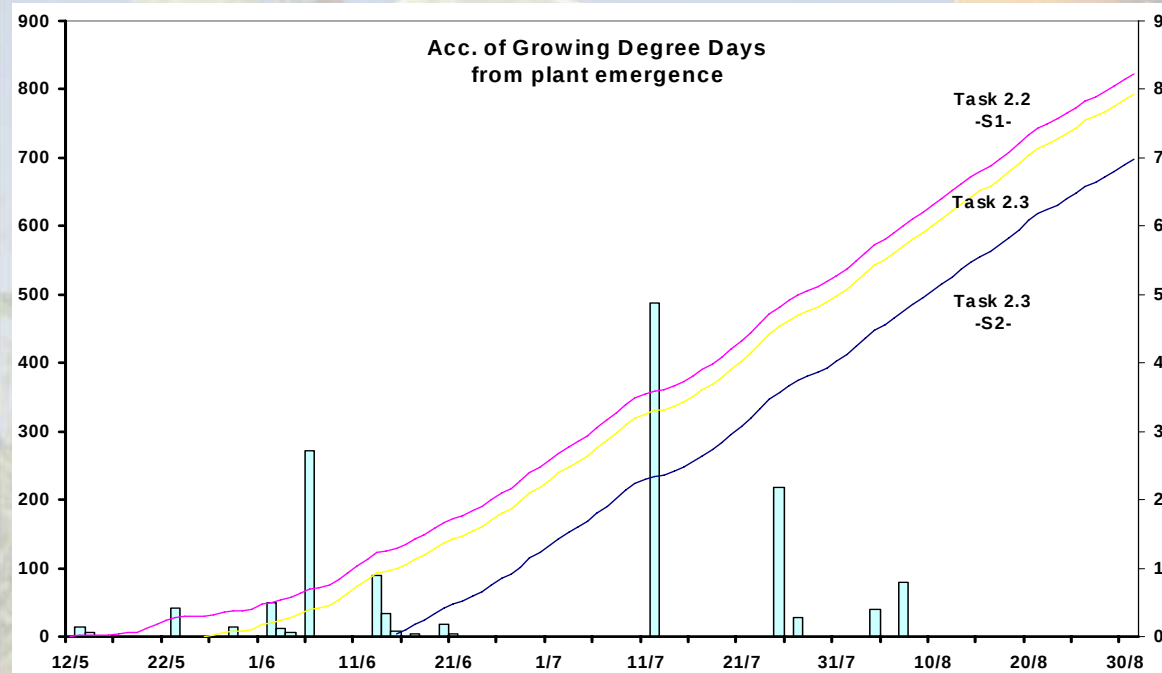




- Precipitation was almost absent from August until 12th September

Rainfall (mm)		
Task 2.2 S1	Task 2.2 S2	Task 2.3
148,8	100,9	140,5

- Air temperature followed the typical trend of the local conditions



- 50 mm in one event with hail

- After first sowing date of Task 2.2 (beginning of May)

few days without GDD increasing

- Less hot than 2003

- More rainfall in May and June

Seed Germinability

Weight 1000 seeds:

Tainung2: 297.1 g

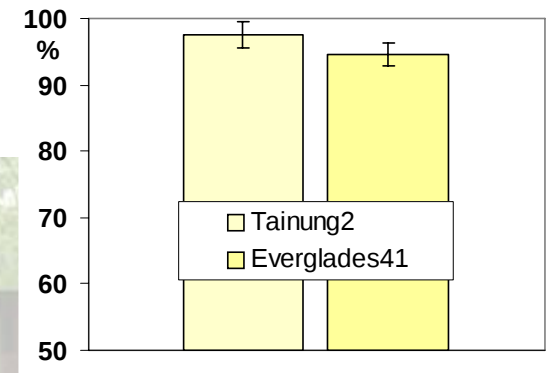
Everglades41: 292.2 g

50 seeds per 4 replications. Incubation room at 20-30 °C.

Sowing on 14/04/2004. First germination survey on 19/04/2004.

Second germination survey on 26/4/2004.

<i>germinability (%)</i>	A	B	C	D	mean	Stand Dev	Stand Error
Tainung2	98	92	100	100	97,5	3,79	1,89
Everglades41	94	96	90	98	94,5	3,42	1,71



Adapted mechanical sowing machine

“Vignoli”

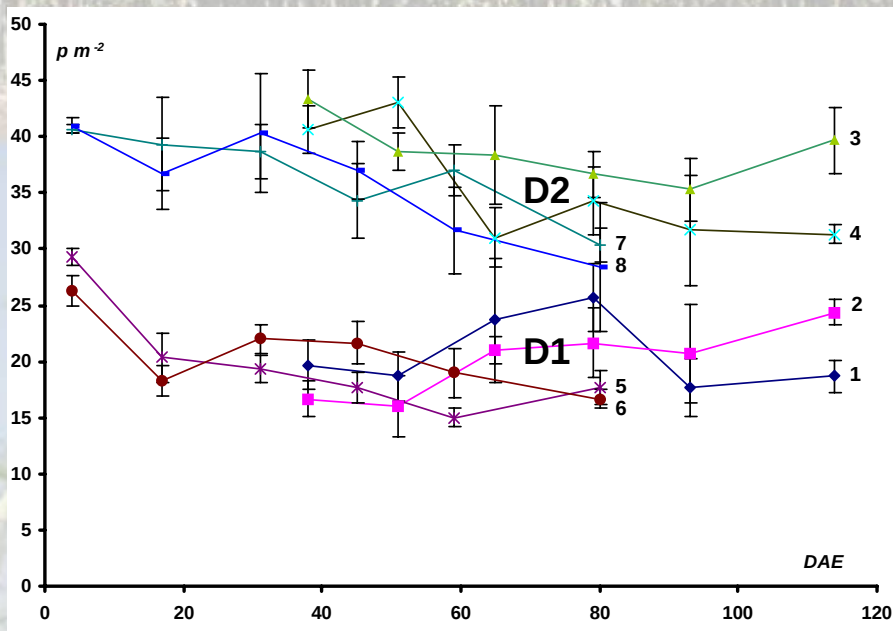
20% of seed damaged by sowing machine

Obtained density on field

Task 2.2

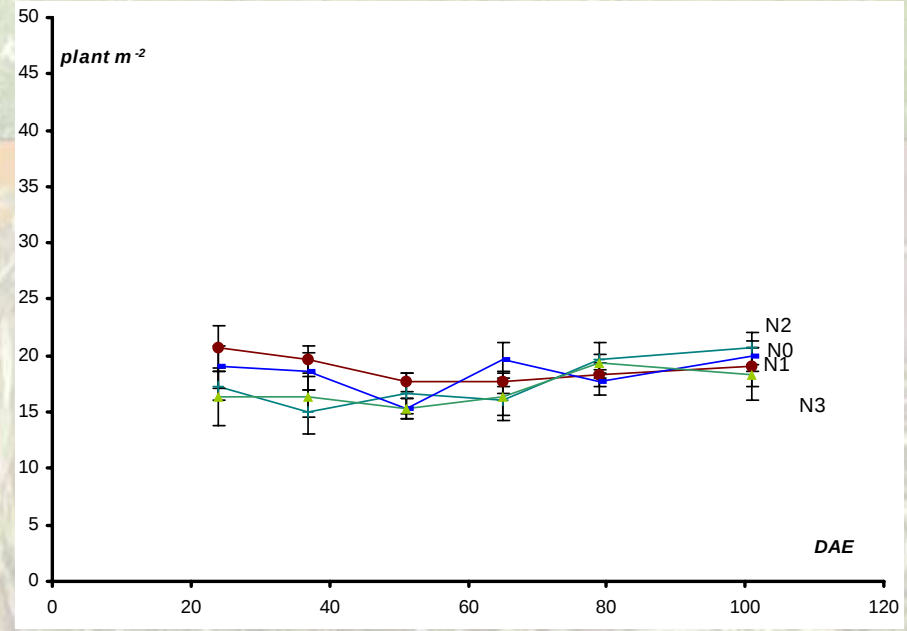
D1: 20.14 ± 1.45 plants m^{-2}

D2: 36.64 ± 2.73 plants m^{-2}



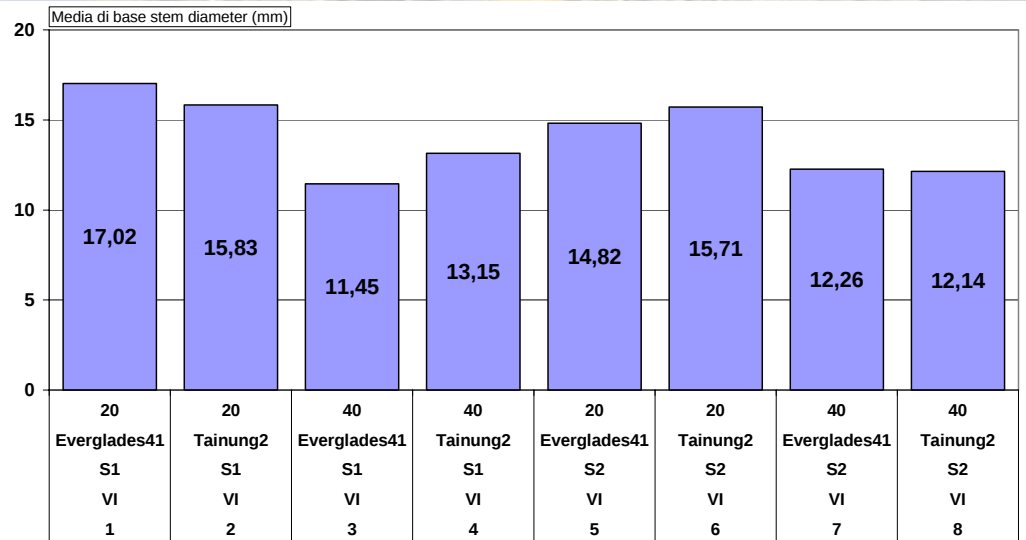
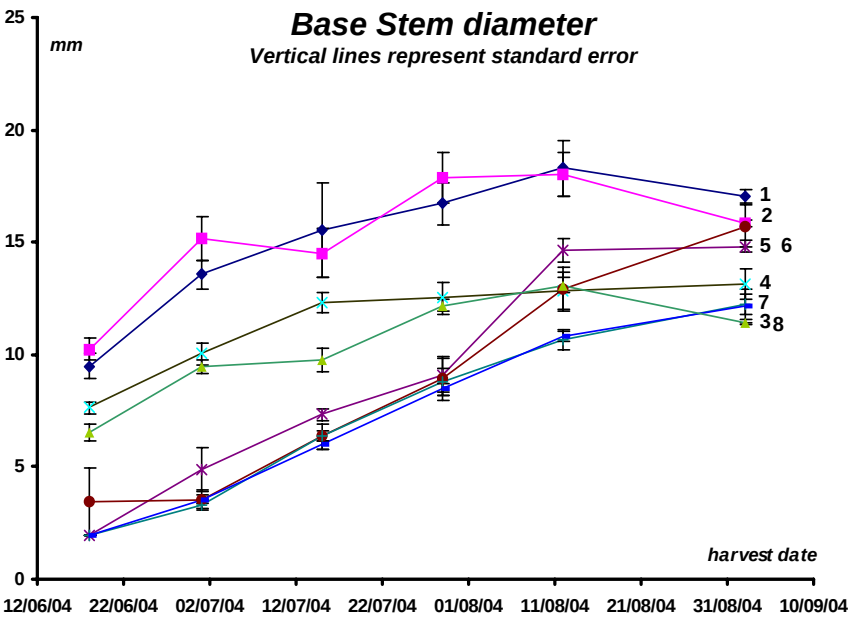
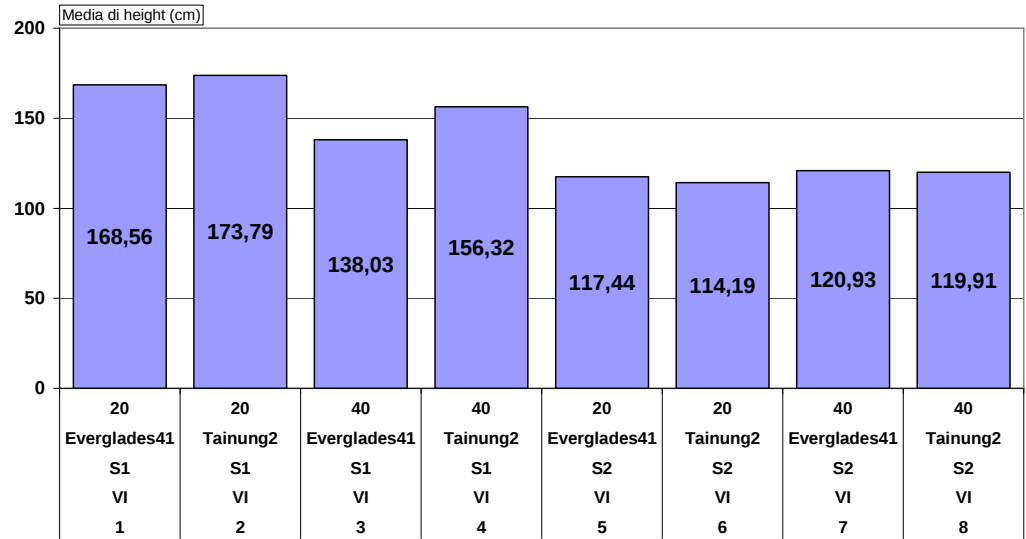
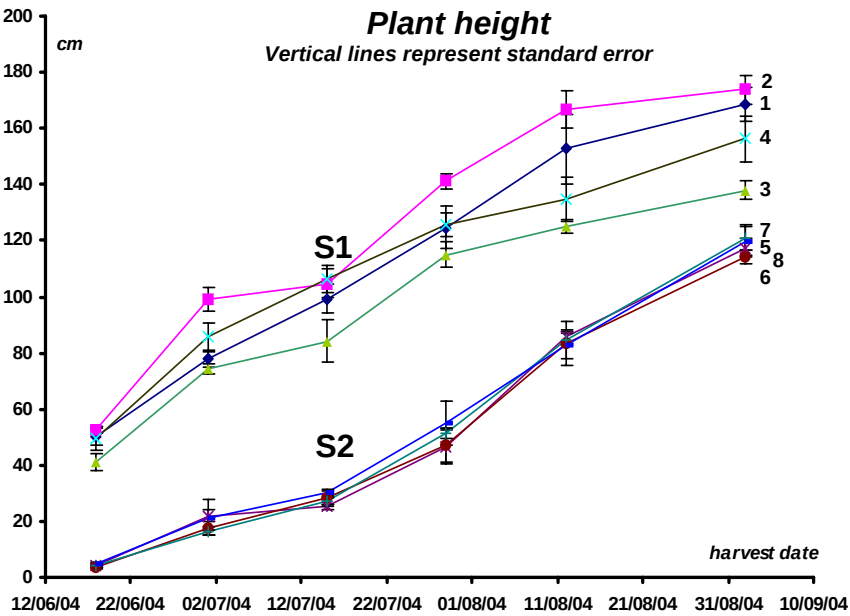
Task 2.3

17.94 ± 0.35 plant m^{-2}



Task 2.2 - Sowing time and Plant populations -

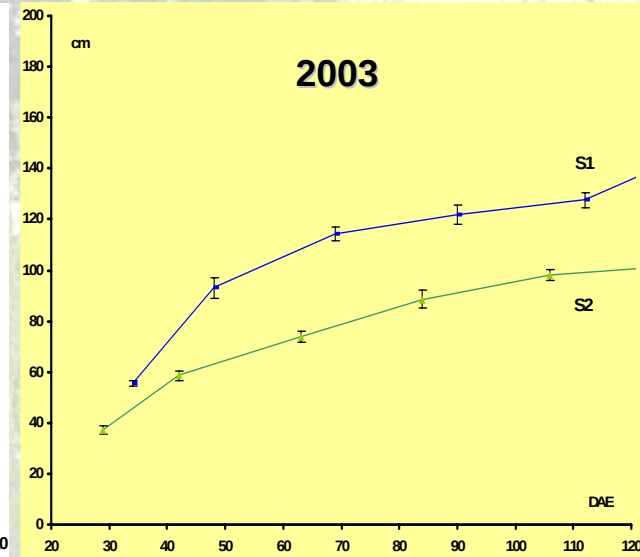
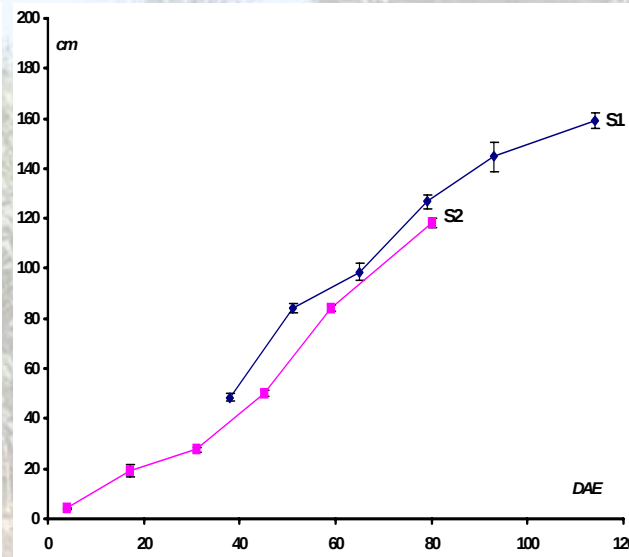
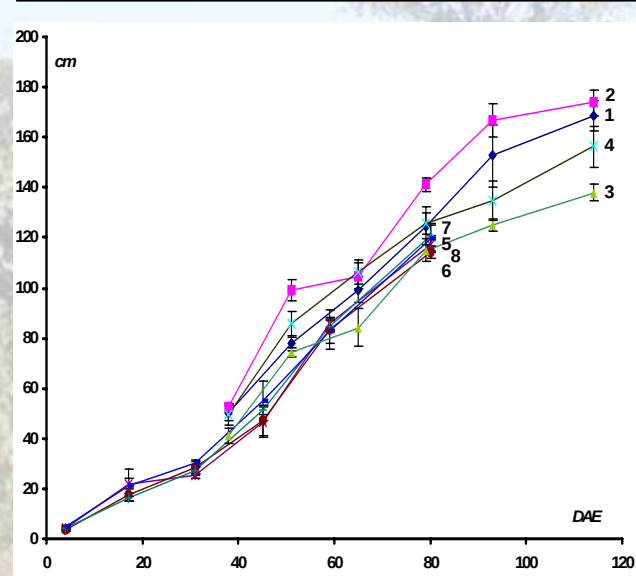
Plant Height and base stem diameter



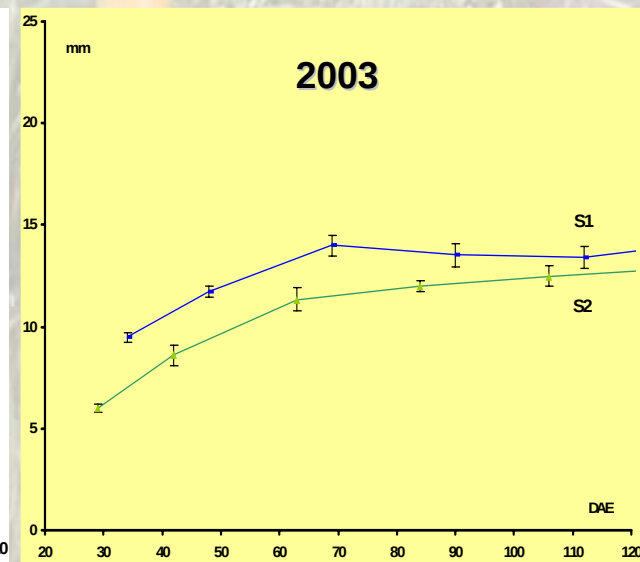
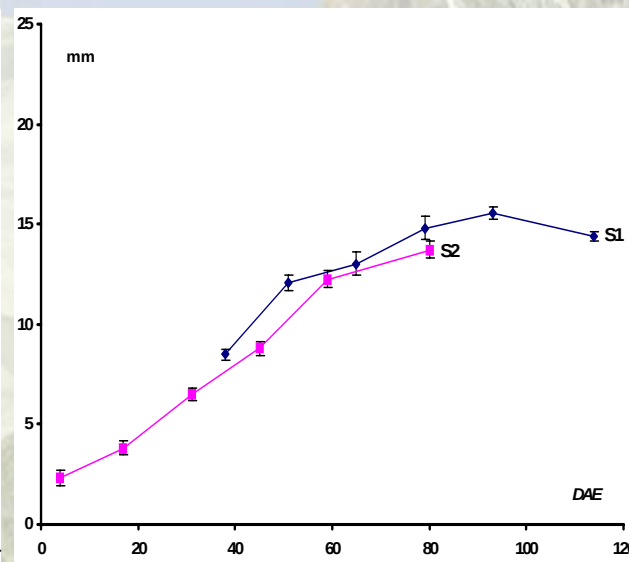
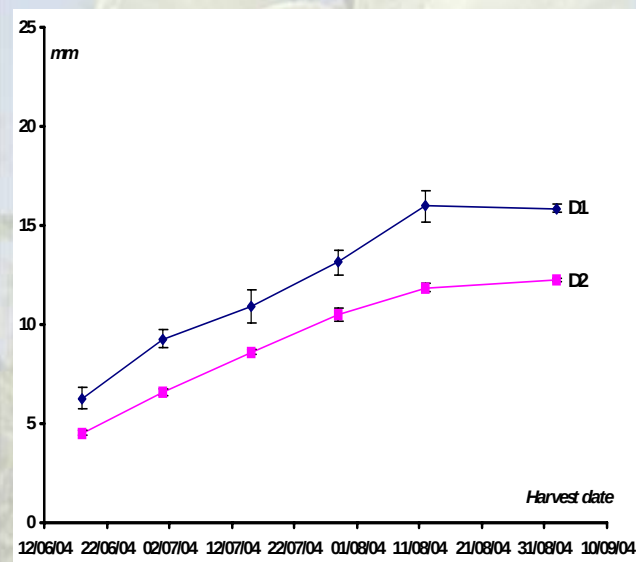
Task 2.2 - Sowing time and Plant populations -

Plant Height (cm)

Vertical lines represent standard error

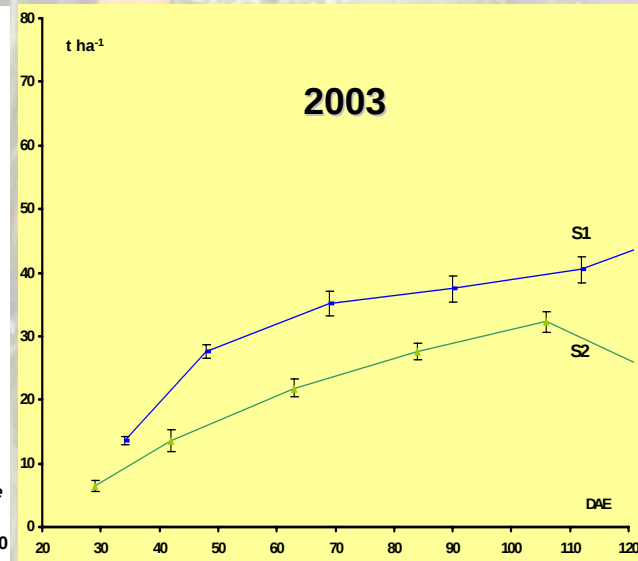
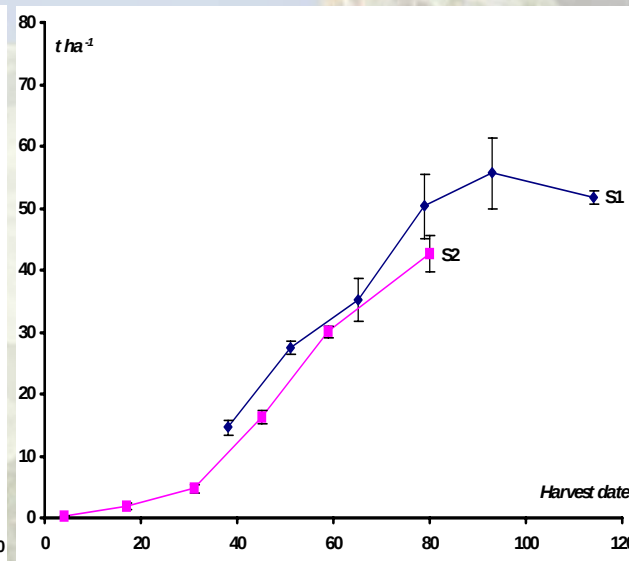
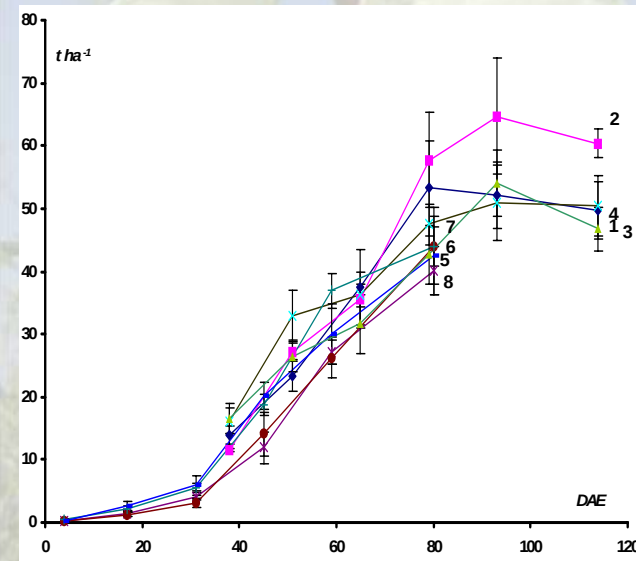
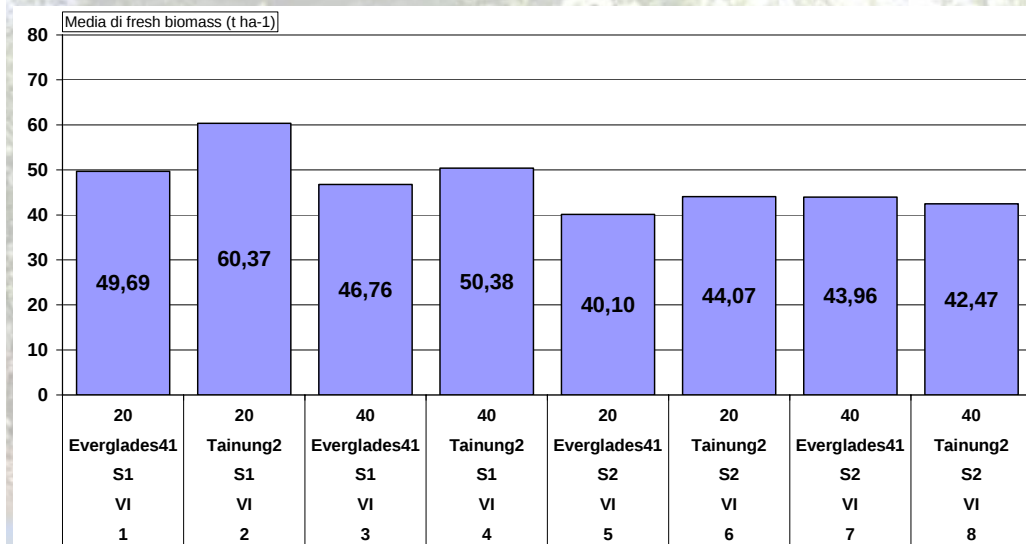
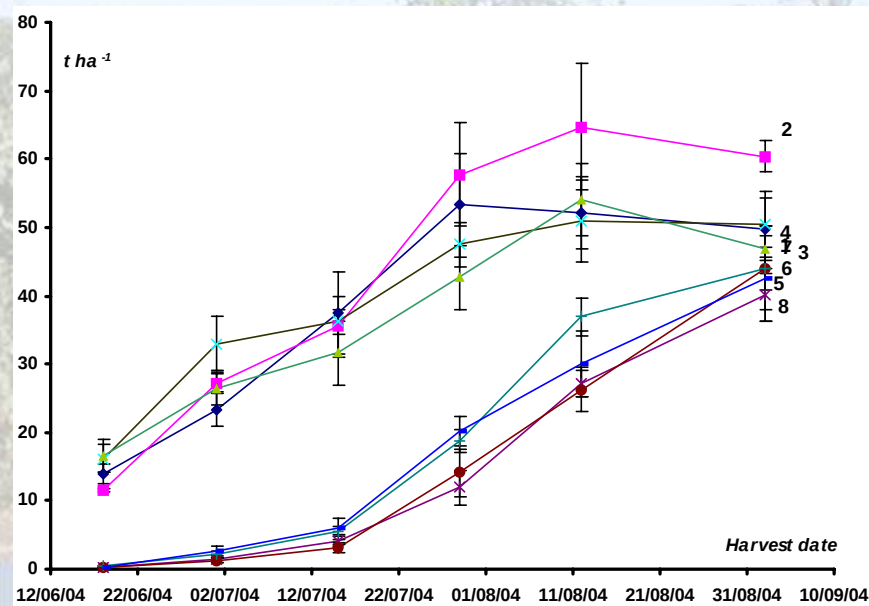


Base Stem diameter (mm)



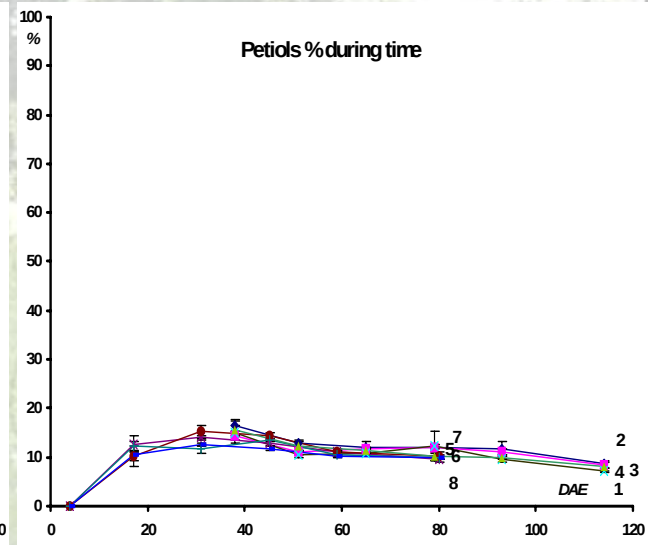
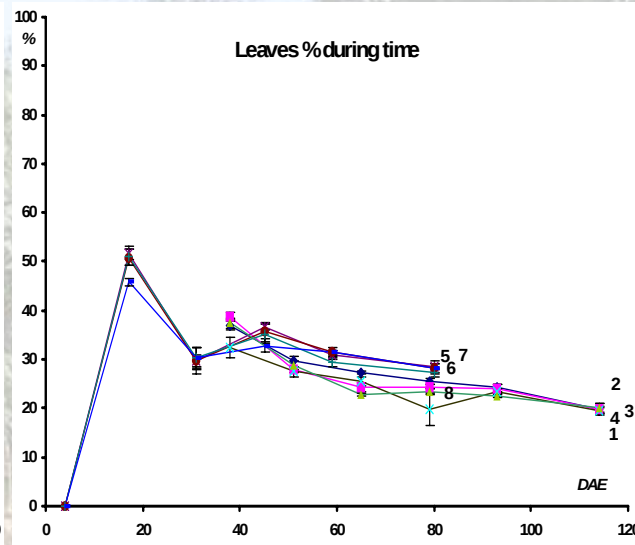
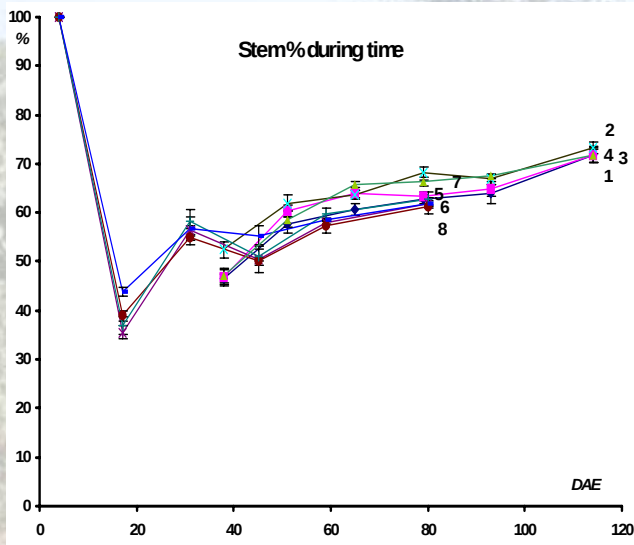
Task 2.2 - Sowing time and Plant populations -

Fresh biomass yield ($t\ ha^{-1}$)

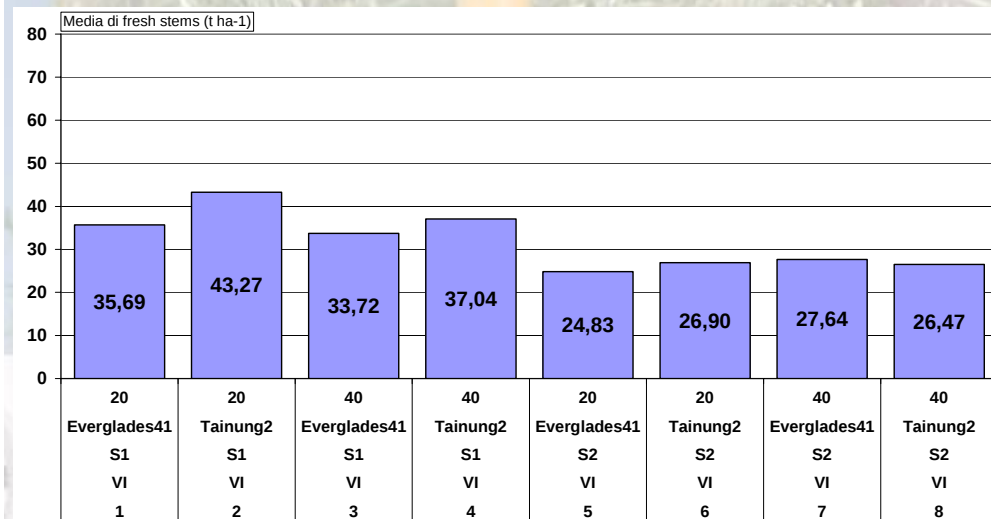
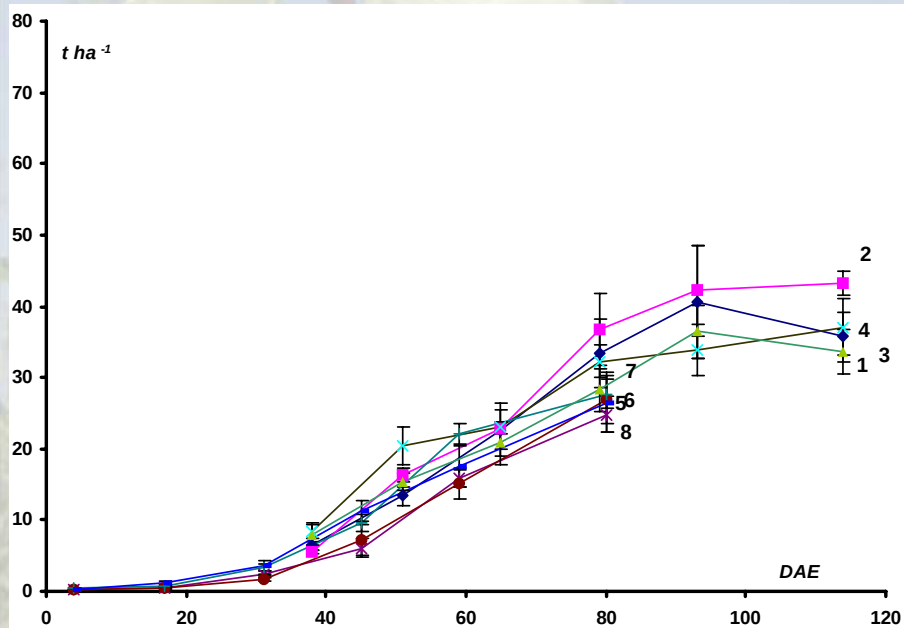


Task 2.2 - Sowing time and Plant populations -

Partitioning of fresh biomass in plant organs



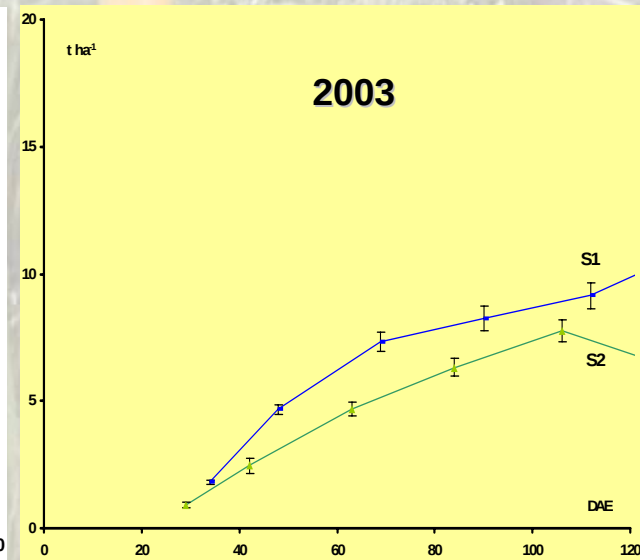
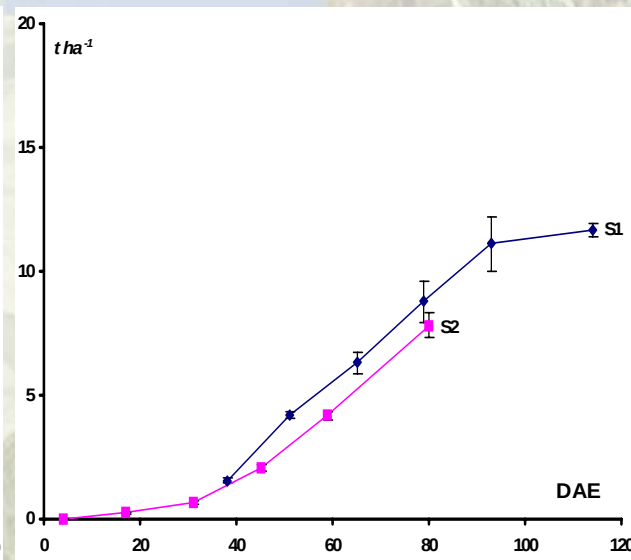
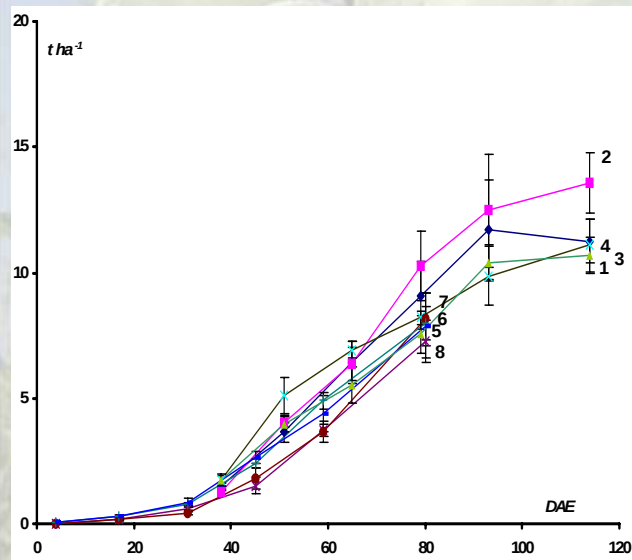
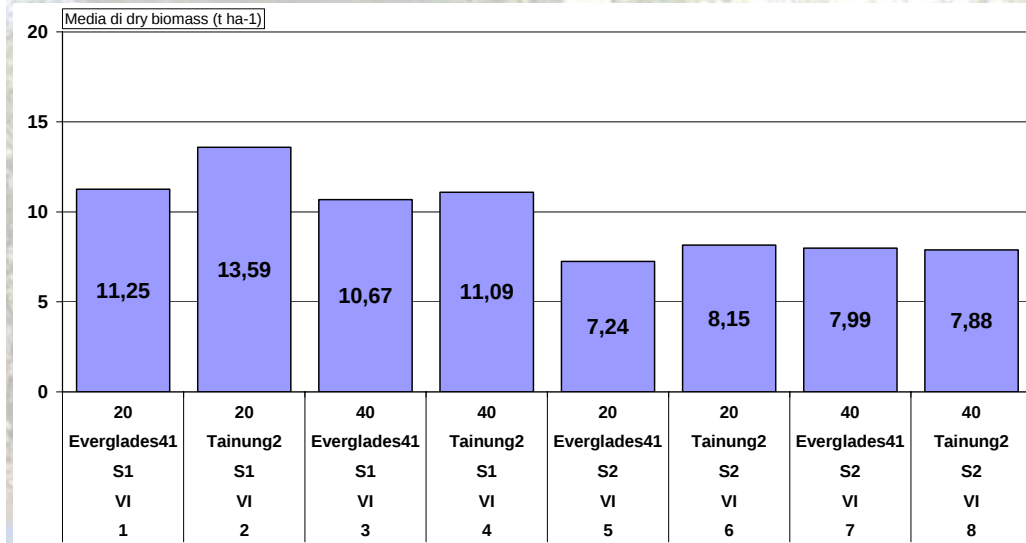
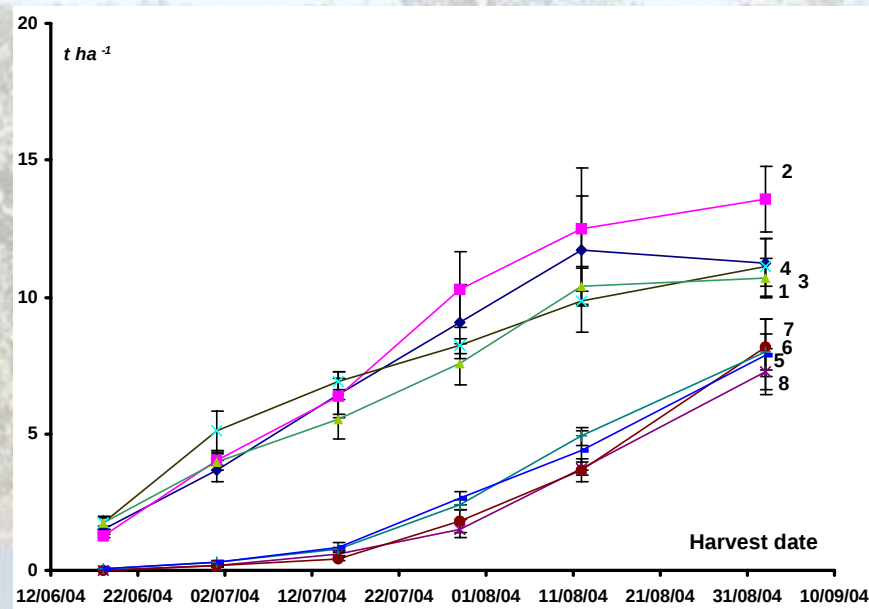
Fresh Stem yield (t ha⁻¹)



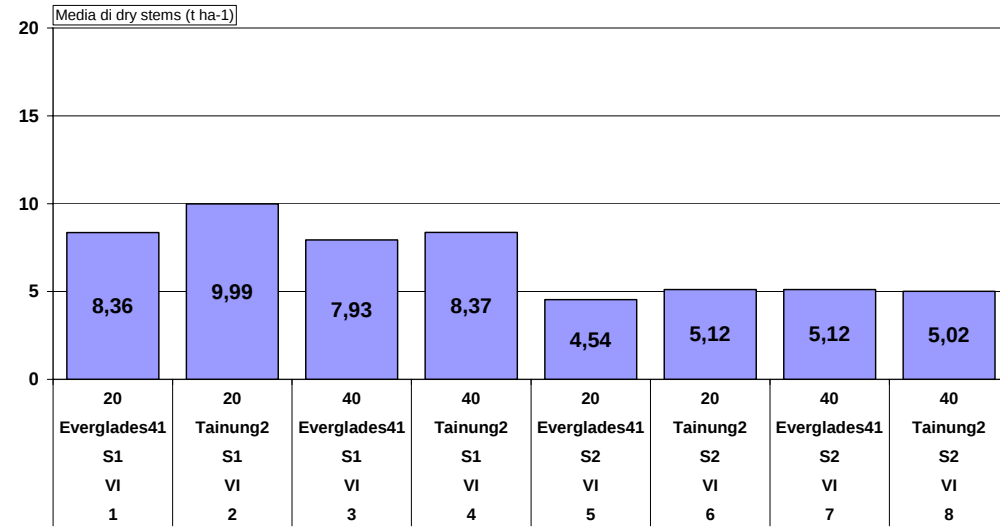
Task 2.2 - Sowing time and Plant populations -

Dry biomass yield ($t\ ha^{-1}$)

Vertical lines represent standard error



Dry stem biomass (t ha⁻¹)

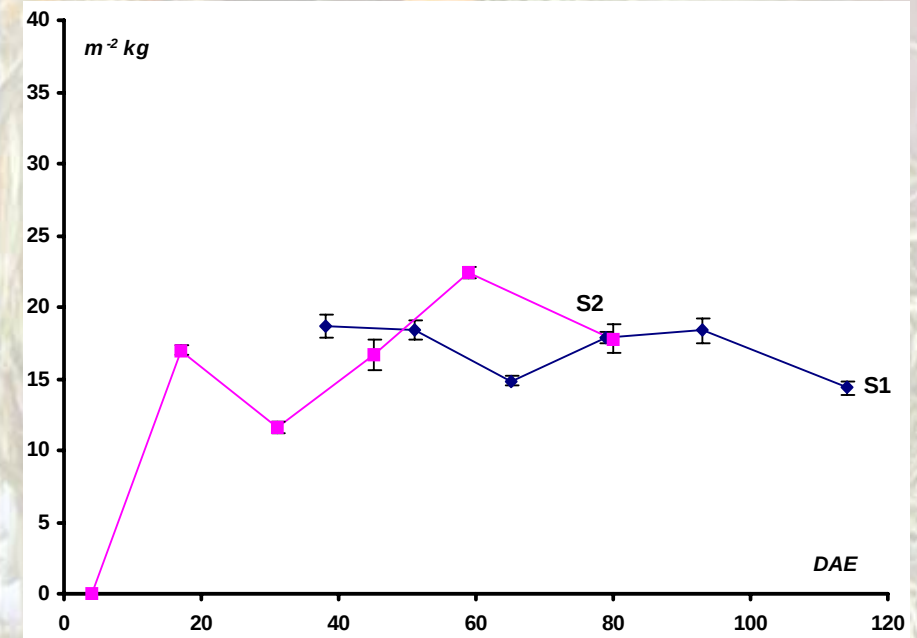
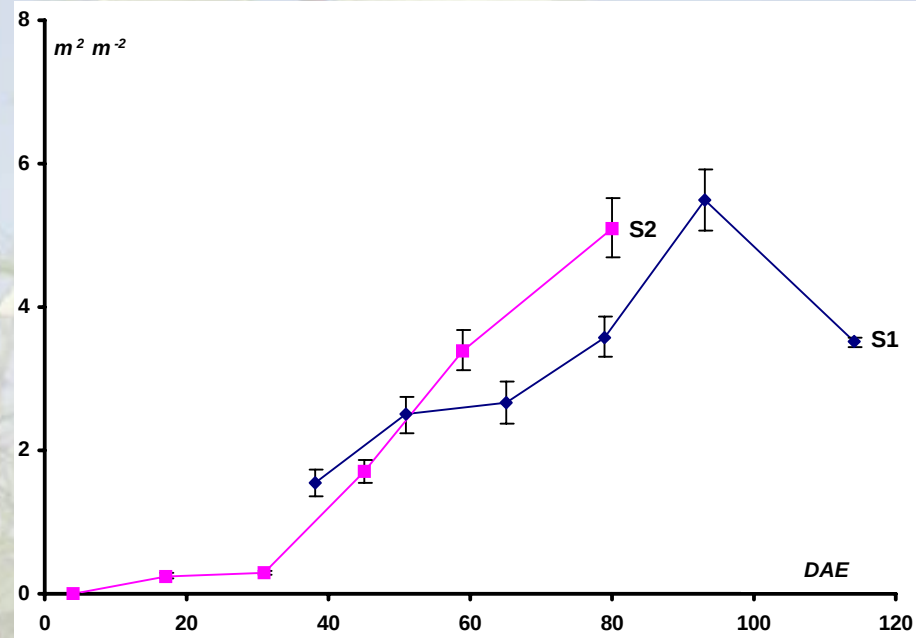
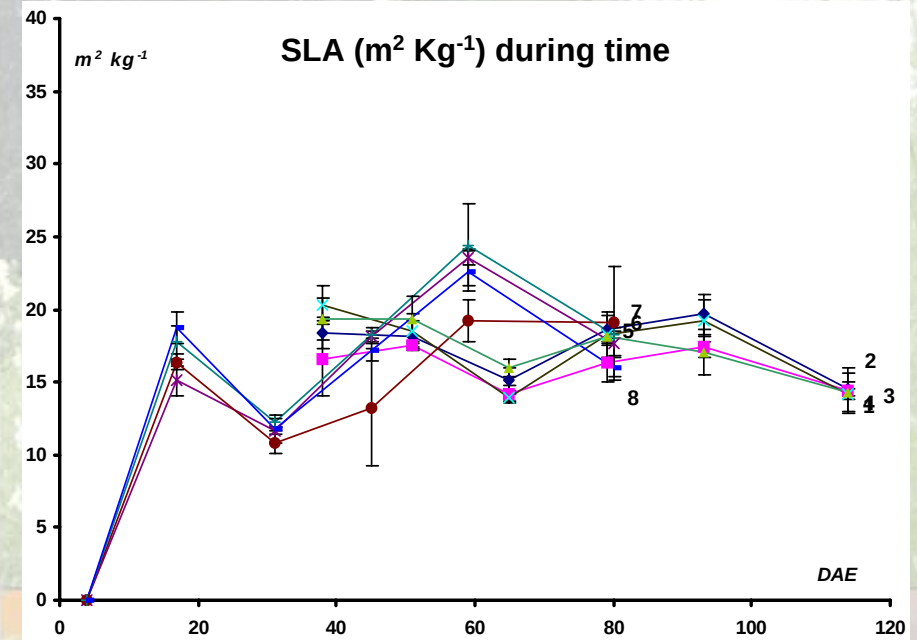
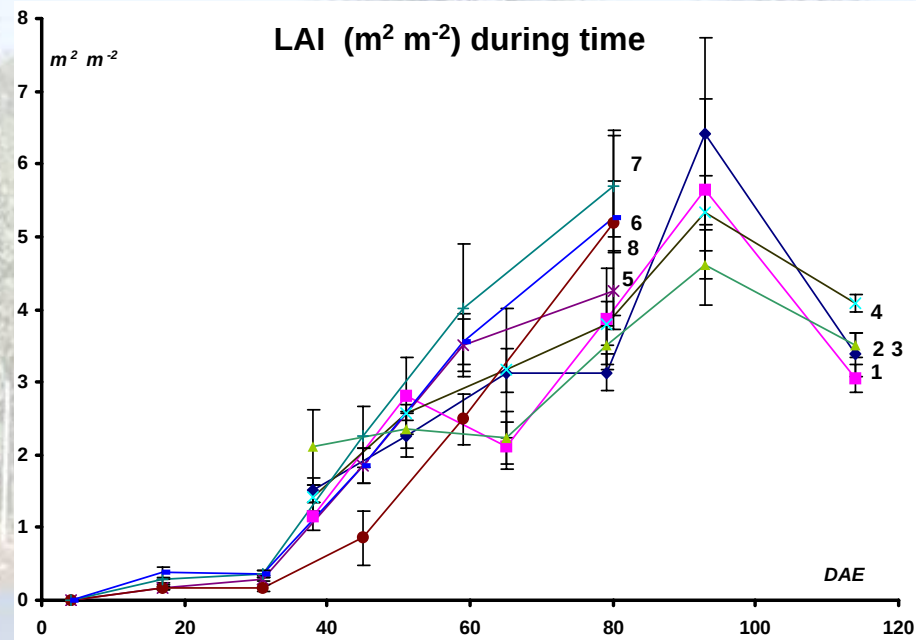


Dry content in leaves during time

DAE	1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	0
15	16	17	17	17	17	17	17	17
30	18	19	19	19	18	18	18	18
45	16	17	17	17	16	16	16	16
60	15	16	16	16	15	15	15	15
75	18	19	19	19	18	18	22	18
90	18	18	18	18	18	18	18	18
115	20	22	22	22	21	21	23	21

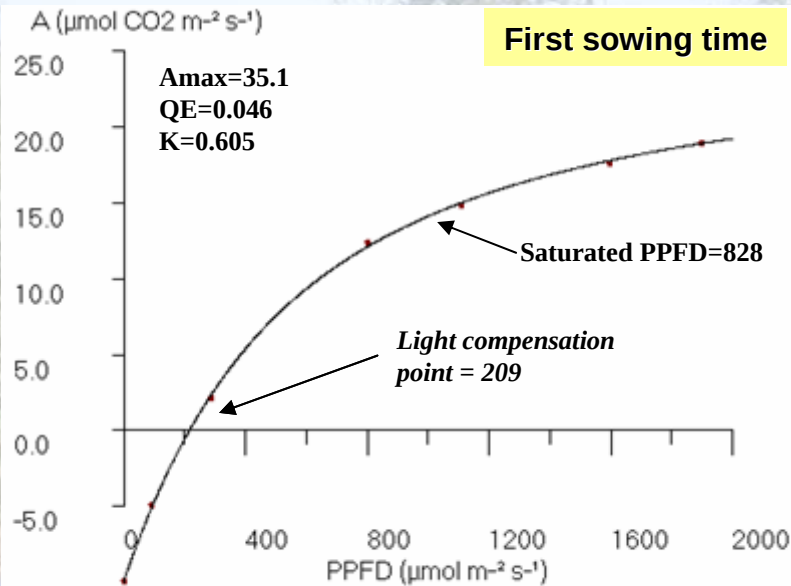
Task 2.2 - Sowing time and Plant populations -

Leaf Area Index and Specific Leaf Area



The light response curve of leaf photosynthesis (A)

31/08/04

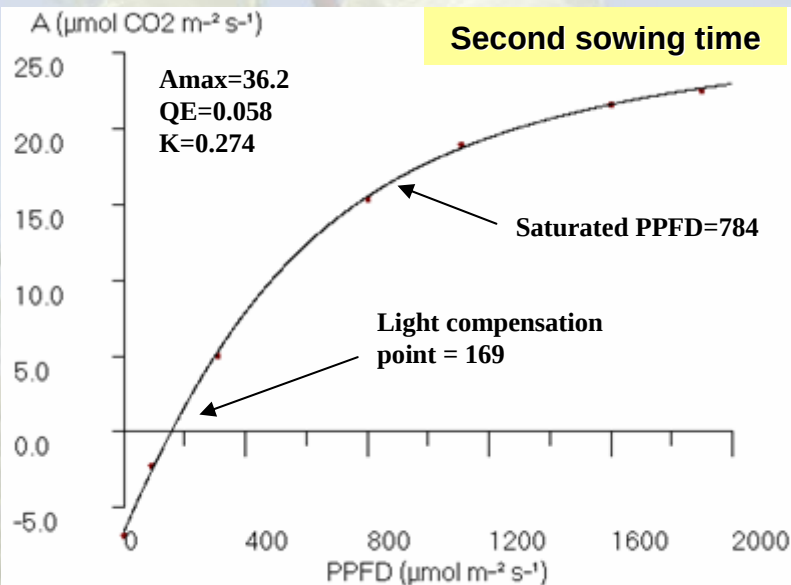


QE:
apparent quantum efficiency

Light compensation point

Amax:
light saturated maximum

K:
convexity



S2 higher QE, Amax

S2 lower light compensation point

leaves of S2 more effective in photosynthesis

Tainung2; D 40 p m⁻²

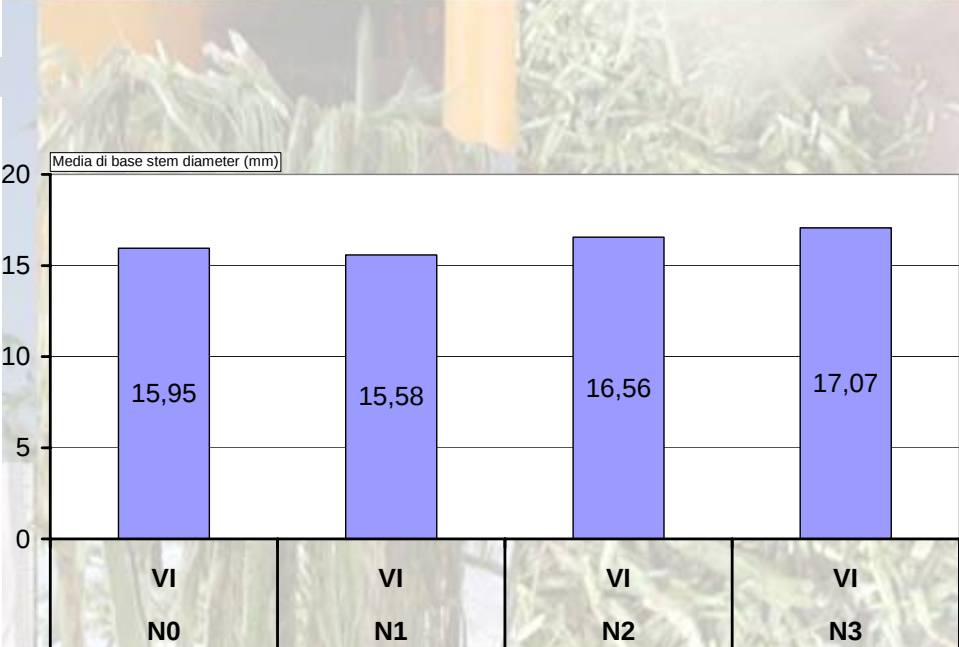
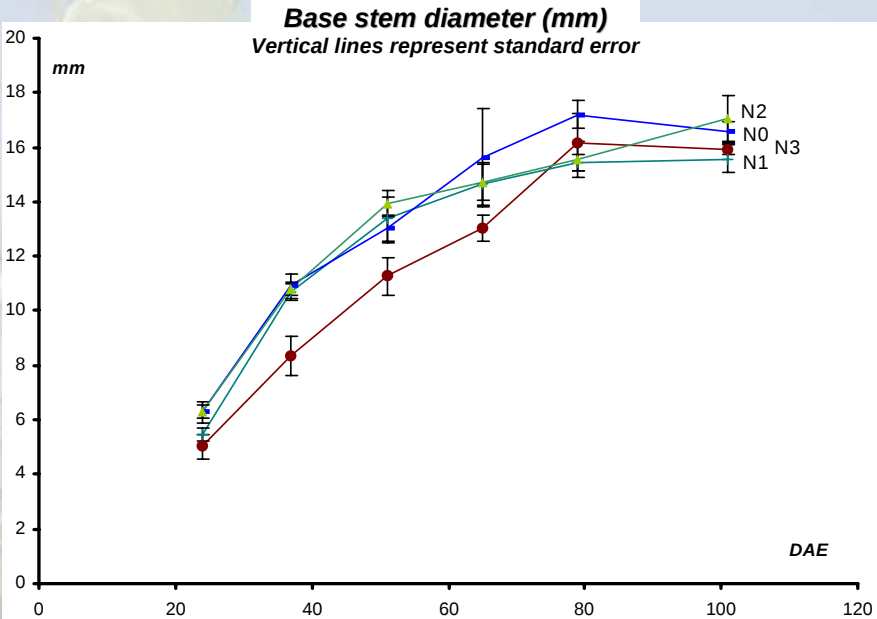
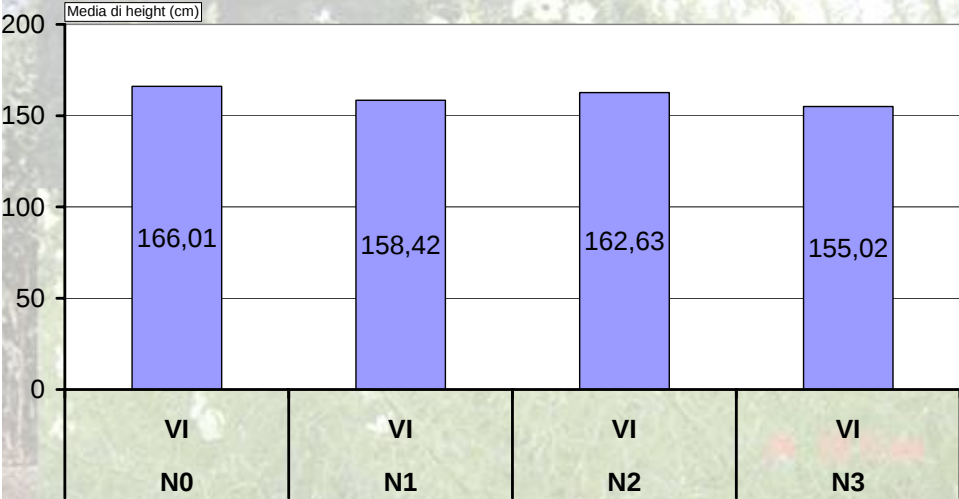
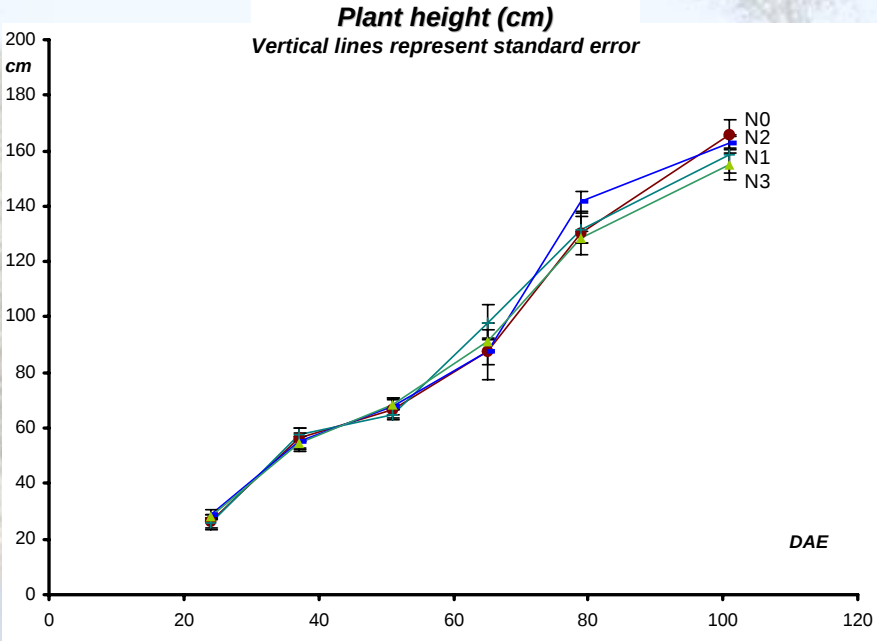
Portable IRGA (CIRAS-2, PP-Systems)

Most recently fully expanded leaves



Task 2.3 - Nitrogen fertilisation rates -

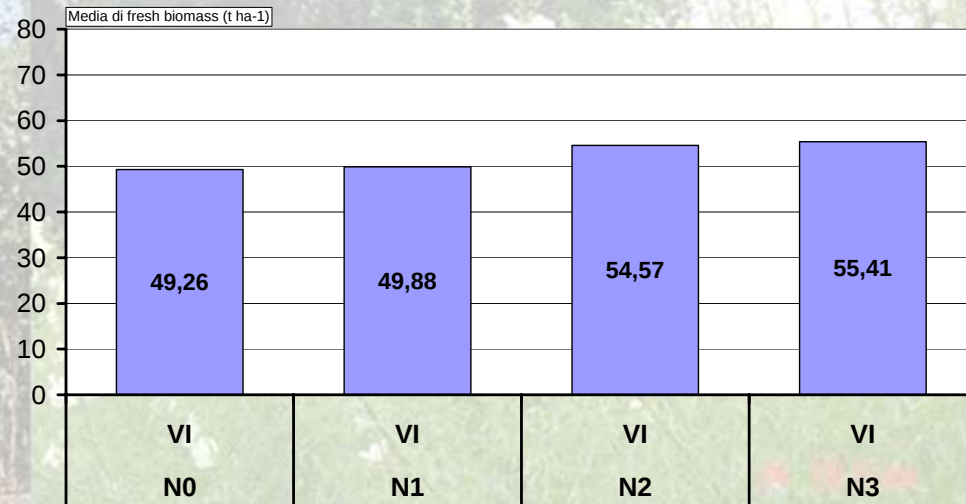
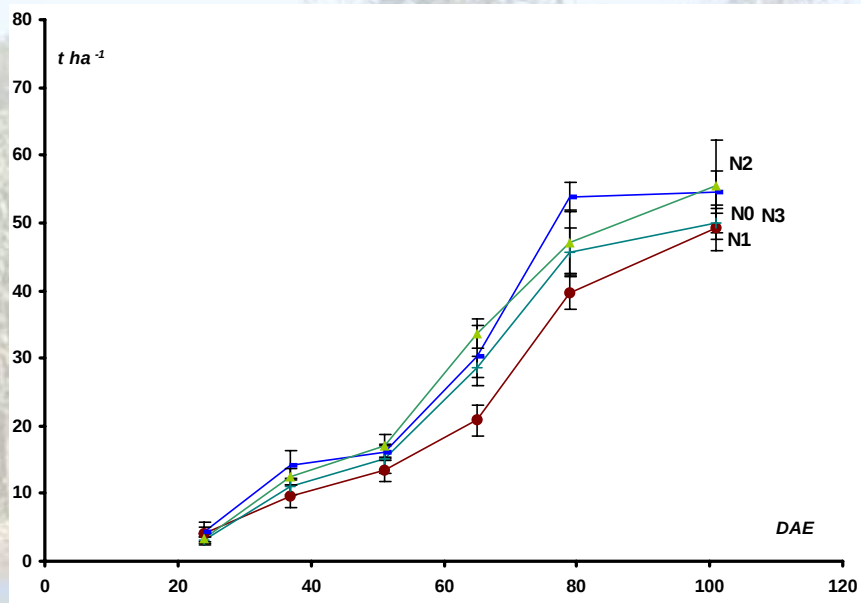
Plant height and Base stem diameter



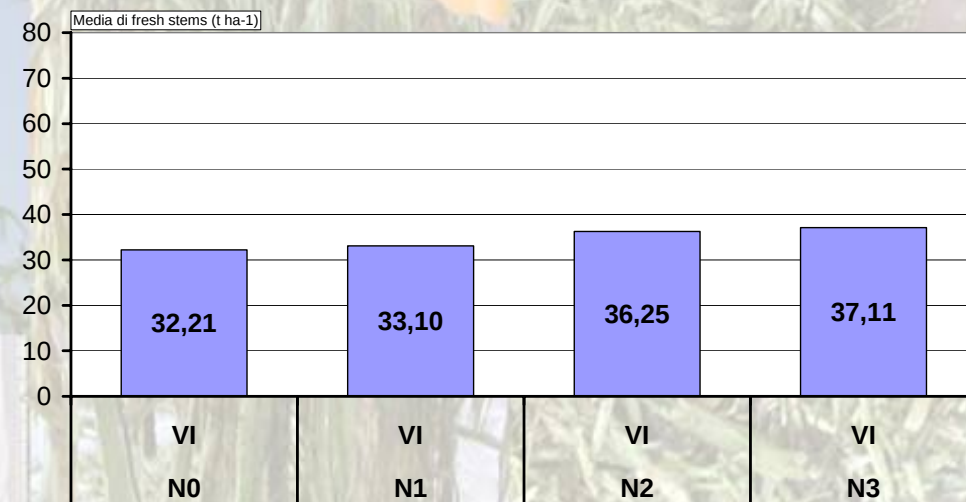
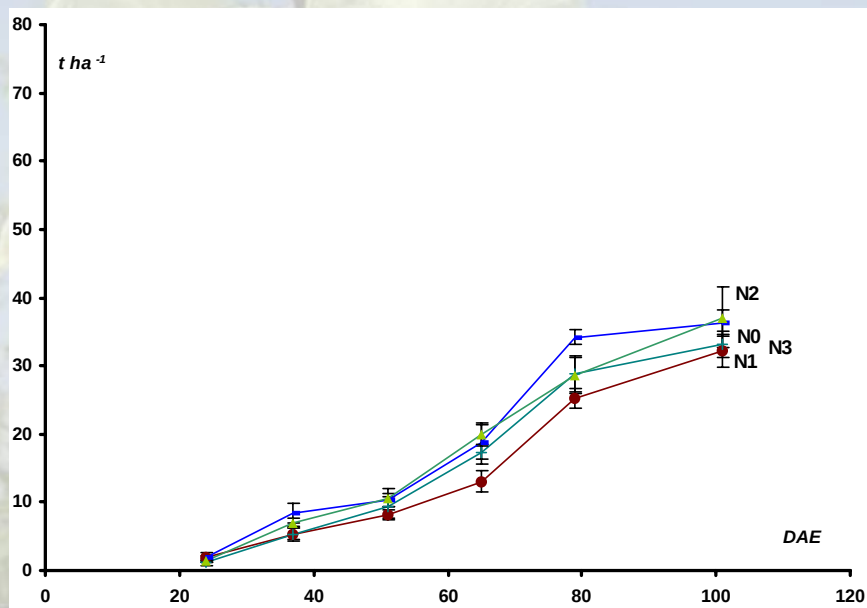
Task 2.3 - Nitrogen fertilisation rates -

Fresh biomass yield ($t\ ha^{-1}$)

Vertical lines represent standard error

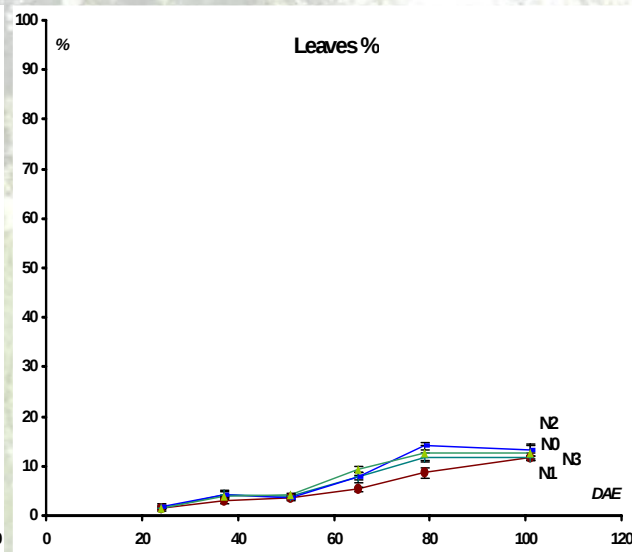
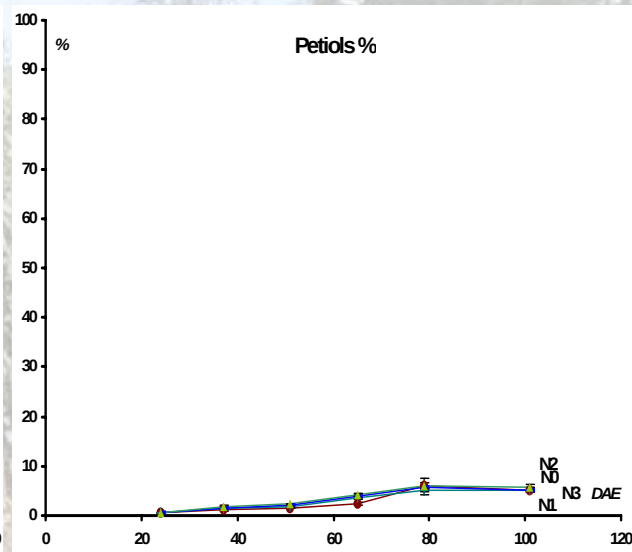
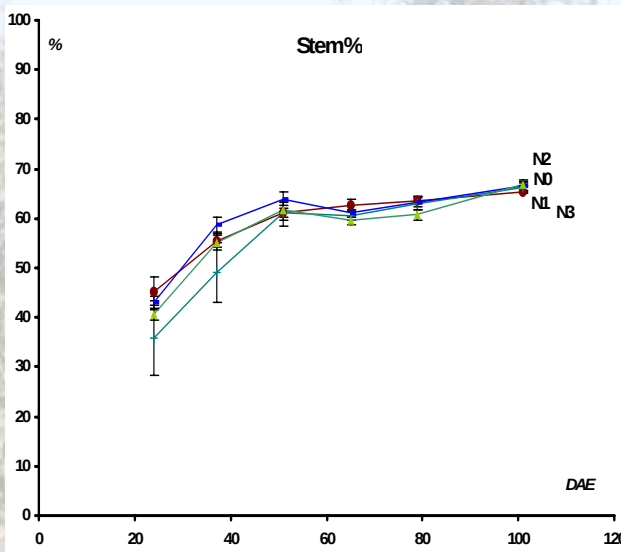


Fresh stem biomass ($t\ ha^{-1}$)

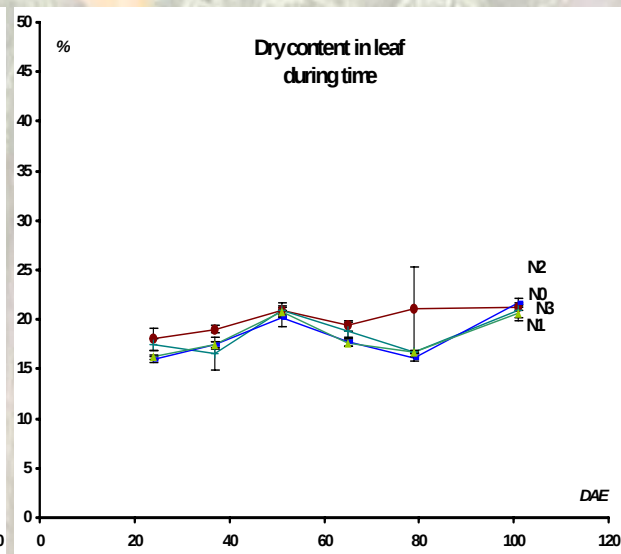
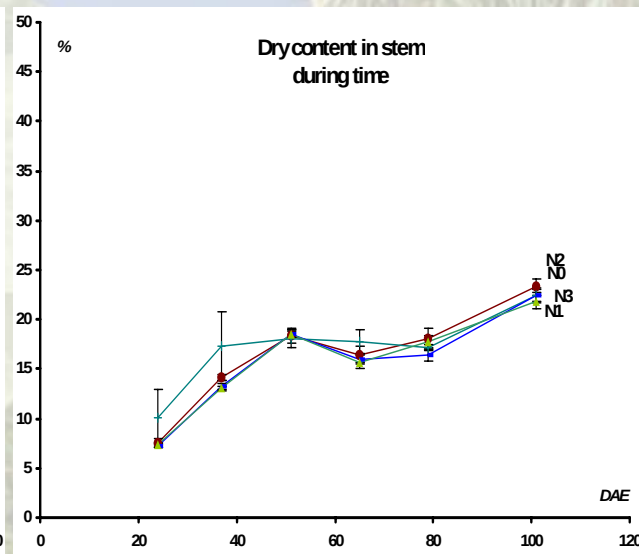
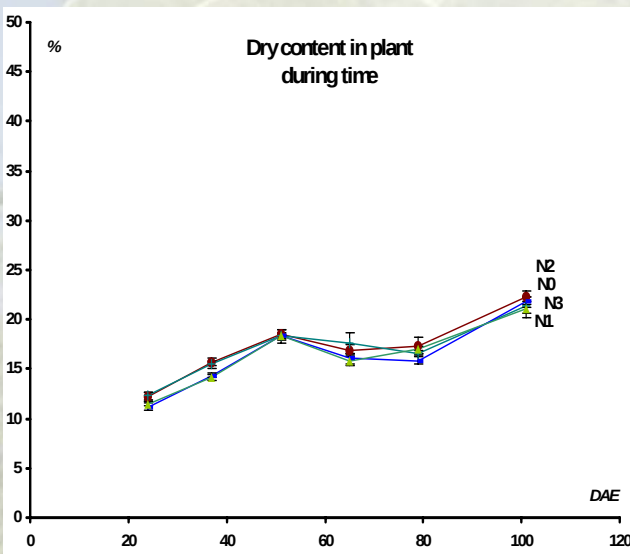


Task 2.3 - Nitrogen fertilisation rates -

Partitioning of fresh biomass in plant organs

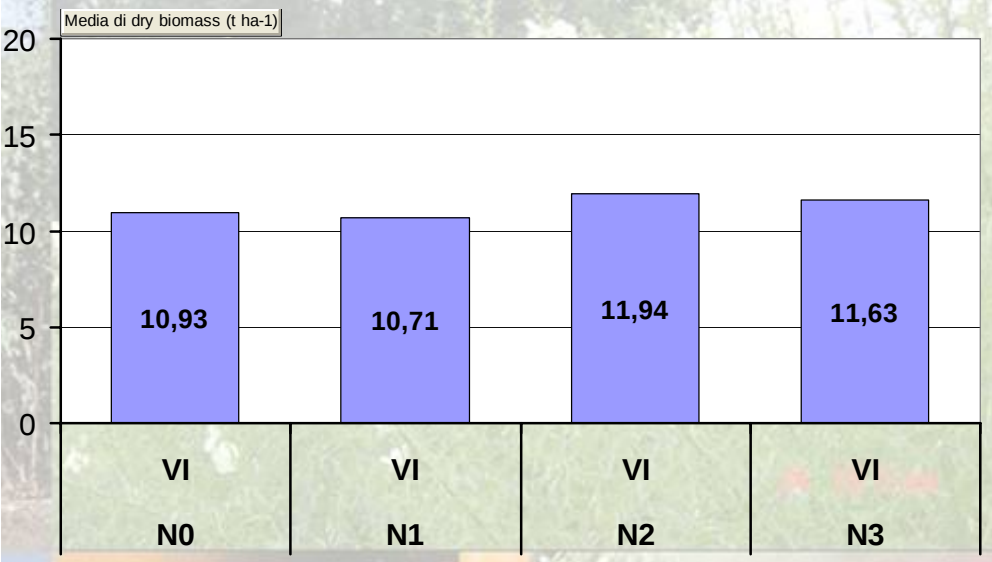
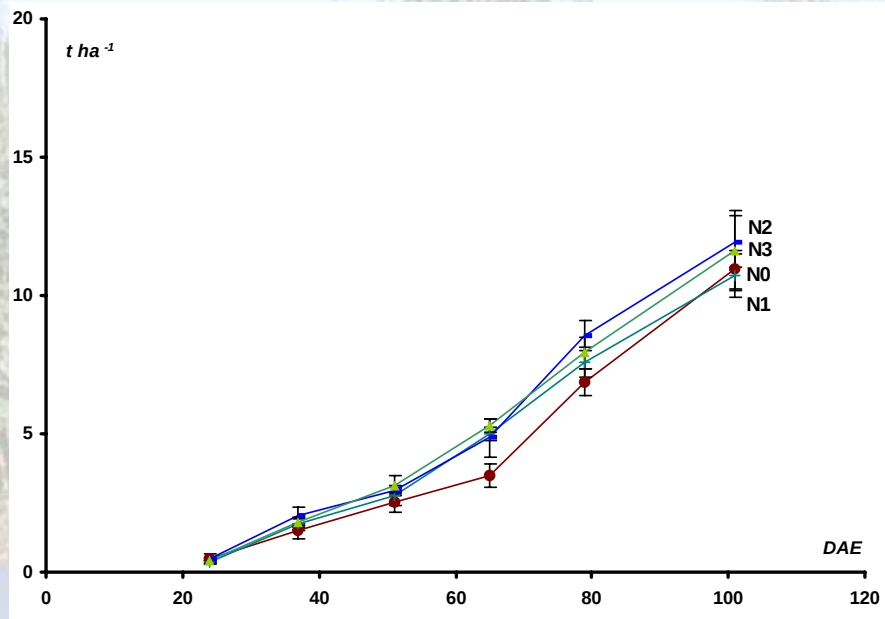


Dry content in plant, stem and leaf (%)

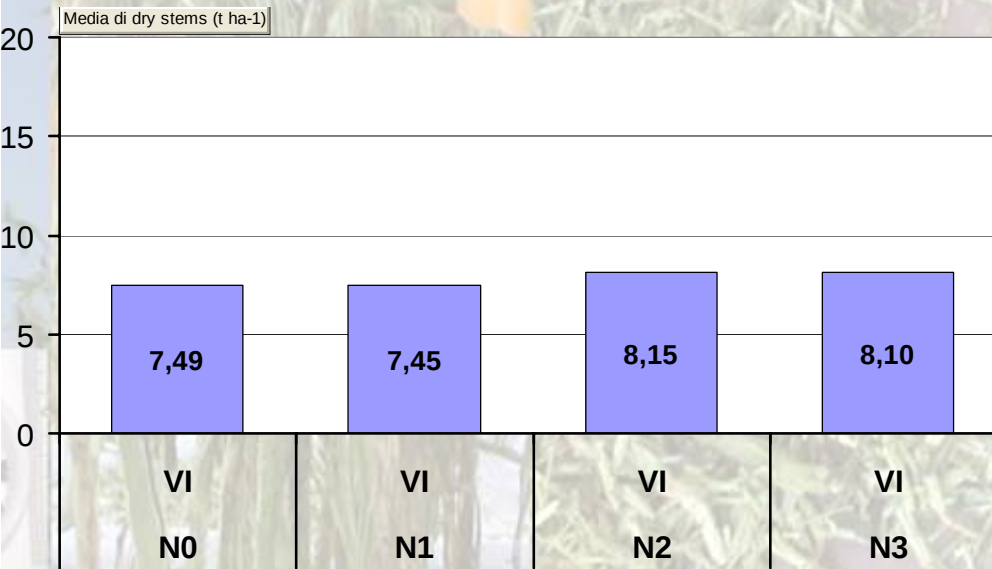
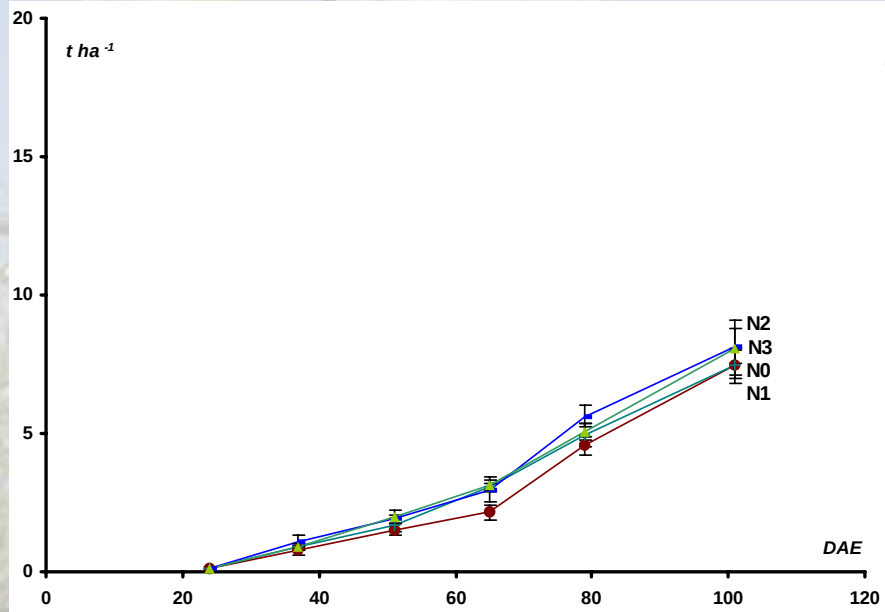


Task 2.3 - Nitrogen fertilisation rates -

Dry biomass yield (t ha⁻¹)



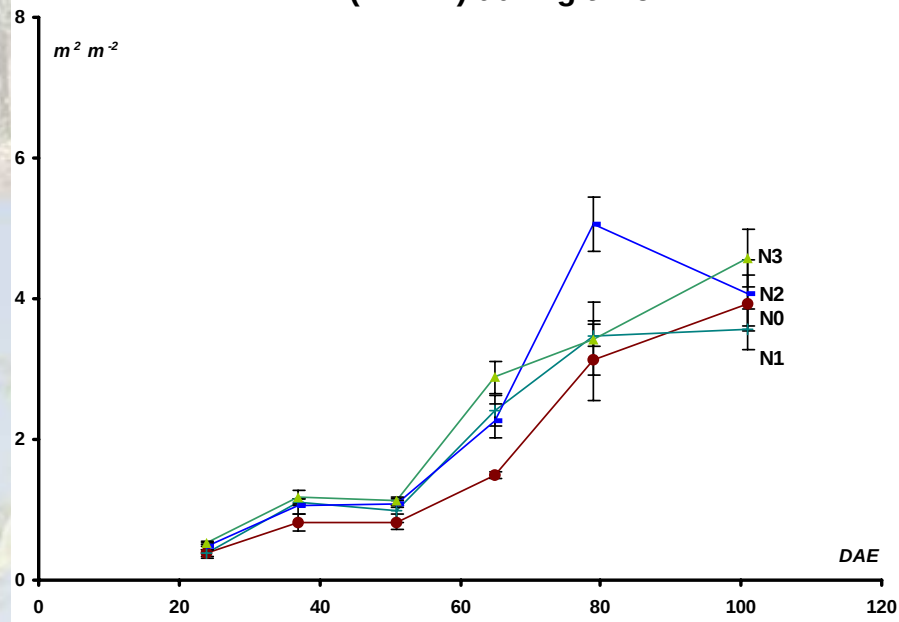
Dry stem yield (t ha⁻¹)



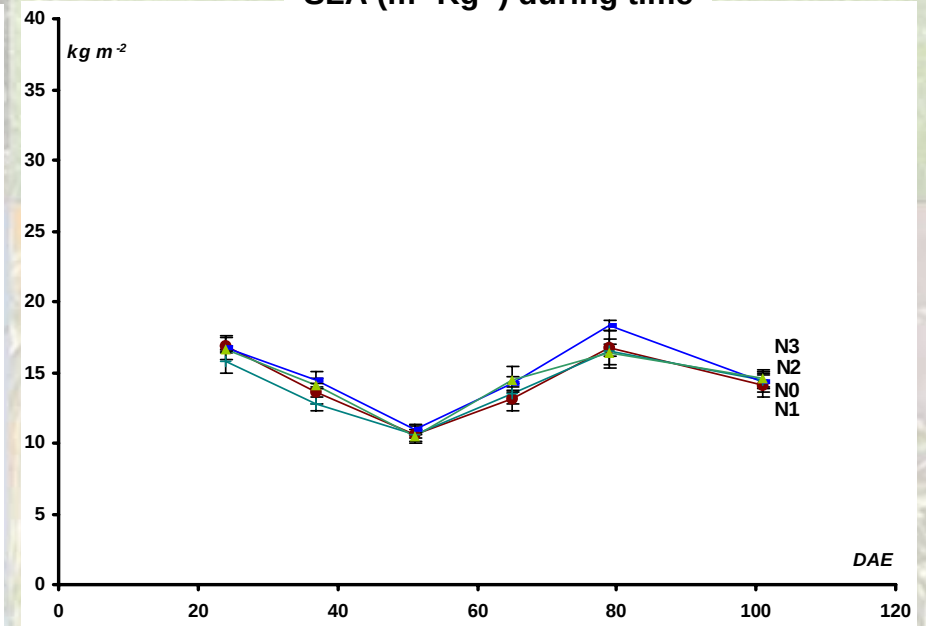
Task 2.3 - Nitrogen fertilisation rates -

Leaf Area Index and Specific Leaf Area

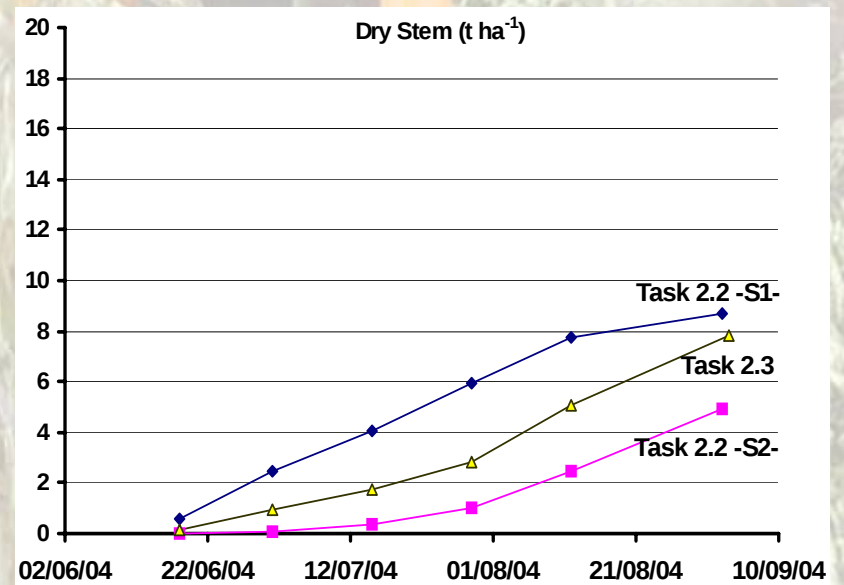
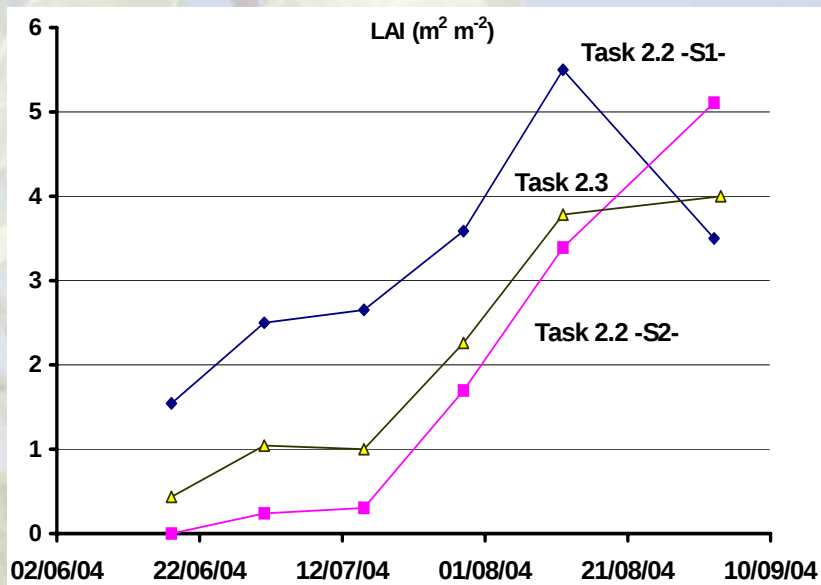
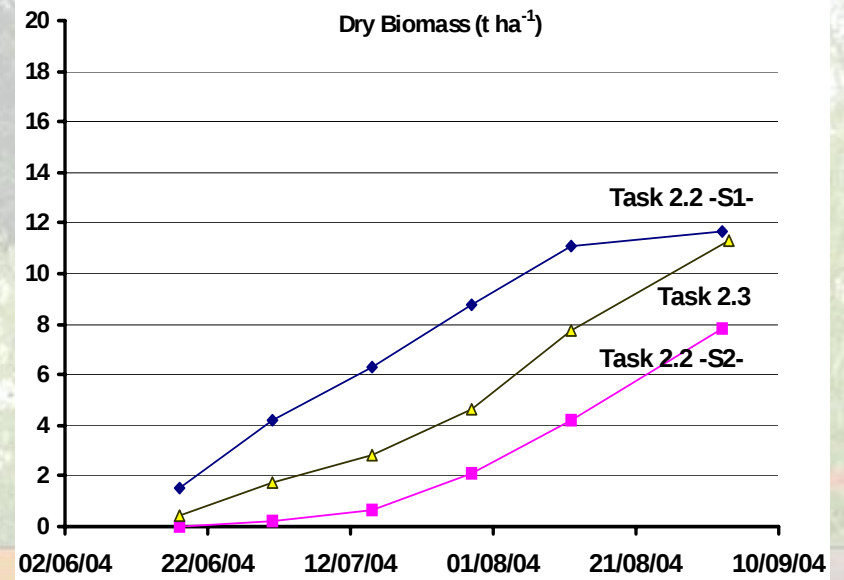
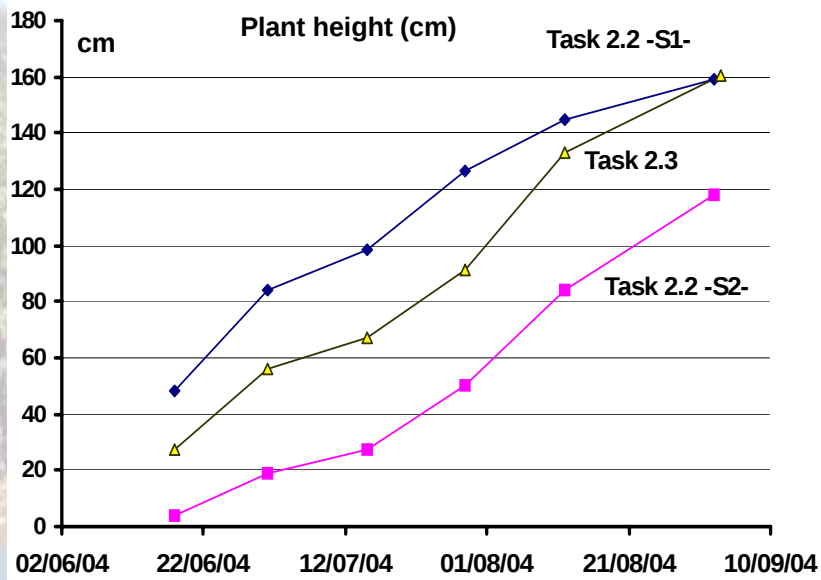
LAI ($\text{m}^2 \text{m}^{-2}$) during time



SLA ($\text{m}^2 \text{Kg}^{-1}$) during time



Task 2.2 vs Task 2.3



First conclusions

- 2004 yield > 2003 yield

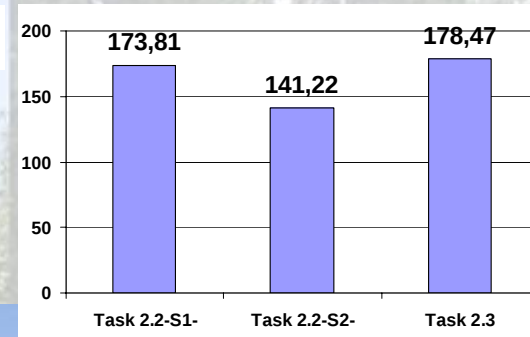
- Less effect of sowing time on plant height and biomass

- Trend of growing similar for S1 and S2

- No influence of nitrogen levels on yields



Plant height (cm)



Harvest VII – 21th September 2004



Data will be collected...

Meteorological data

Soil analysis at harvest A and B

Final harvests (Harvest A and B)

- *Biometric parameters*
- *Number of ramifications*
- *Number of nodes*
- *Decortication (fresh / dry weight of bark and core)*
- *N% in soil and stems*

Mechanical decortication



bark



core



