WP2. Adaptability and Productivity Field Trials

Results from the period 1/4/04-today

E. Alexopoulou
CRES
Biomass Department

WP2. Adaptability and Productivity Trials

In the second year of the project three kenaf field trials were established in Aliartos (central Greece).

- Task 2.1: Screening trial
- Task 2.2: Effect of sowing dates and plant populations on biomass yields
- Task 2.3: Effect of irrigation and nitrogen fertilisation on biomass yields

Established trials in the second year of the project

Organization	Country	Kenaf trials
CRES	Greece	• Screening trial • Sowing dates and plant densities • Irrigation and fertilization trial
UTH	Greece	• Sowing dates and plant densities • Irrigation and fertilization trial ***(in two sites)***
University of Catania	Italy	• Sowing dates and plant densities • Irrigation and fertilization trial
University of Bologna	Italy	• Sowing dates and plant densities • Fertilization trial
CETA	Italy	• 2 ha field trial
INIA	Spain	• Sowing dates and plant densities **(in two sites)** • Irrigation and fertilization trial
UniNOVA	Portugal	• Sowing dates and plant densities • Irrigation and fertilization trial
INRA	France	• Sowing dates and plant densities • Irrigation and fertilization trial

Site description
(Task 2.1, Task 2.2 and Task 2.3)

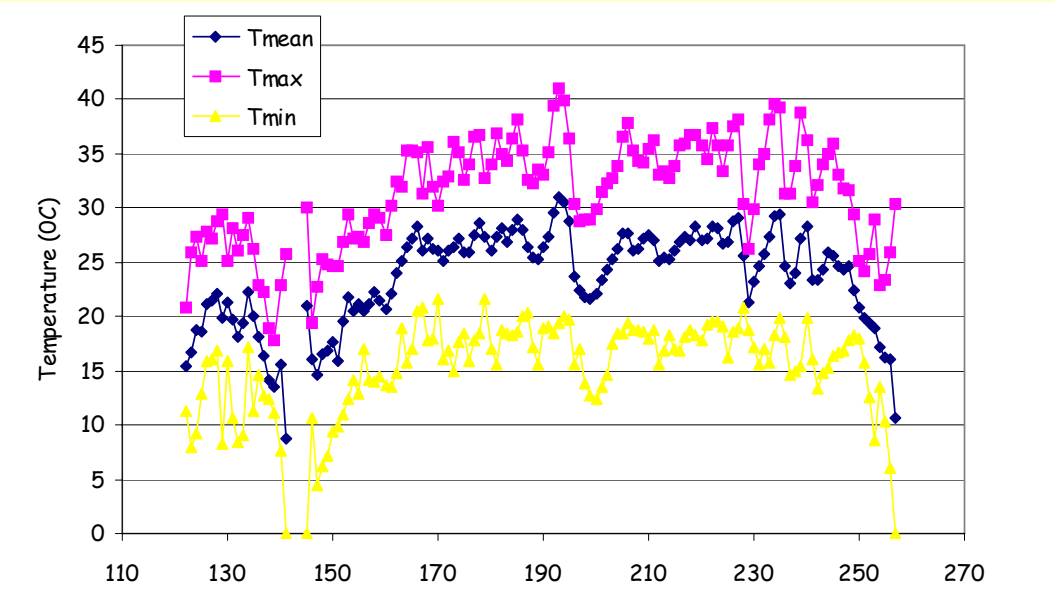
Location: Aliartos (central Greece)

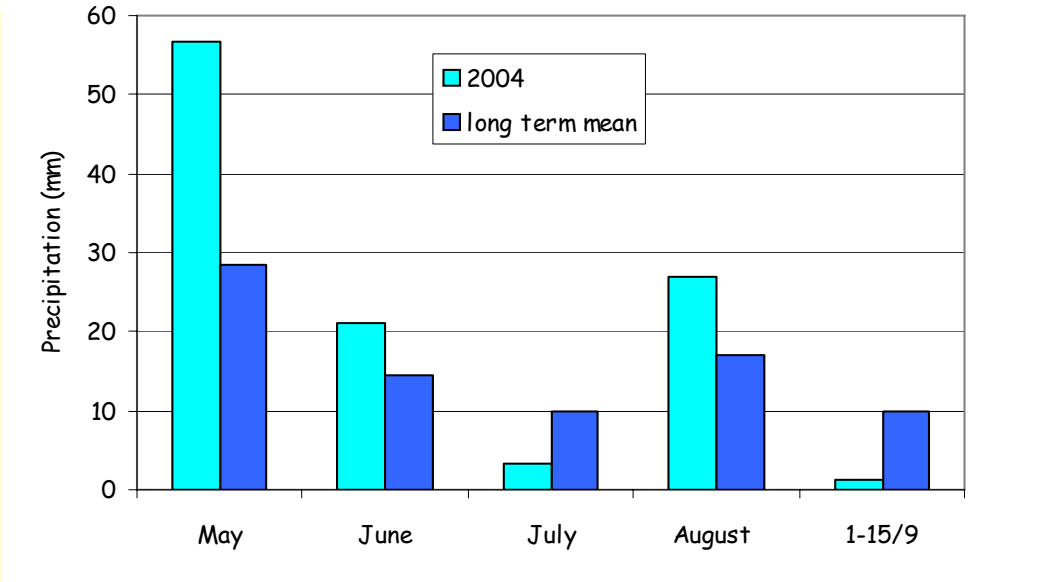
Site coordinates: Latitude 38^0 22′, longitude 23^0 10′ and altitude 114 m above the sea level

Climate: Dry, mean yearly precipitation less than 400 mm. An automatic weather station is established in the site of experiments recording temperature, precipitation, wind speed, relative humidity, RAR)

Soil: SCL with relatively low organic matter (less than 1%)
Soil analysis were carried out before sowing.

Daily temperature (^{0}C) (max, min and average) and monthly precipitation (mm) for the period 1/5/04-middle of September



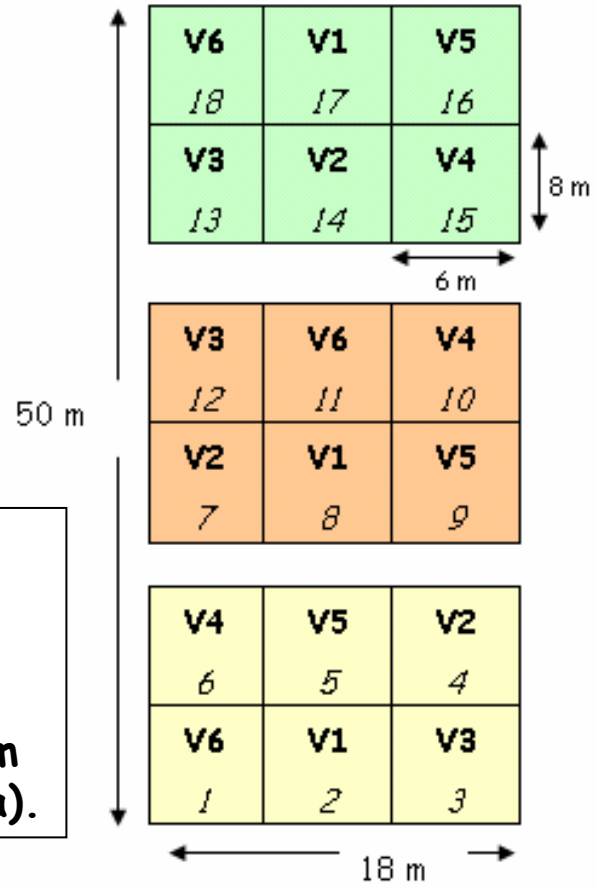


Experimental layout of Task 2.1
Screening trial

Sowing date: 13/5/04 (by hand)

Emergence date: 18/5/04

Thinning date: 14/6/04



Block I

Block II

Block III

5 marked plants/plot was used for height and stem diameter measurements

The distances between the rows were 50 cm and within the rows 10 cm (200,000 pl/ha).

Harvest dates: 12/7/04, 3/8/04, 25/8/04, 13/9/04

V1: Tainung 2
V2: Everglades 41
V3: Gregg
V4: Dowling
V5: SF 459
V6: G4

* The six tested varieties were:

Everglades 41

late variety that produce reasonable fiber production and a cotton-like leaf shape

Tainung 2

late variety, with superior raw fiber production and palmate leaf shape

Gregg

is a new variety with slightly longer growing period that may contributes to greater fiber production and palmate leaf shape

Dowling

new variety, that may prove to be a very high fiber producer with non-palmate leaf shape

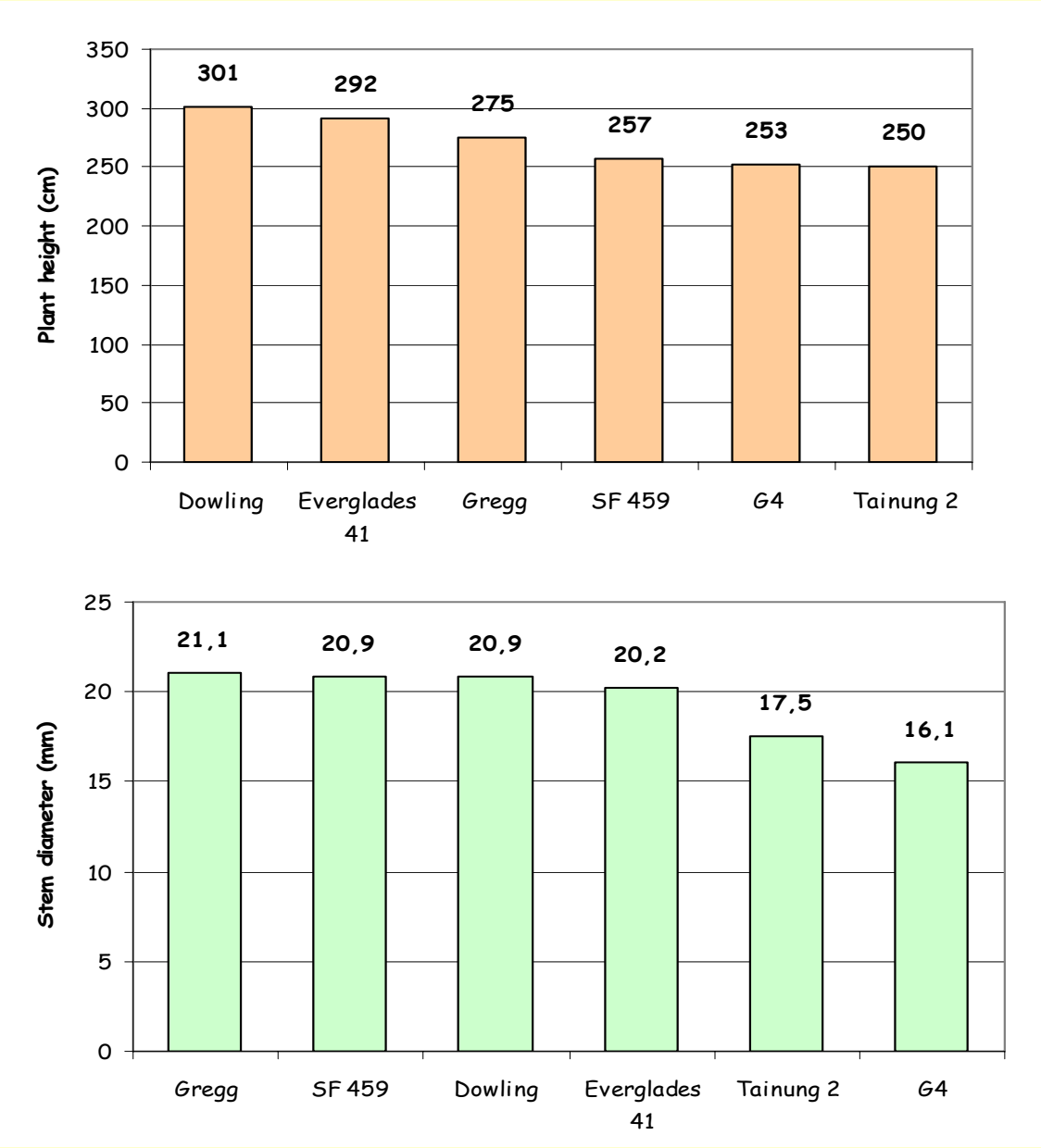
SF 459

new variety that is favored for soils with nematode problem and palmate leaf shape

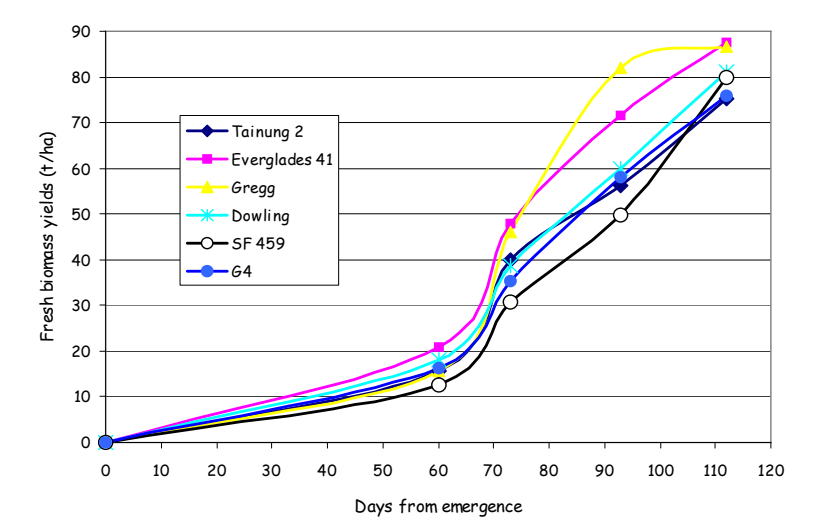
G4

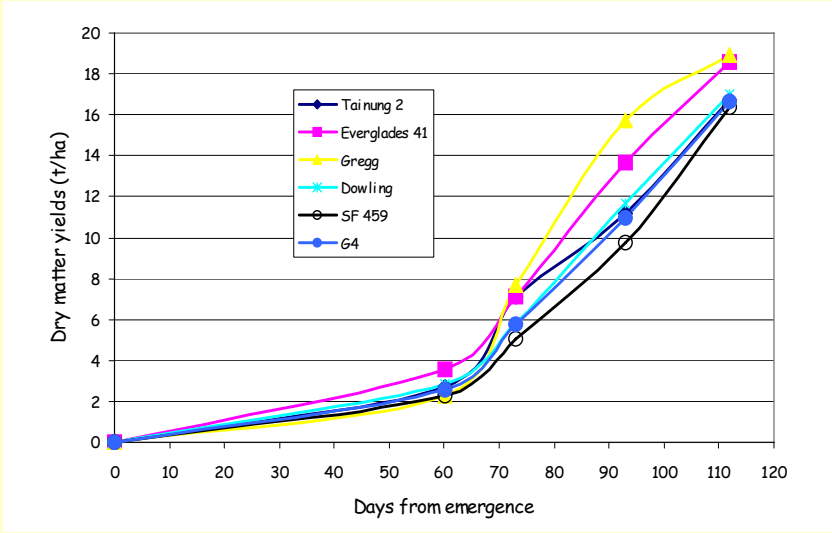
it is considered as a photoperiod-insensitive variety that combines a short maturity cycle (100-130 days between emergence and flowering) and high productivity when grown in the Mediterranean region)

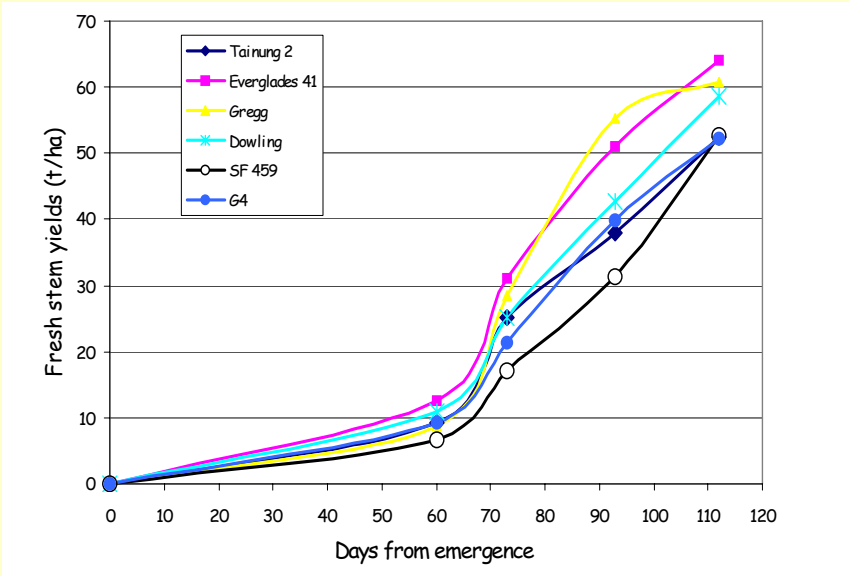
Plant height (cm) and basal stem diameter (mm) – 7/9/04

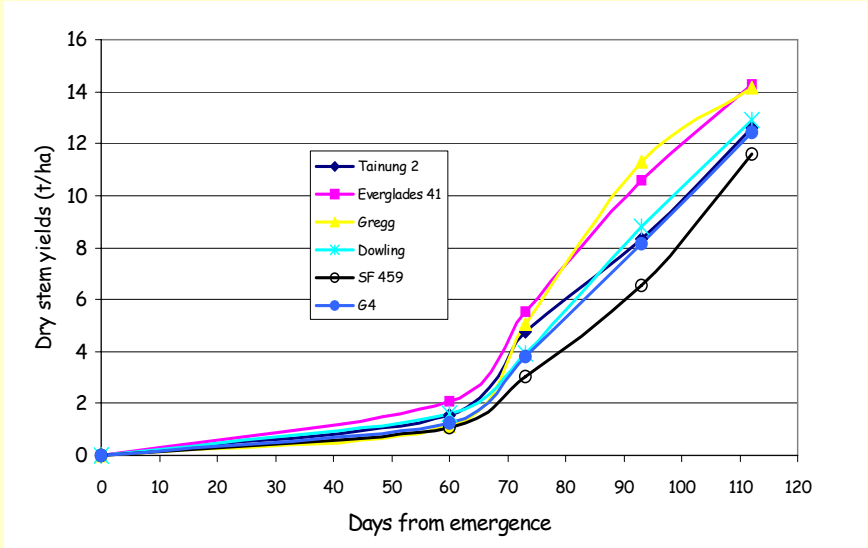


Accumulation of fresh and dry matter yields (t/ha) until middle of September 2004

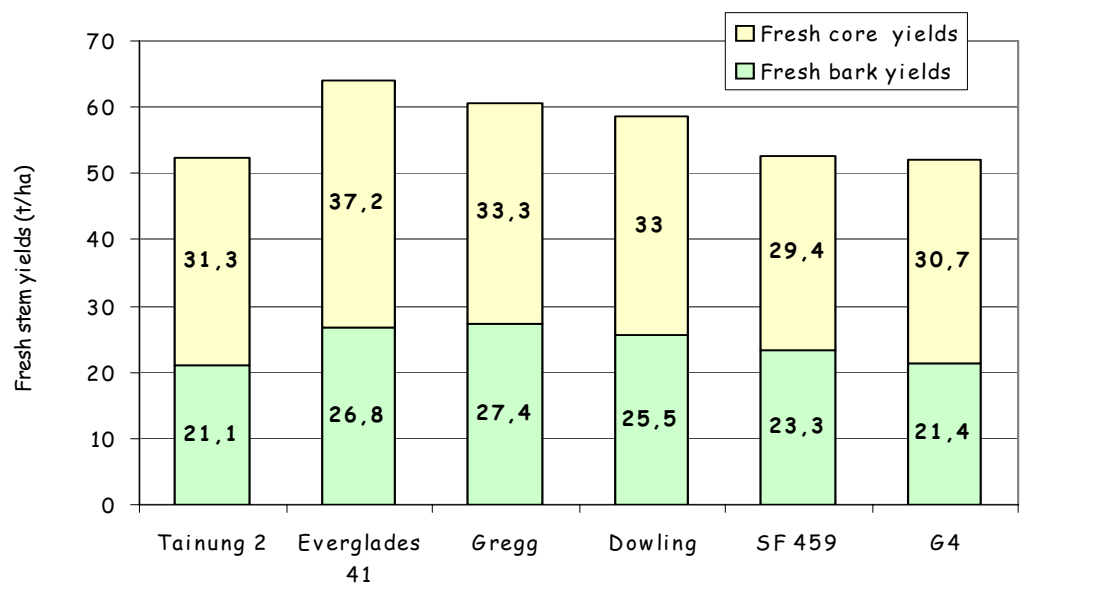


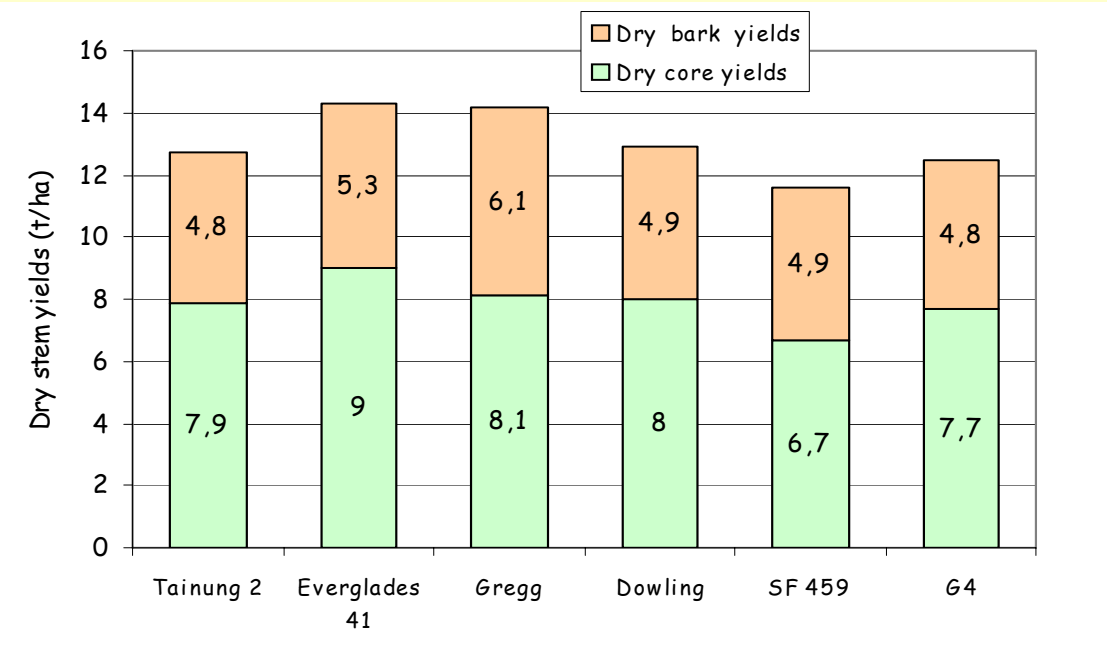






Fresh and dry stem yields (t/ha) for both stem fractions – 7/9/04





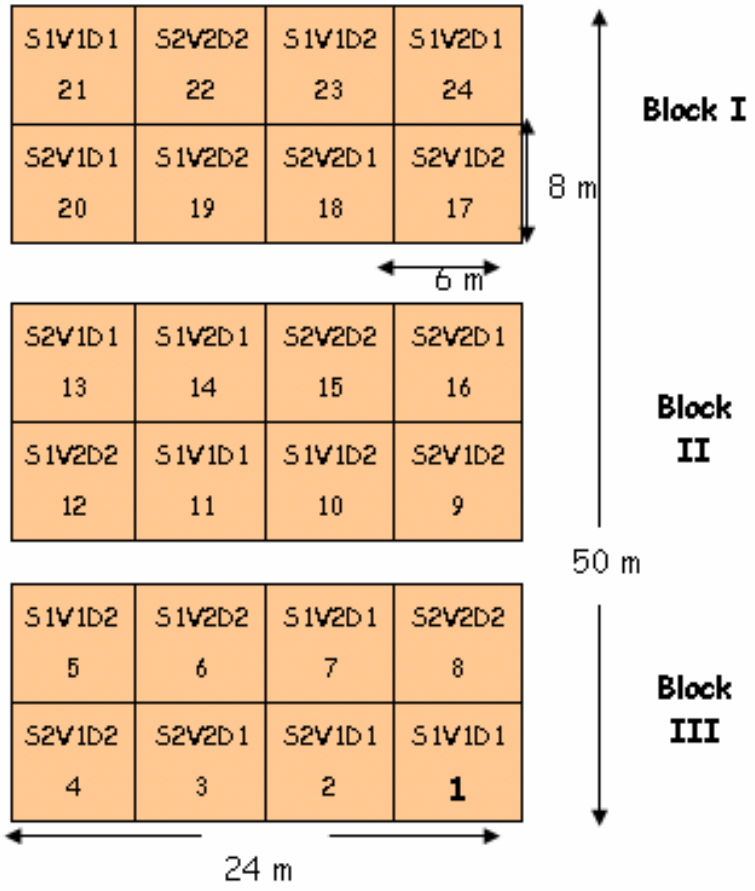
The highest percentage of bark on dry basis was recorded for the variety Gregg and the lowest one by 36,7% (Everglades 41).

Conclusions so far from the nursery trial

- The highest plants were developed (early September) **by variety Dowling (301 cm)**, while the lowest ones were **by G4 (253 cm)**.
- At the same time three out of the six tested varieties had a basal stem diameter around **21mm (Gregg, Dowling and SF 459)**. It should be mentioned that the stems with the smallest density were developed by **G4 (16.1mm)**.
- In the middle of September 2004 the dry matter yields by descending order were **19 t/ha (Gregg),** 18.6 t/ha (Everglades 41), 17 t/ha (Dowling), 16.7 t/ha (Tainung 2 and G4) and 16.4 t/ha (SF 459).
- It should be pointed out that **no statistical significant differences** were recorded for the measured parameters among the tested varieties (LSD Test, $P<0.05$)

In the beginning of September 2004 the variety G4 had produced flowers (the flowering of G4 started at the end of July 2004).

Experimental layout of Task 2.2
Sowing times and plant populations



Treatments:

S1:18/5/03, S2: 7/6/03

V1: Tainung 2, V2: Everglades 41

D1: 200,000 pl/ha, D2: 400,000 pl/ha

Dates of sowing:

S1:30/4/04

S2: 25/5/04

Dates of emergence:

S1:4/5/04

S2: 29/5/04

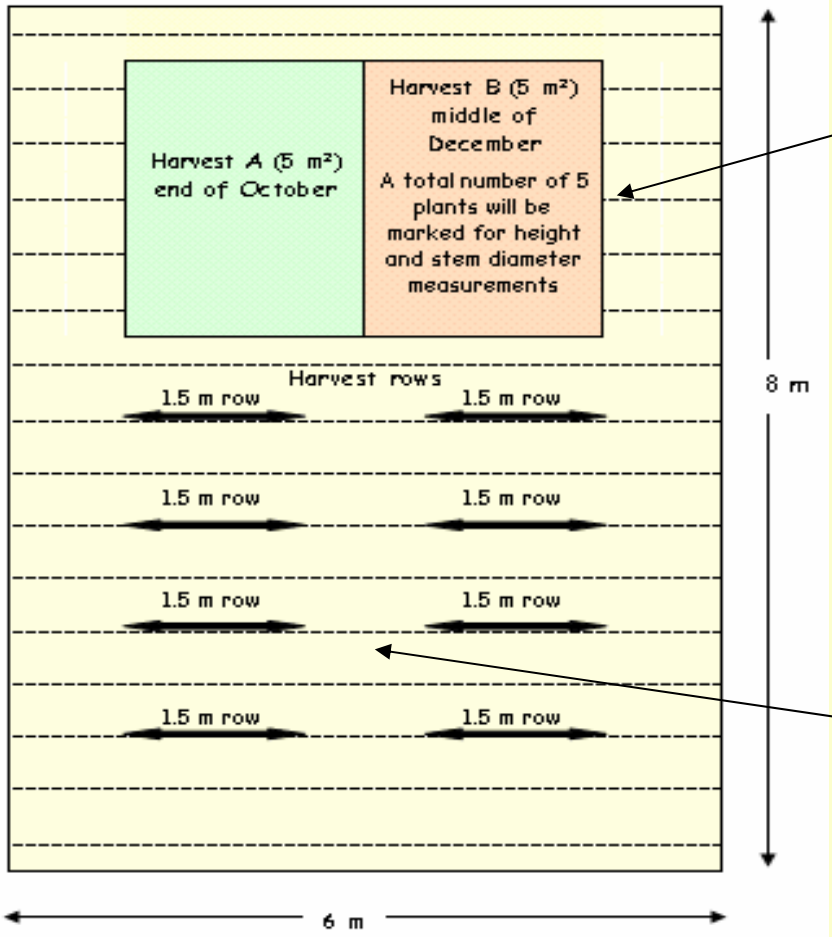
Dates of thinning:

S1:5/6/04

S2: 22/6/04

A quantity of 75 kg N/ha was applied through the drip irrigation system at the end of June

Experimental plot of Task 2.2
Sowing times and plant populations



- The size of each plot will be 6x8m (48m²)
- The distance between the rows will be 50 cm and within the rows 5 cm for the density of 400,000 plants/ha and 10 cm for the density of 200,000 plants/ha.
- A total number of 16 rows will be sown in each plot.

The plant height was measured on five marked plant per plot every two weeks, while on the same plants the basal stem diameter was measured every four weeks.

Harvest dates:

12/7/04

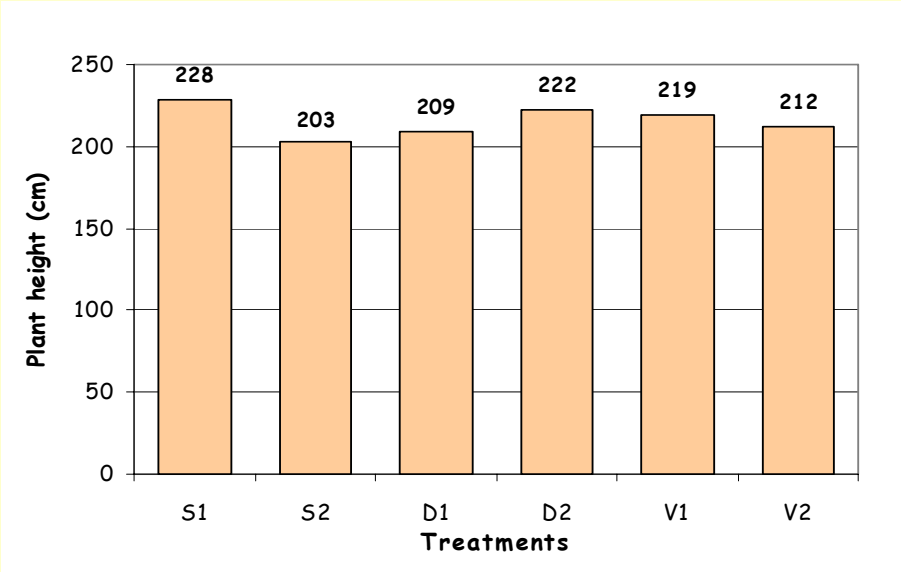
3/8/04

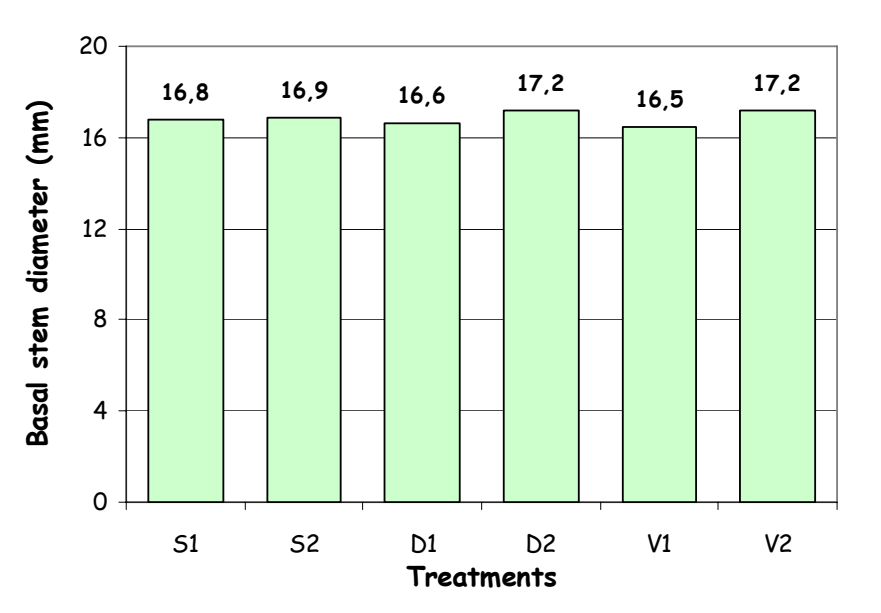
25/8/04

13/9/04

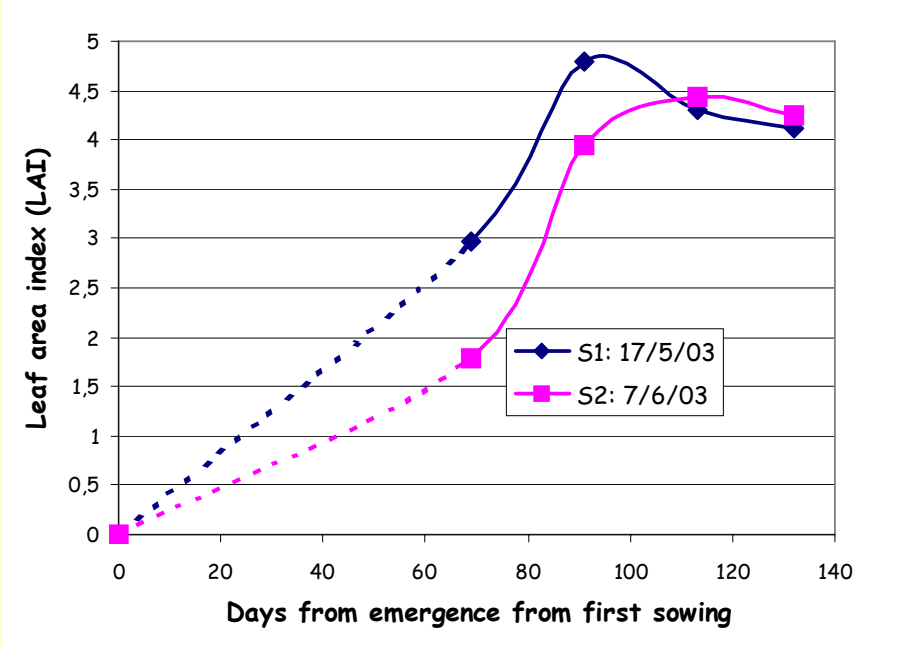
View of the nursery trial (end of June 2004)

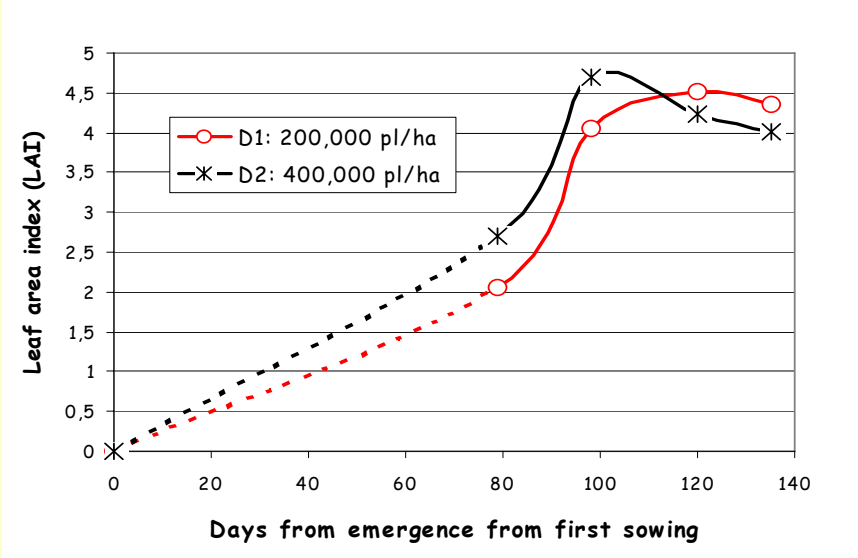
Task 2.2 – Final plant height (cm) and basal stem diameter (mm)

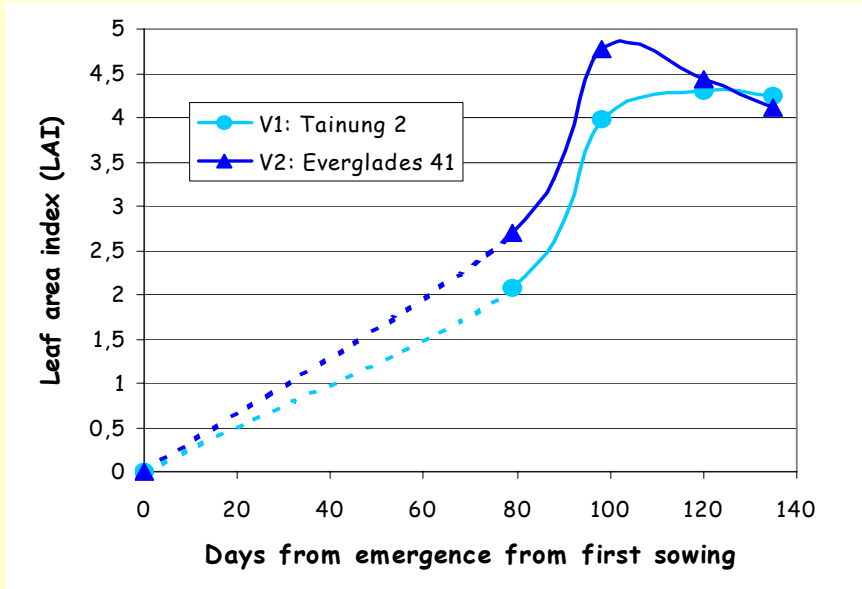




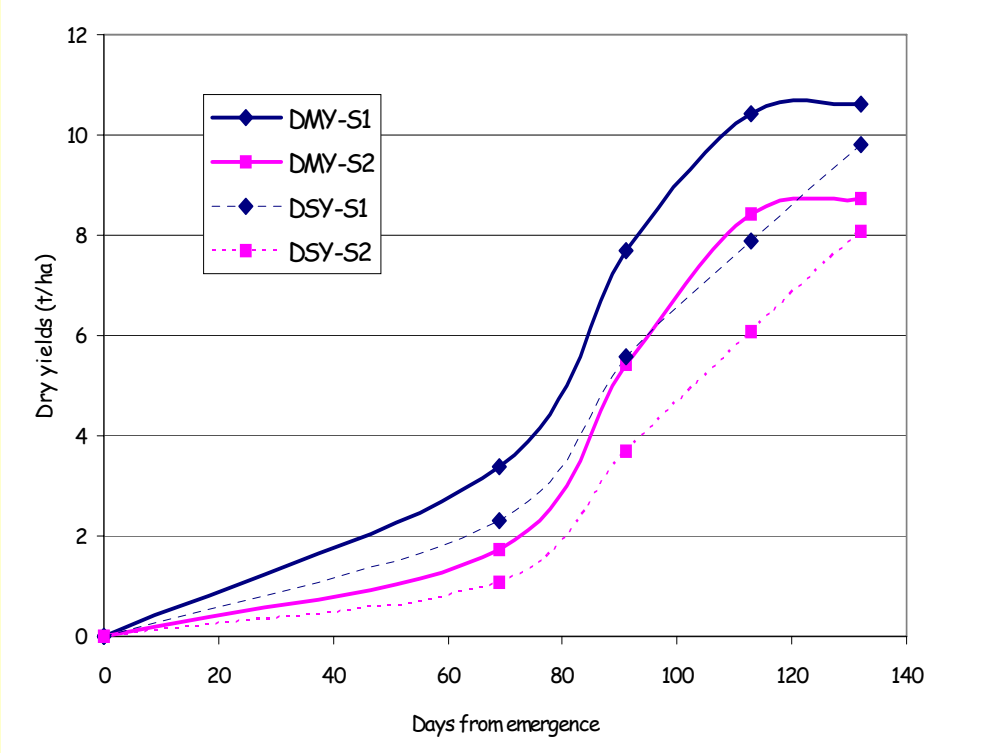
Evolution of leaf area meter (LAI) until the middle of September 2004

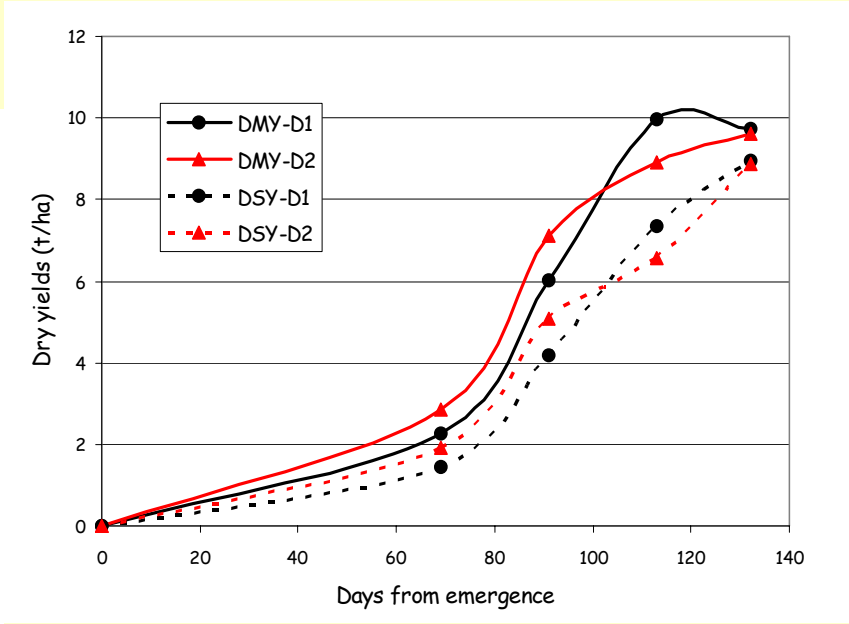


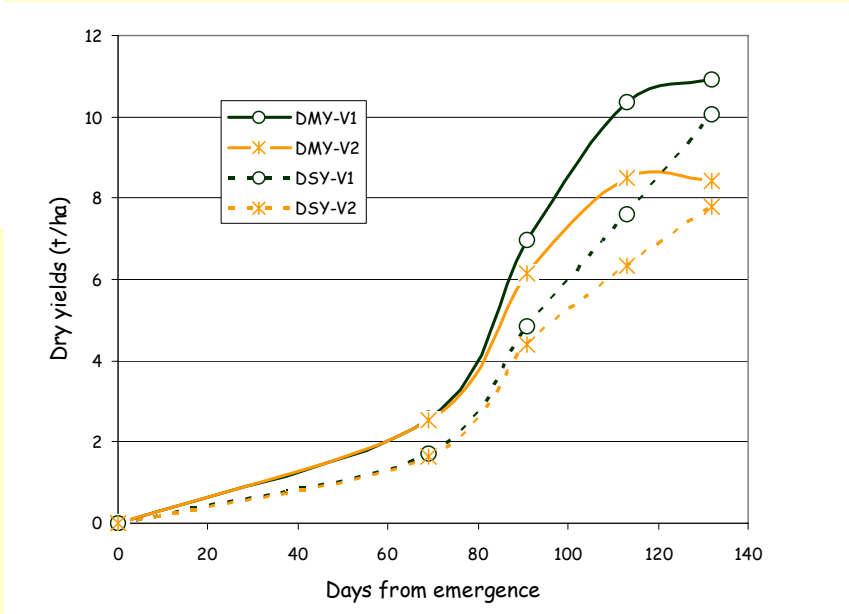




Accumulation of total dry and stem yields (t/ha)



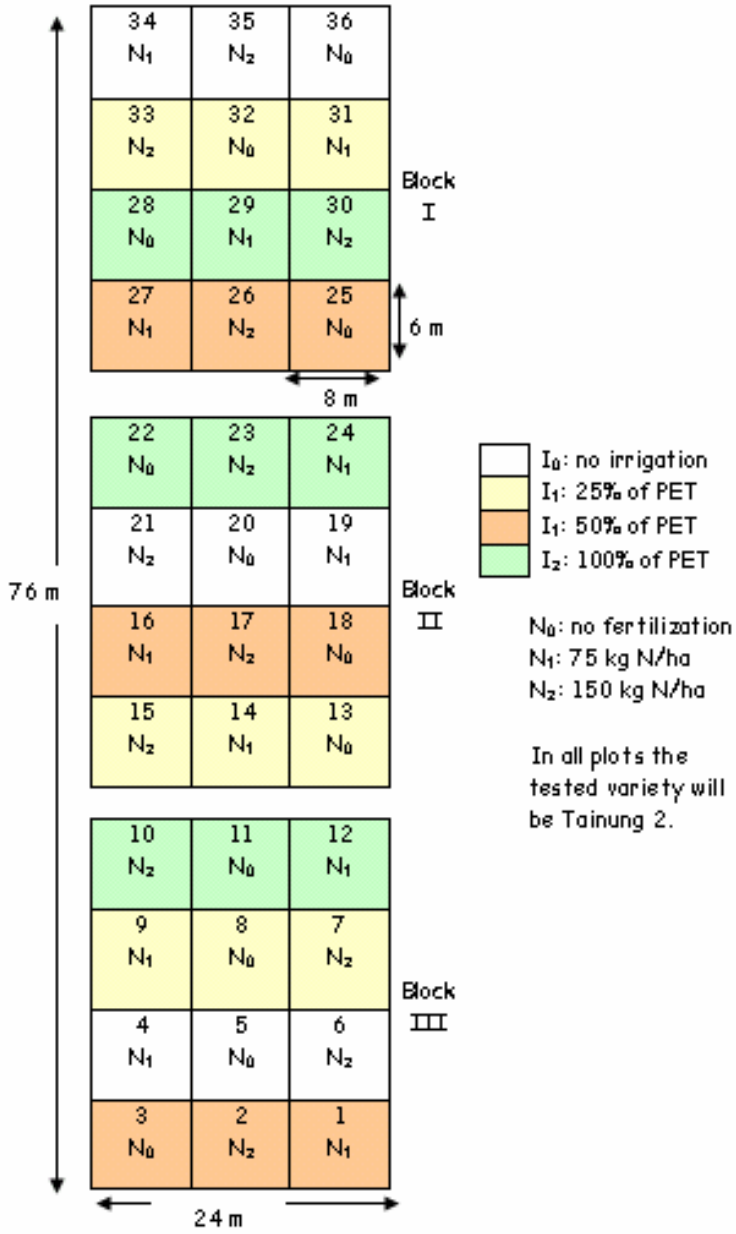




Conclusions from the sowings trial

- **Statistical significant differences were recorded between the two sowing dates until the end of August 2004** for the tested parameters (plant height, diameter and biomass yields). In the middle of September 2004 the dry matter yields of early sowing were 10.6t/ha, while the late sowing were 8.8 t/ha.
- **Until the end of August 2004 the plots with the density of 400,000 pl/ha were more productive compared to the plots of the 200,000 pl/ha (with statistical differences, LSD Test, P<0.05).** In the middle of September the dry yields of two plant densities were almost the same 9.7 t/ha (200,000 pl/ha) and 9,6 t/ha (400,000 pl/ha).
- A superiority concerning the productivity of Tainung 2 was recorded over the Everglades 41 in the middle of September 2004 (10.9 t/ha versus to 8.4 t/ha) that was statistic significant.

Experimental layout of Task 2.3
Irrigation and nitrogen fertilization rates



Date of sowing: 11/5/04

↓

Date of emergence: 16/5/04

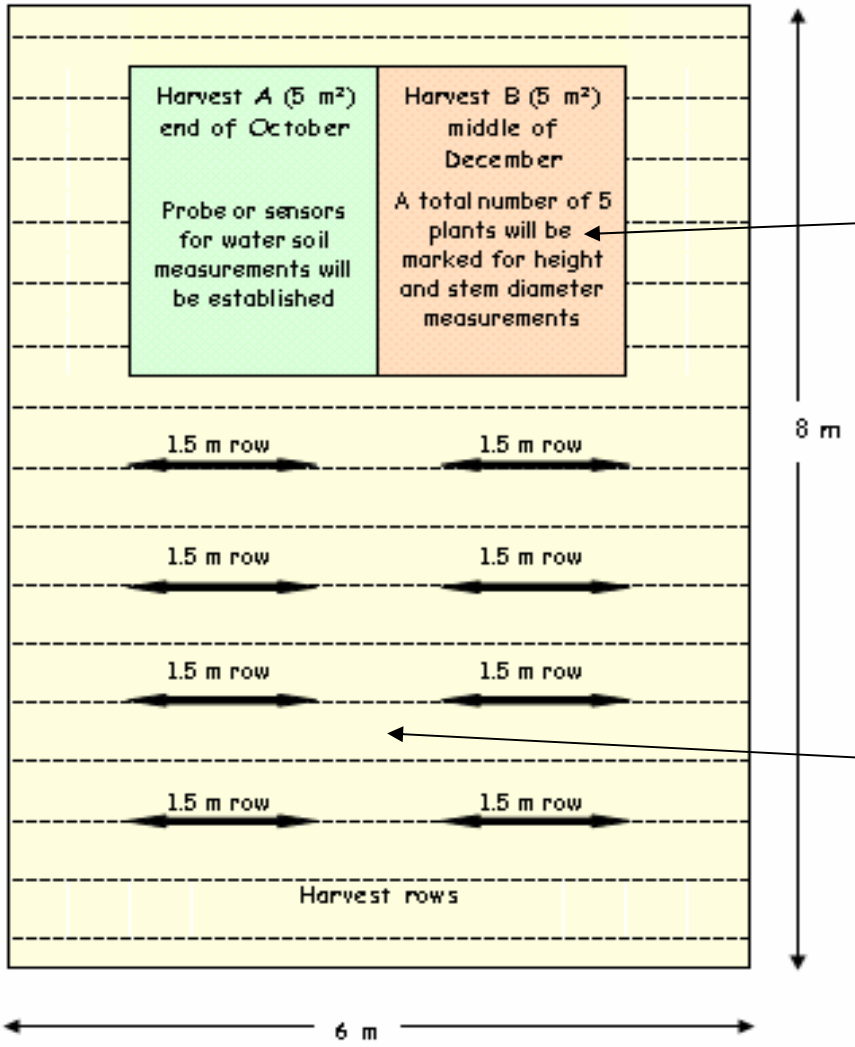
↓

Date of thinning: 8/6/04

↓

The different levels of nitrogen fertilization was applied through the drip irrigation system in the beginning of July 2004

Experimental plot of Task 2.3
Irrigation and nitrogen fertilization rates



- The size of each plot will be 6×8m (48m²)
- The distance between the rows will be 50 cm and within the rows 10 cm (200,000 plants/ha).
- One variety will be sown (Tainung 2 or Everglades 41).
- A total number of 16 rows will be sown in each plot.

The plant height was measured on five marked plant per plot every two weeks, while on the same plants the basal stem diameter was measured every four weeks.

Harvest dates:

12/7/04

3/8/04

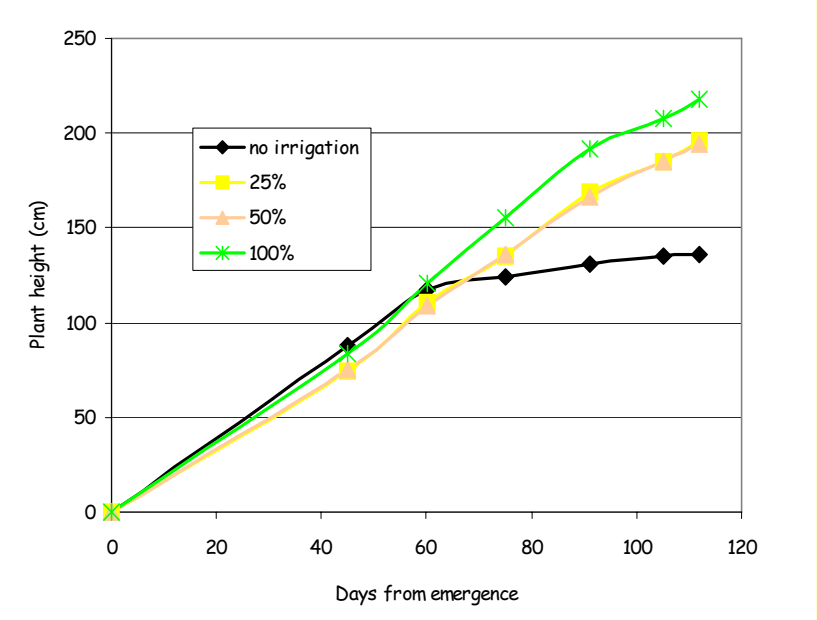
25/8/04

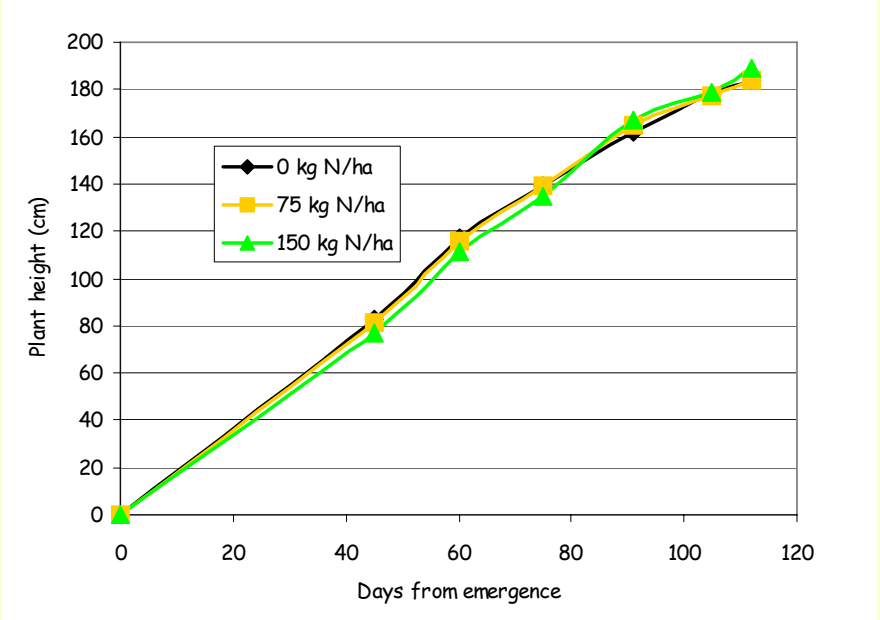
13/9/04

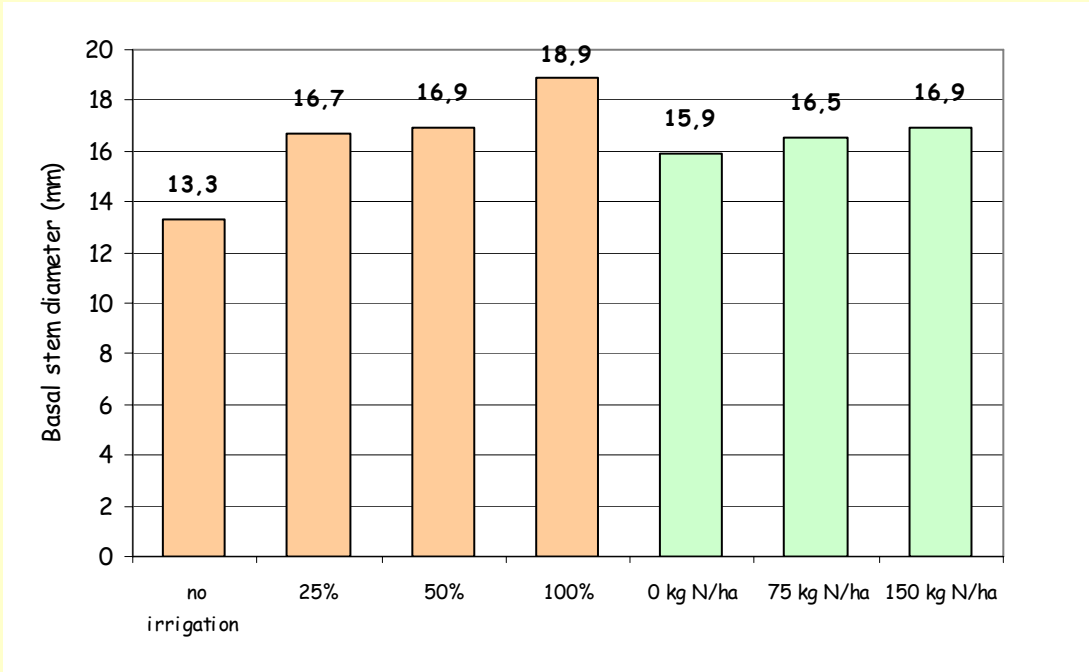
View of the irrigation trial

Effect of the irrigation on plant growth

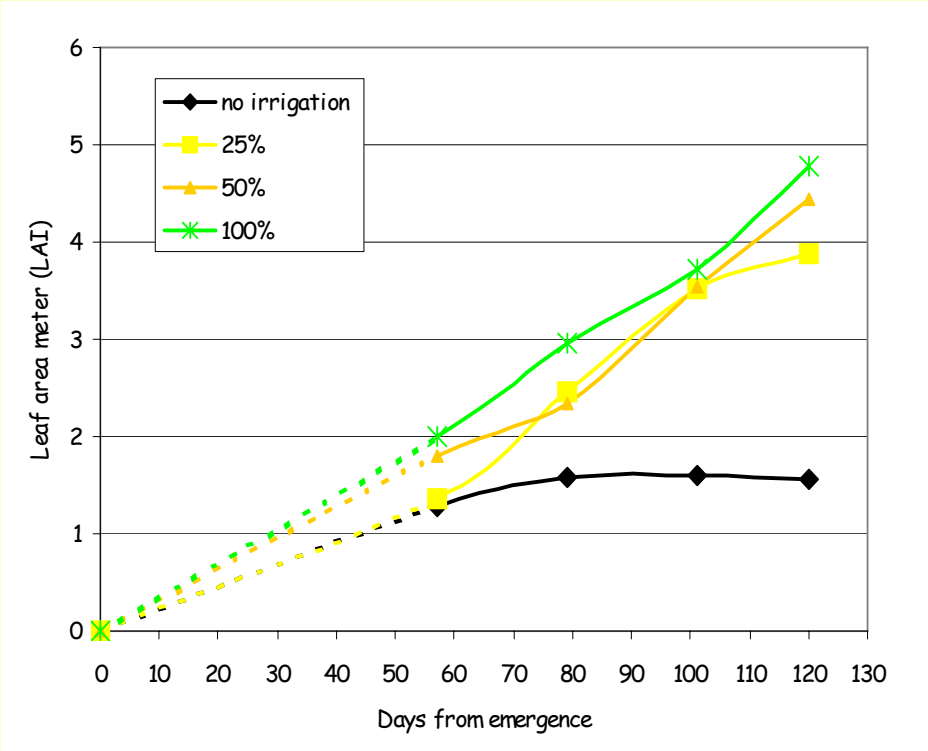
Plant height (cm) and basal stem diameter (mm) -7/9/04

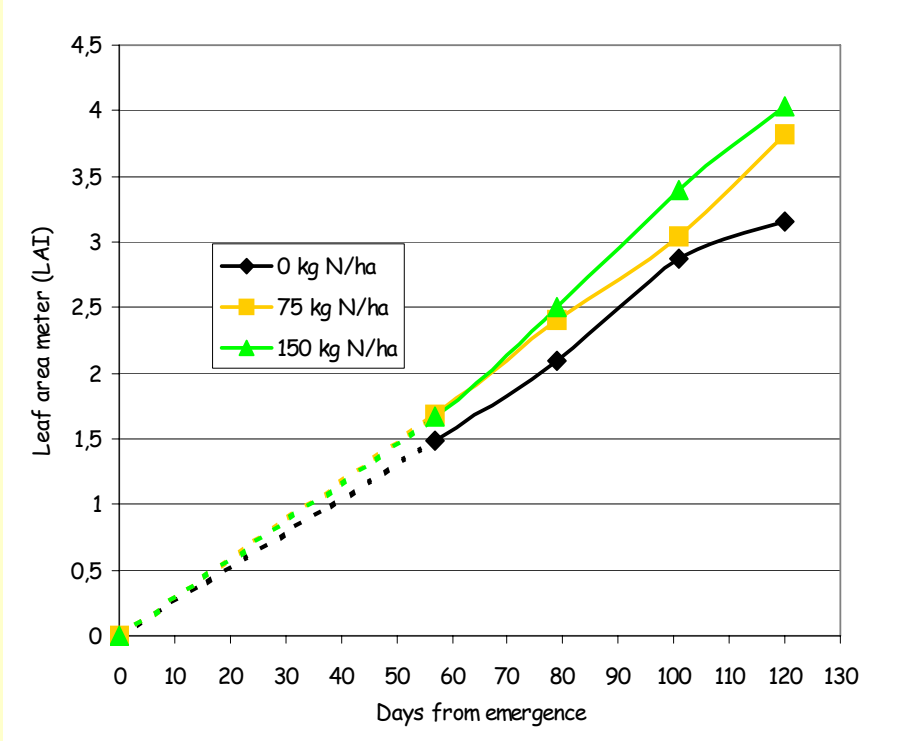




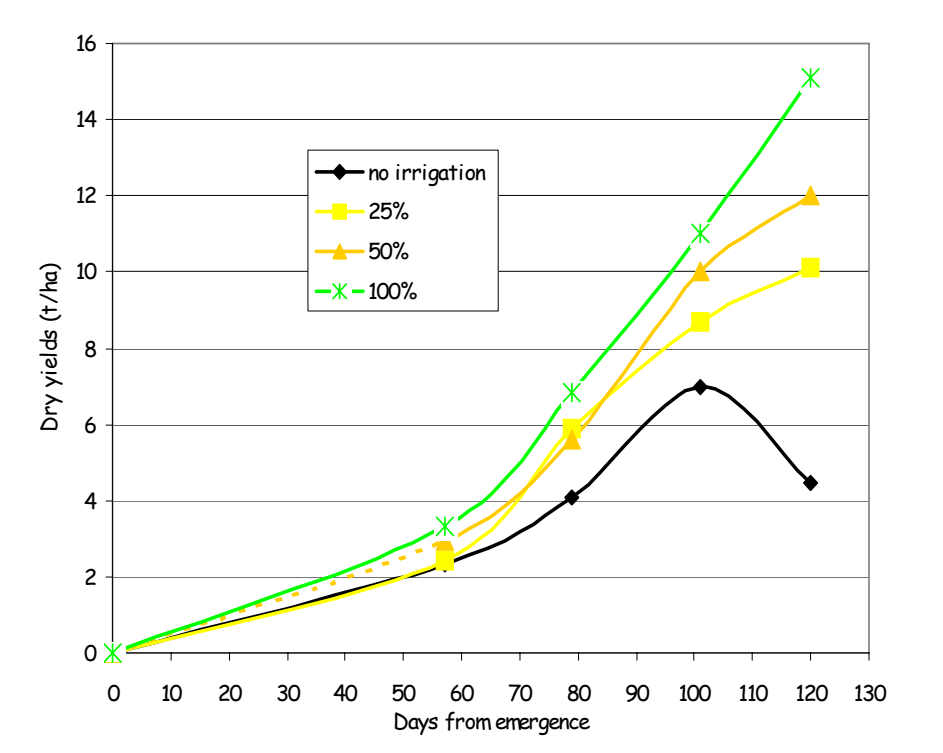


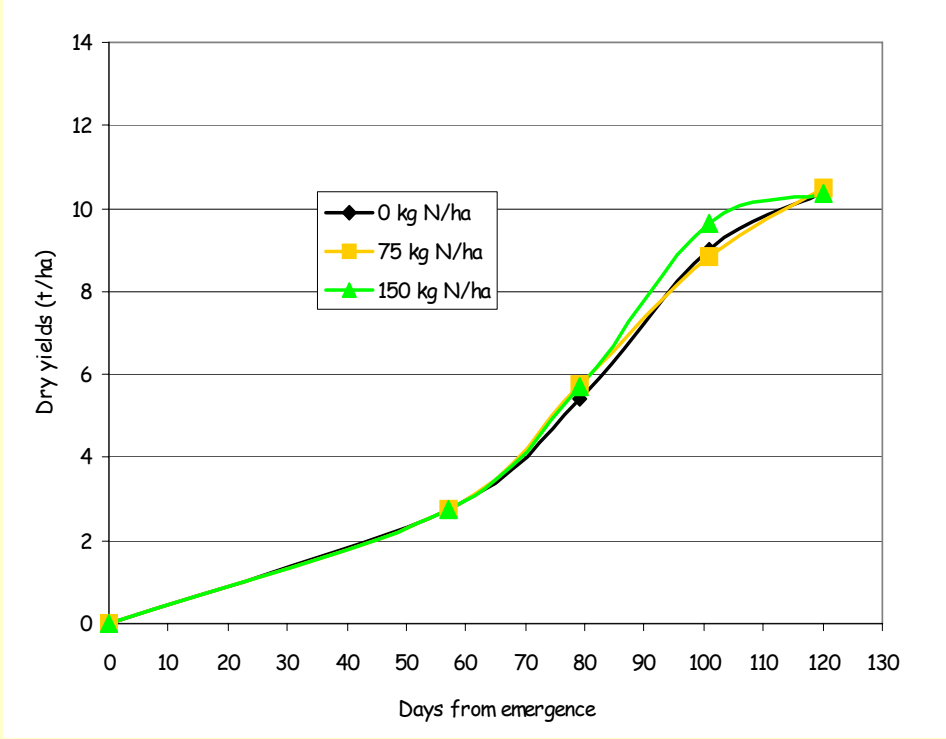
Evolution of leaf area meter (LAI) until the middle of September 2004



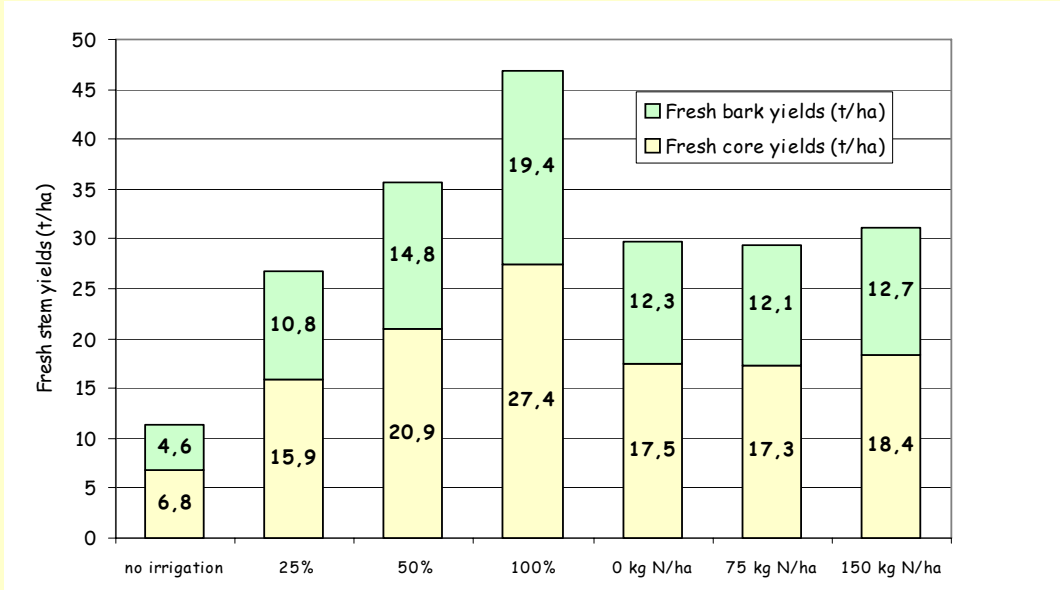


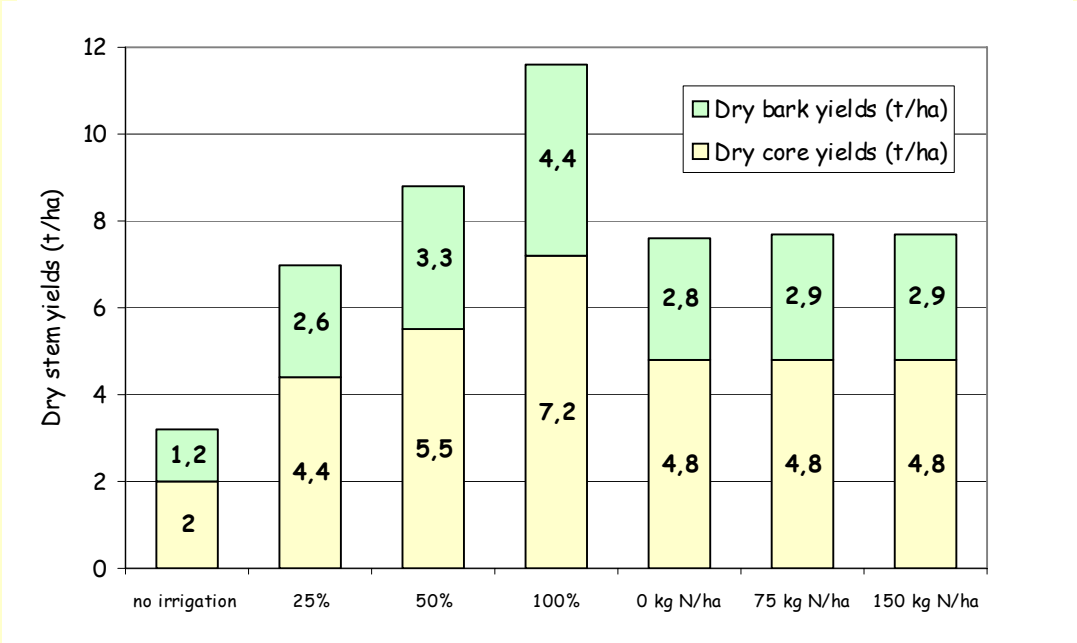
Accumulation of dry matter yields (t/ha) until the middle of September





Fresh and dry stem yields (t/ha) for both stem fractions (core and bark) in middle of September 2004





Conclusions from the irrigation trial

- **Statistical significant differences** were recorded for all the measured parameters concerning **the four irrigation rates (LSD Test, P<0.05)**. In the middle of September the achieved dry yields in the no-irrigated plots were 4.4 t/ha, while in the plots that received 25% of PET was 10 t/ha, in the plots of 50% of PET was 12 t/ha and in the plots that fully irrigated were 15 t/ha.
- On the other hand **no statistical significant were recorded among the three tested nitrogen fertilization rates** and the achieved yields in the middle of September 2004 were almost the same 10.4 t/ha (0 kg N/ha), 10.5 t/ha (75 kg N/ha) and 10.4 t/ha (150 kg N/ha)