WP2. Adaptability and Productivity Field Trials

Results from the period 1/7/05-today

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WP2. Adaptability and Productivity Trials

In the third 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 fertilization on biomass yields
- Task 2.4: 2 ha field (a ha field was established in Komotini in May 2005 (Everglades 41) by NAGREF an 1 ha field was established in Thessaloniki)

It should be pointed out that the fields of Tasks 2.1, 2.2 and 2.3 were established in the exactly the same sites that were established in the previous two years.

Established trials in the third year of the project

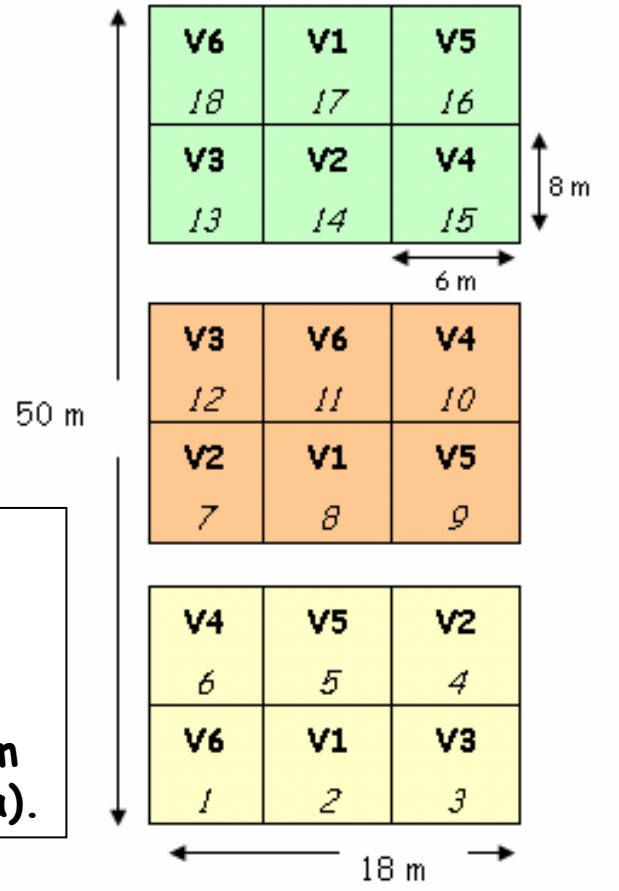
Organization	Country	Kenaf trials
CRES	Greece	• Screening trial • Sowing dates and plant densities • Irrigation and fertilization trial • 1 ha field in Thessaloniki
NAGREF	Greece	• 2 ha field trial in Komotini
UTH	Greece	• Sowing dates and plant densities • Irrigation and fertilization trial • ***(in 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 • 2 ha field
UniNOVA	Portugal	• Sowing dates and plant densities • Irrigation and fertilization trial
INRA	France	• Sowing dates and plant densities • Irrigation and fertilization trial

Experimental layout of Task 2.1
Screening trial

Sowing date: 6/5/2005 (by hand)

Emergence date: 11/5/05

Thinning date: 9/6/05



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

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: 25/7/05, 9/8/05, 30/8/05, 28/9/05, 18/10/05, 8/11/05

* 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

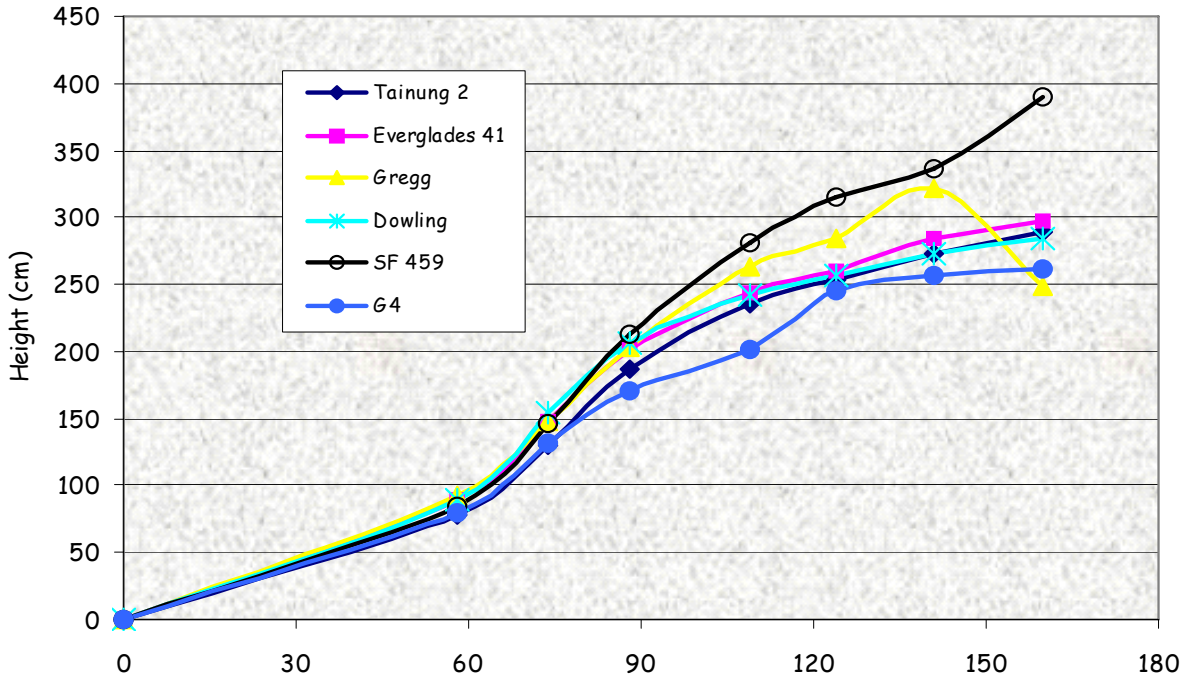
new variety, that may prove to be a very high fiber producer with non-palmate leaf shape

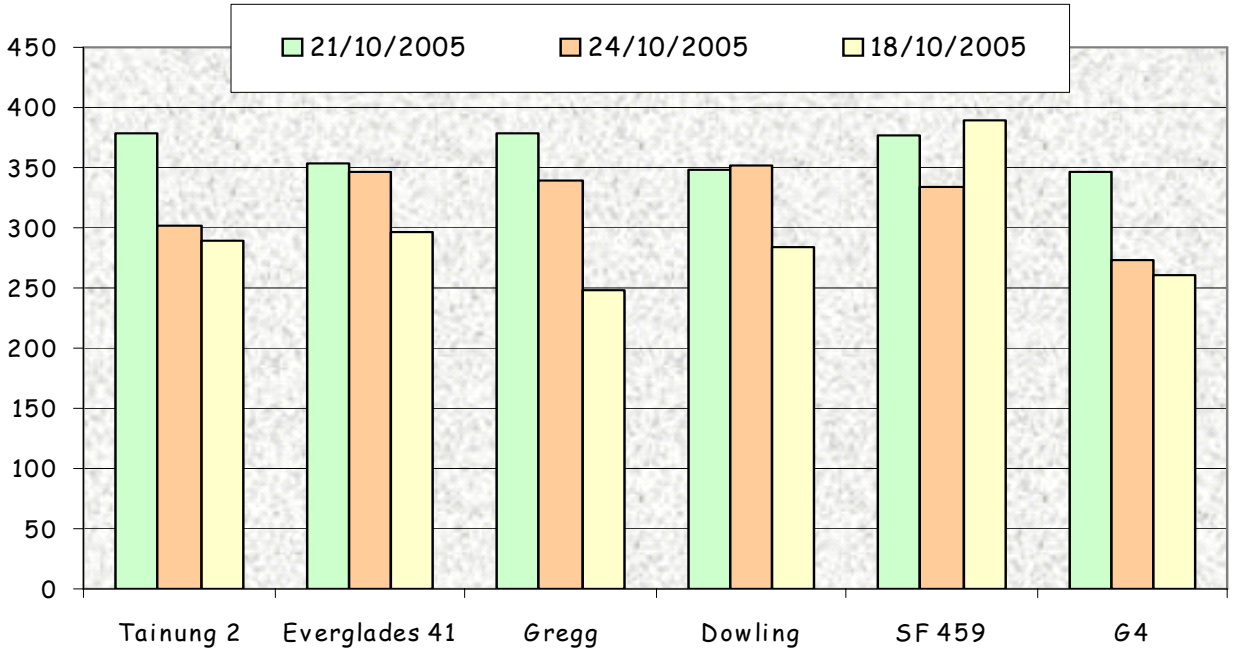
SF 459

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

G4

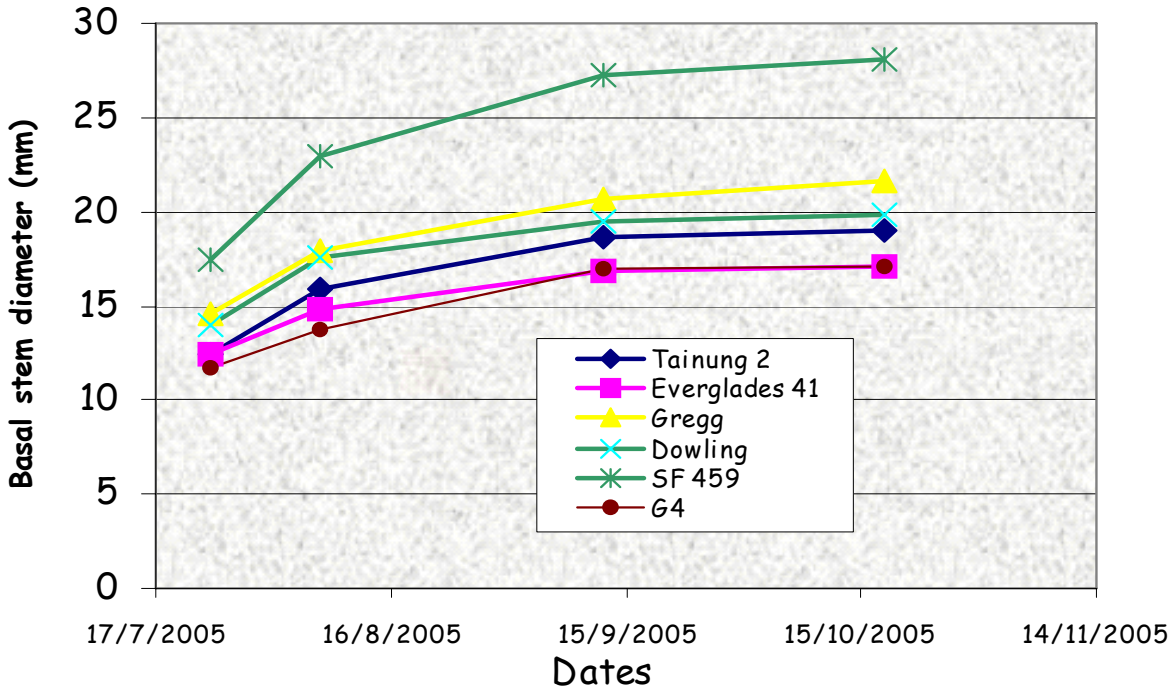
it is considered as a photoperiod-insensitive variety that combines a short maturity cycle (100-130 days between emergence and flowering) and high productivity when grown in the Mediterranean region)

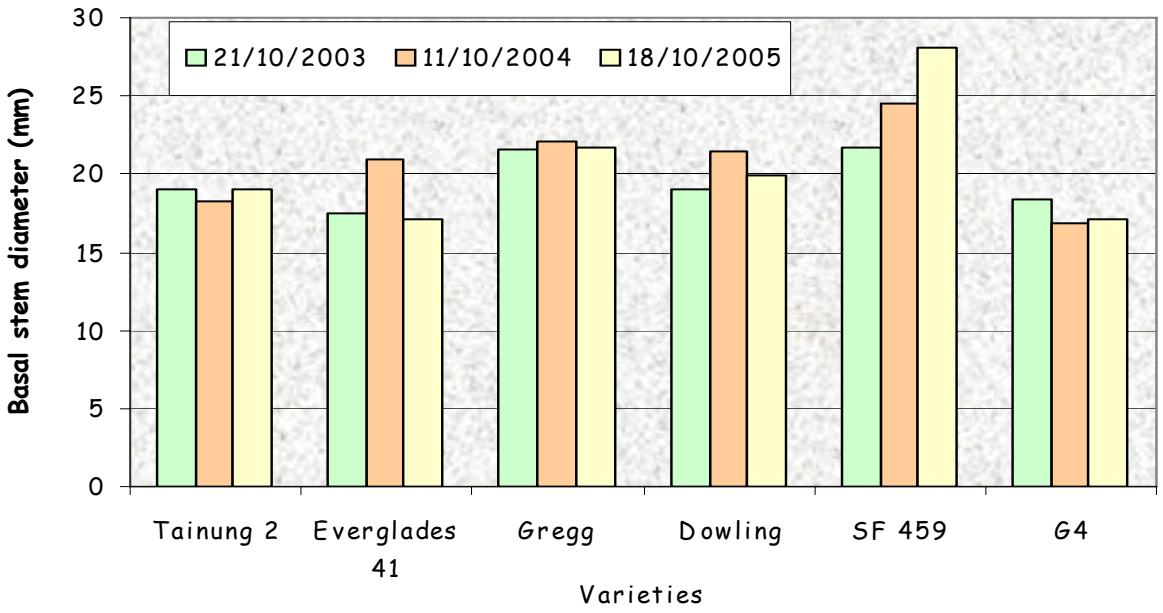




Plant height (cm)

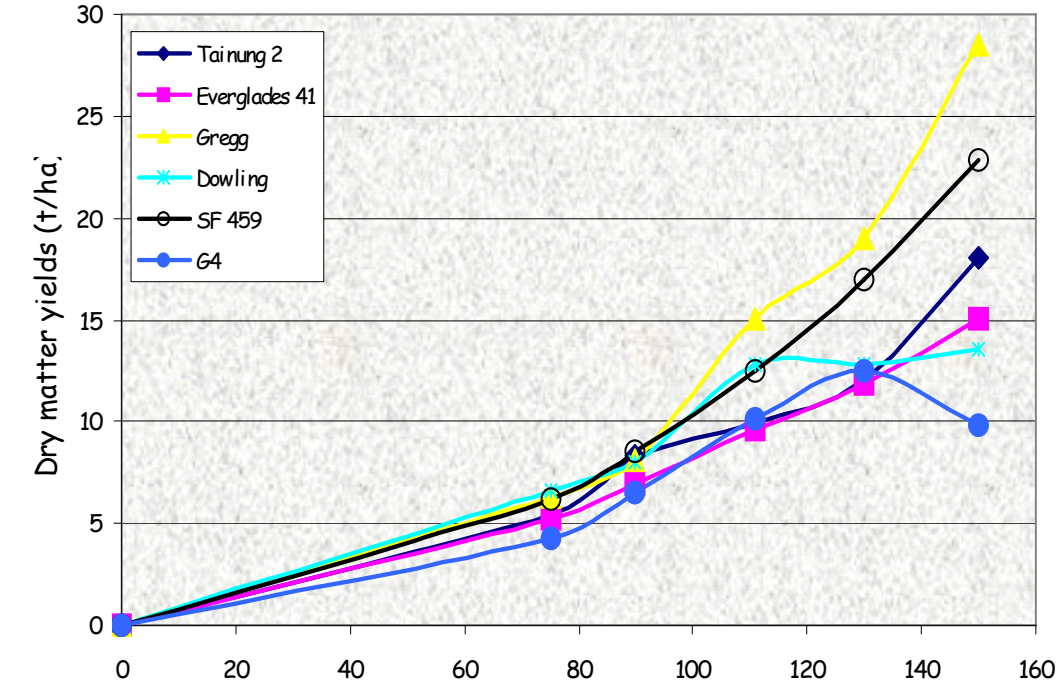
- In October 2005 the highest plants were recorded from the variety **SF 459** (390 cm).
- A comparison among the three years showed a decline of plant height from year to year. In October 2003 the mean plant height was 364 cm, in October 2004 was 324 cm (11% decline) and in October 2005 was 284 cm that mean a further decline 12%.

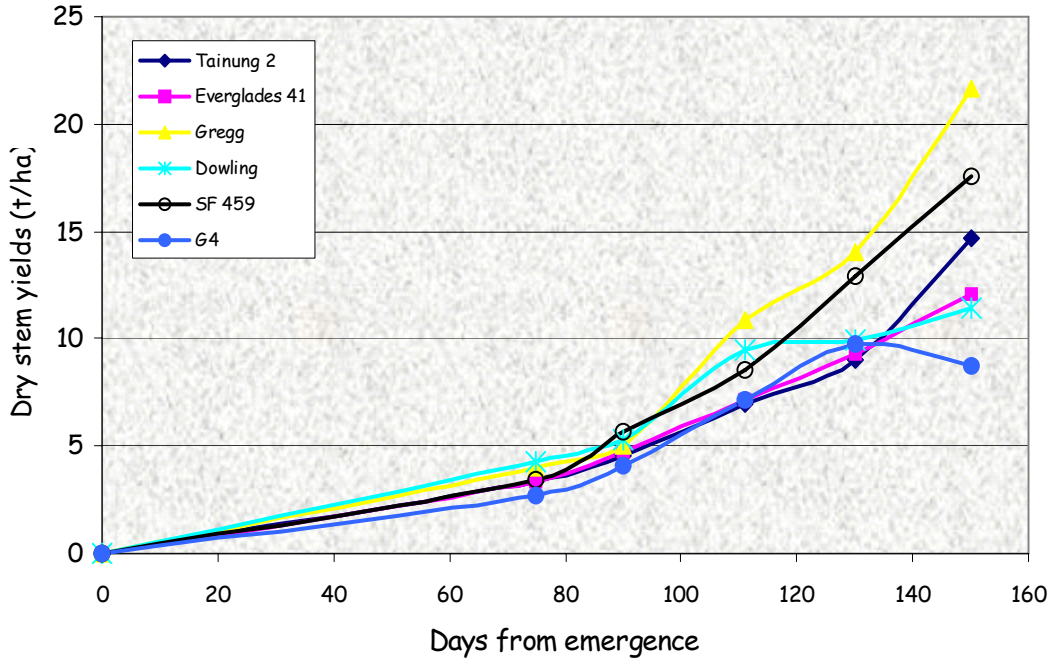




Basal stem diameter (mm)

- October 2005 the stem diameter by descending order was **28.1 mm for SF 459, 21.7 mm for Gregg, 19.6 mm for Dowling, 18.9 mm for Tainung 2 41, 17.1 mm for Everglades 41 and 17 mm for G4**
- Averaged overall varieties, in October 2003 the mean stem diameter was 19.6mm, in October 2004 was 20.7mm, while in 2005 was 20.5mm.

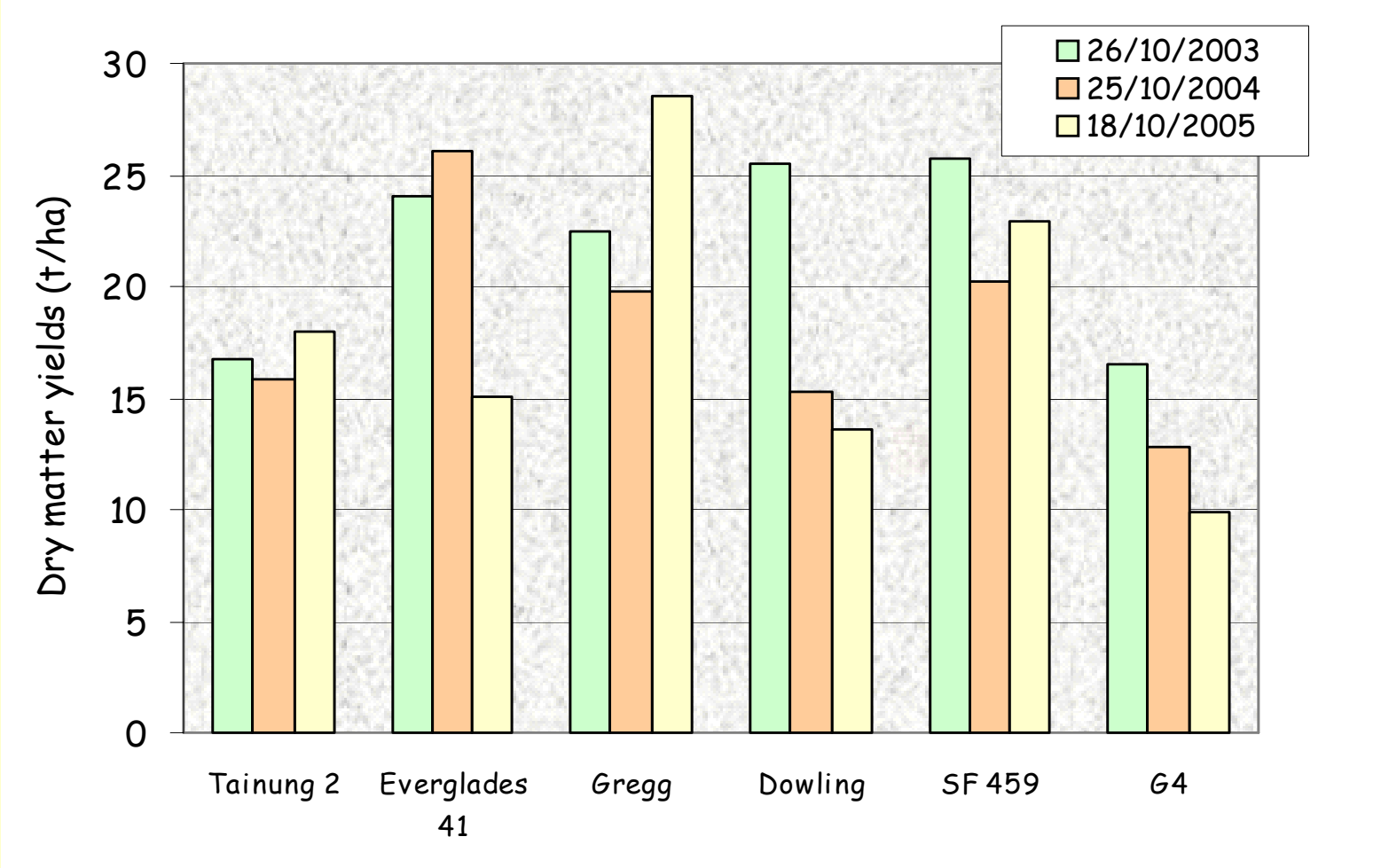




Accumulation of dry yields (total and stem)

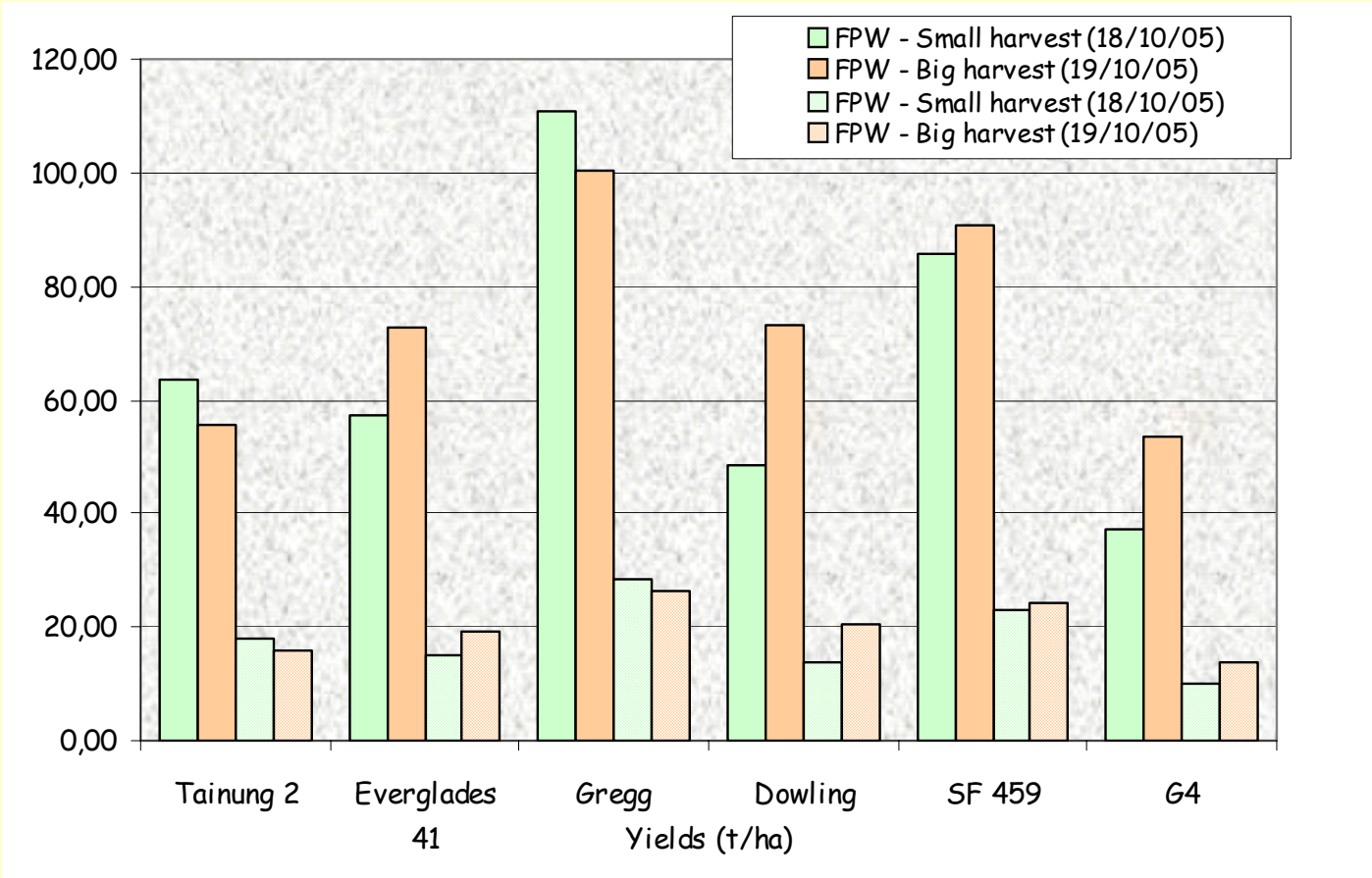
- In the middle of October 2005 (18/10) the dry matter yields by descending order were 28 t/ha for Gregg, 23 t/ha for SF 459, 18 t/ha for Tainung 2, 15 t/ha for Everglades 41, 13.6 for Dowling and 9.9 for G4.
- It is obvious that the group of the late varieties (all except G4) were more productive compared (mean dry yields of 19.6 t/ha) to the early variety G4 (9.9 t/ha).

Comparison of dry matter yields in October (2003, 2004, 2005)



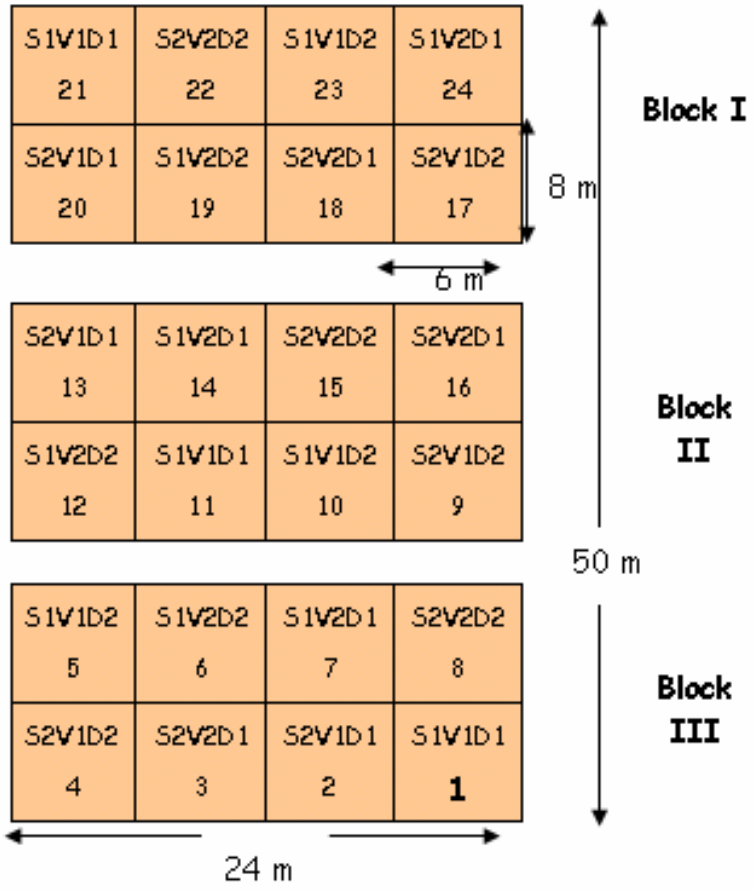
The mean dry yields in October 2003 was 21.8 t/ha, in October 2004 was 18.3 t/ha and 18 t/ha in October 2005. The peak yields were recorded always by a late variety and was SF 459 in 2003 (25.6 t/ha), Everglades 41 in 2004 (26.1 t/ha) and Gregg in 2005 (28 t/ha). In all years the lowest dry yields were recorded by G4 (16.5, 12.8 and 9.9 t/ha, respectively).

Fresh and dry matter yields (t/ha) as it was estimated in one small and one large harvest in October 2005



Averaged overall varieties the fresh biomass yields that were estimated from the one square meter harvest was 67 t/ha, while the estimated yields from the 10 square meter was 74 t/ha. The corresponding values for the dry yields were 20 t/ha and 18 t/ha. In both cases the highest yields were recorded by Gregg and the lowest by G4

Experimental layout of Task 2.2
Sowing times and plant populations



Treatments:

Early sowing, Late sowing

V1: Tainung 2, V2: Everglades 41

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

Dates of sowing:

S1:27/4/05

S2: 18/5/05

Dates of emergence:

S1:1/5/05

S2: 21/5/05

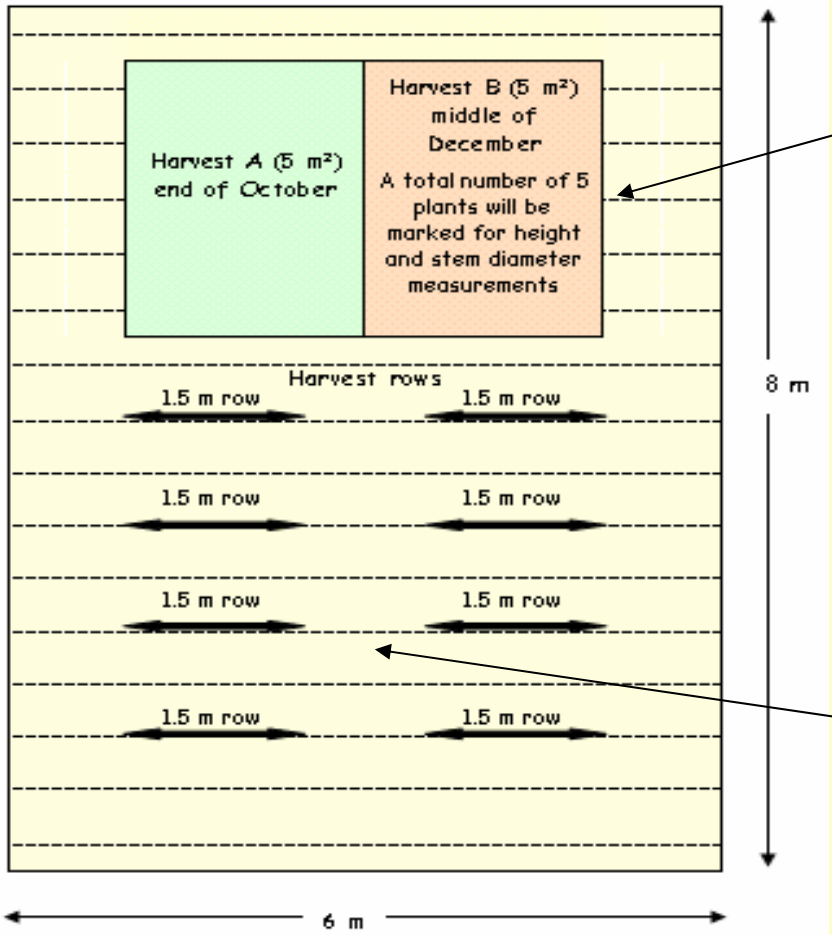
Dates of thinning:

S1:1/6/05

S2: 13/6/05

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:

25/7/05

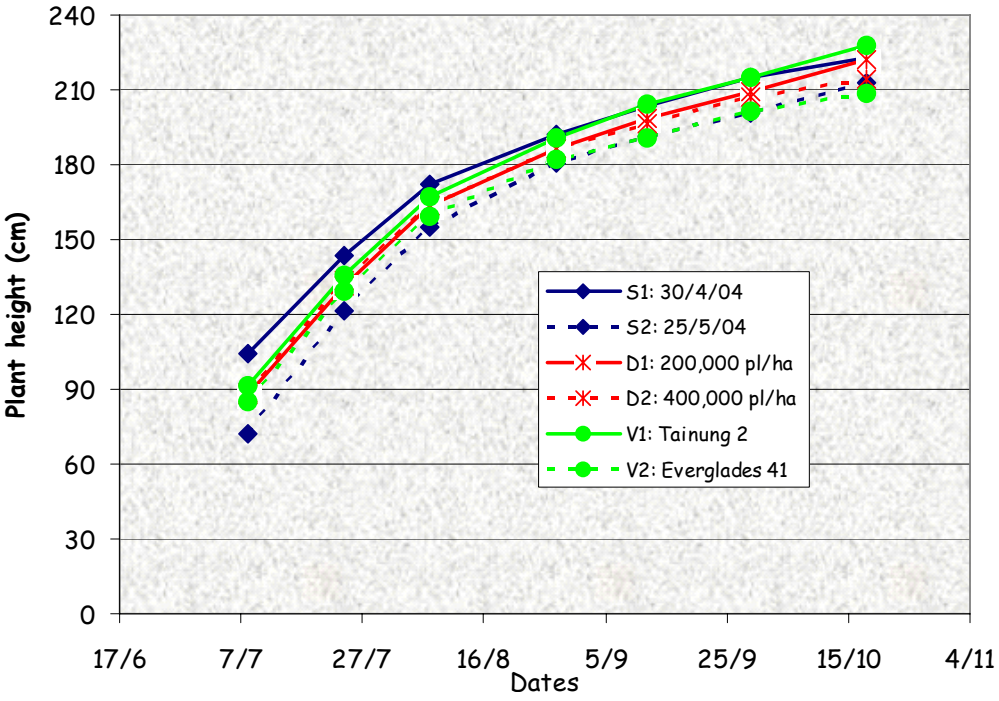
9/8/05

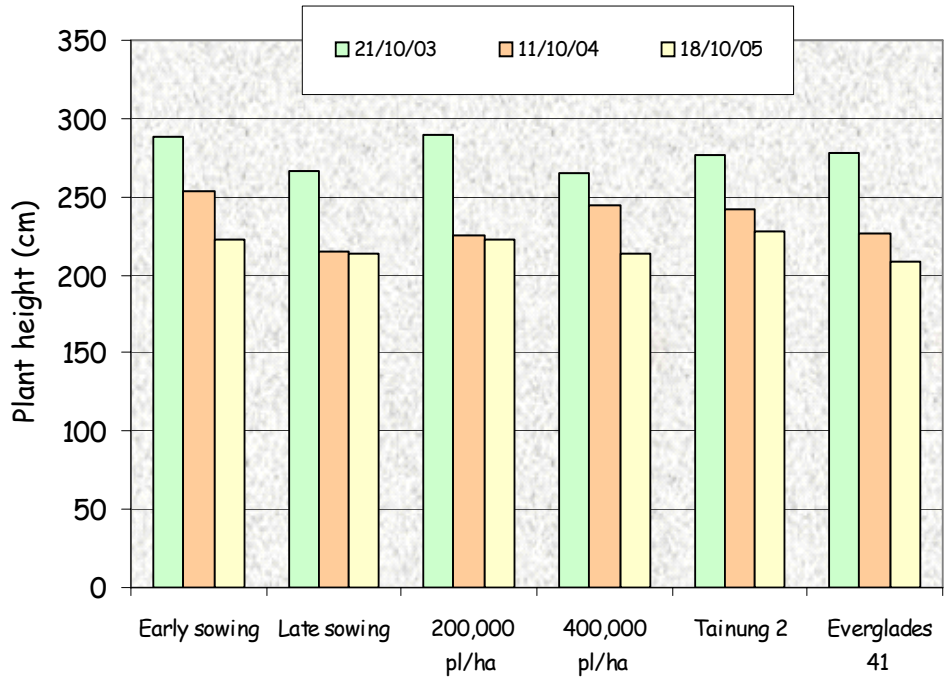
30/8/05

28/9/05

18/10/05

8/11/05

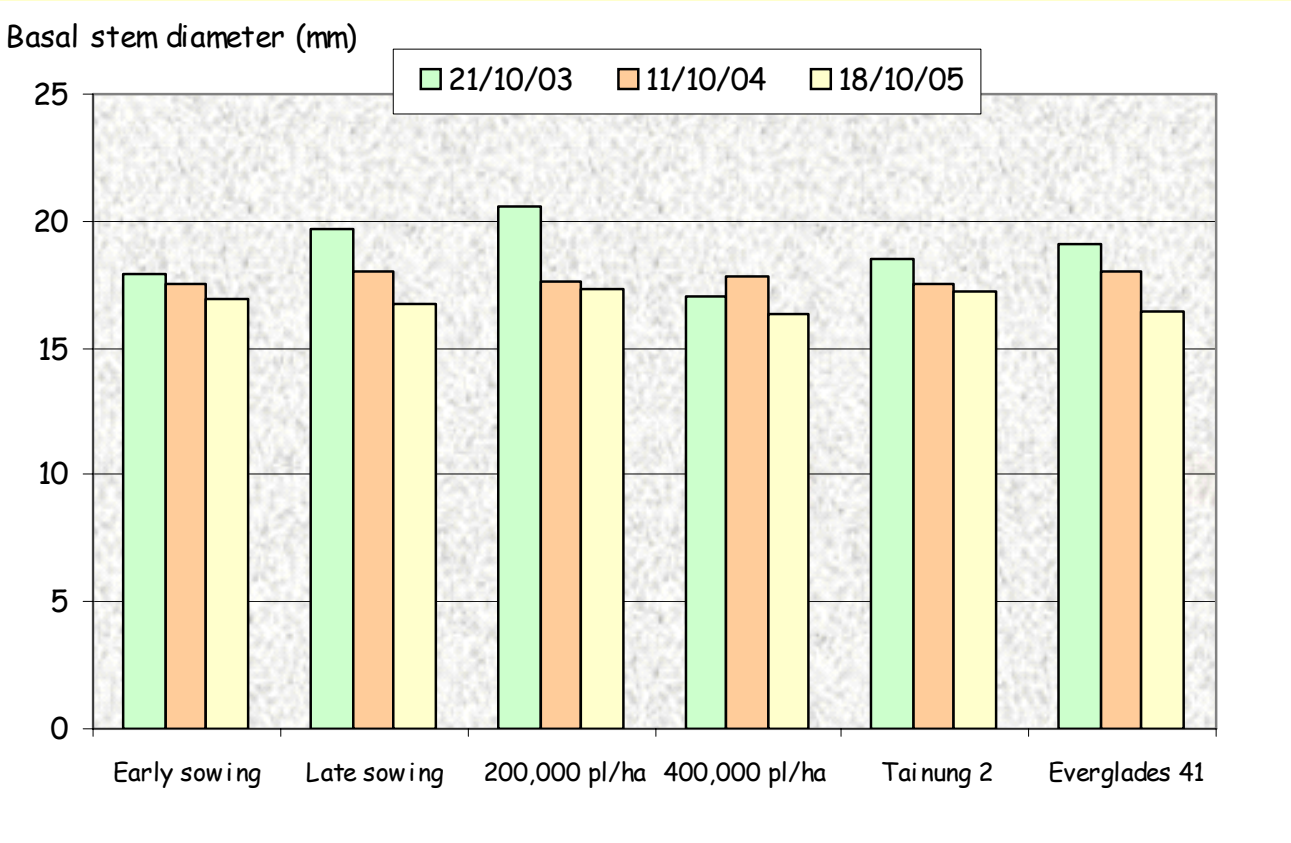




Final plant height (cm)

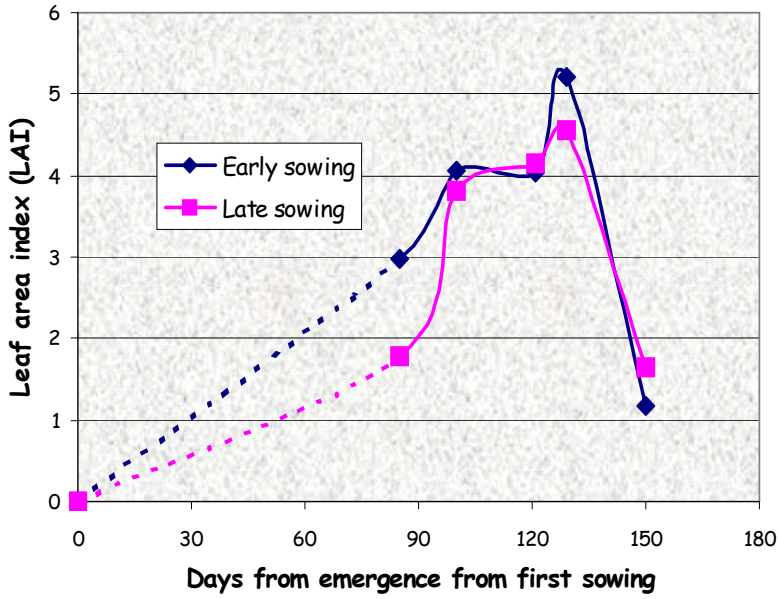
- The early sowing gave higher plants (October 2005) compared to the late one (223 cm versus to 213 cm).
- The plots with the low density gave shorter plants (228 cm) compared to the ones that grew up in the denser plots (214 cm).
- A superiority in terms of plant height of Tainung 2 (228 cm) over Everglades 41 (208 cm) was recorded
- In October 2003 the mean plant height was 278 cm, in October 2004 was 234 cm, while in October 2005 was 218 cm.

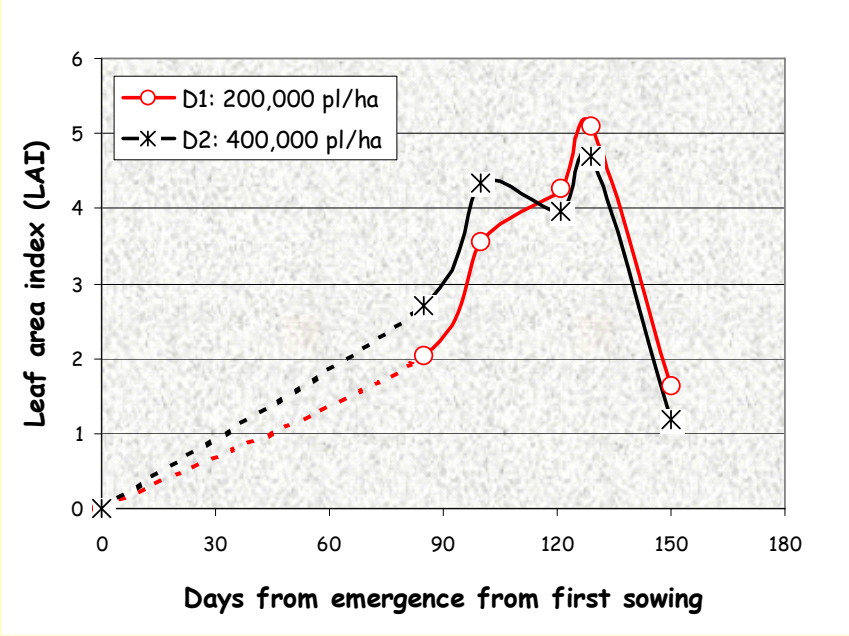
Comparison of basal stem diameter (mm) among 2003, 2004 and 2005

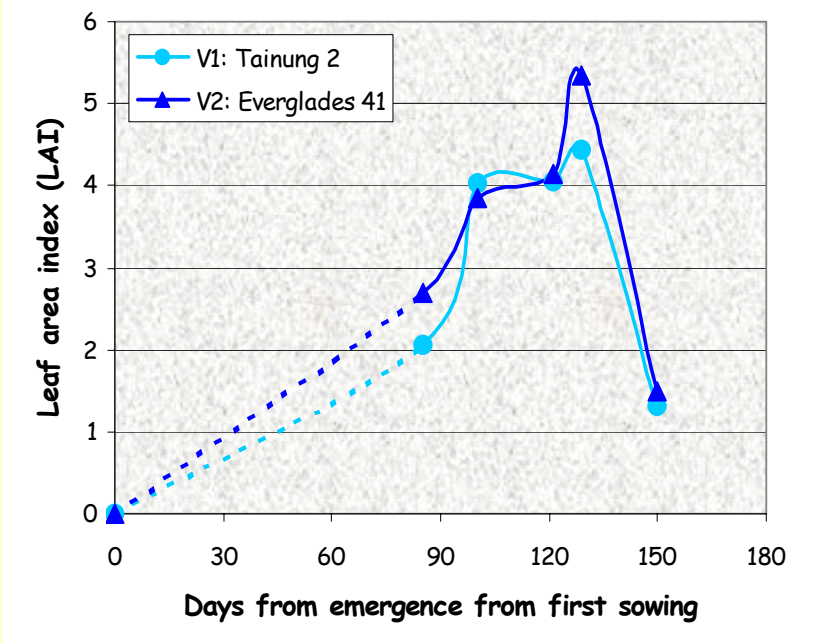


In October the stem diameter, averaged overall factors, was 18.8 mm in 2003, 17.8 mm in 2004 and 16.8 mm in 2005.

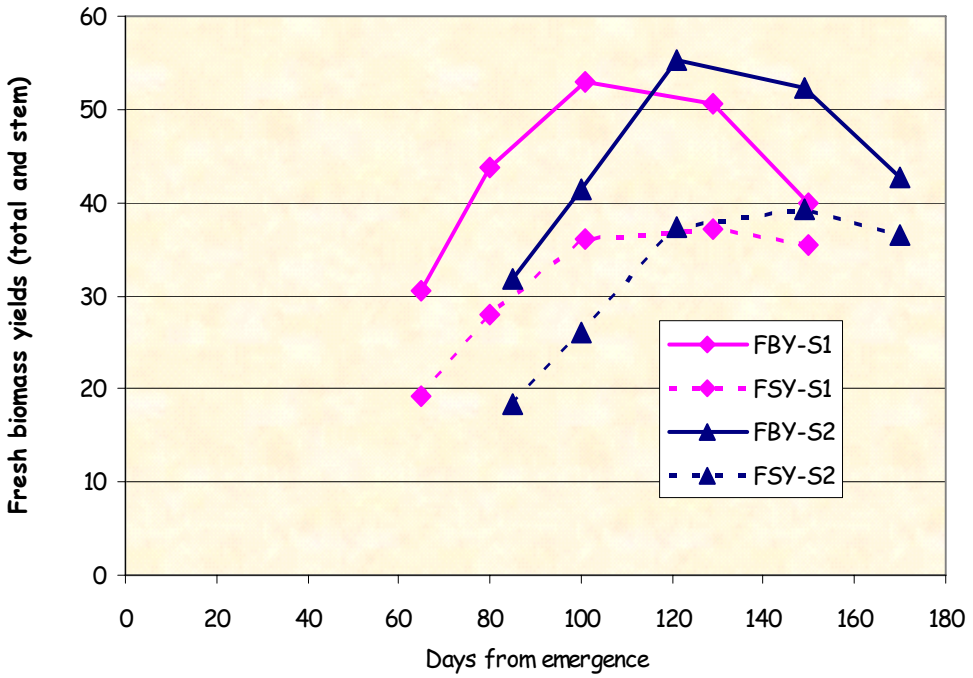
Evolution of leaf area meter (LAI) during 2005

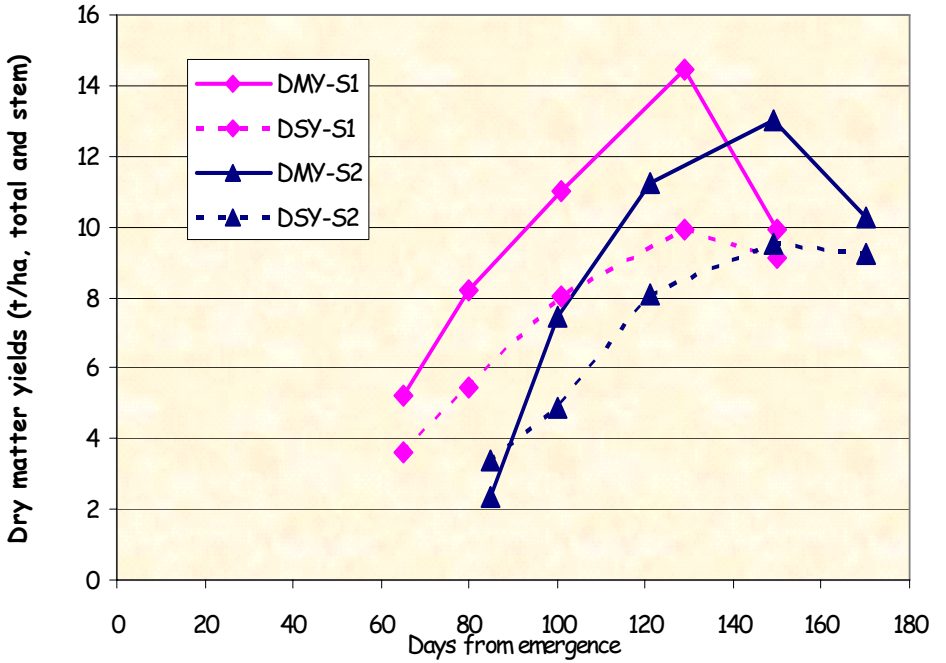






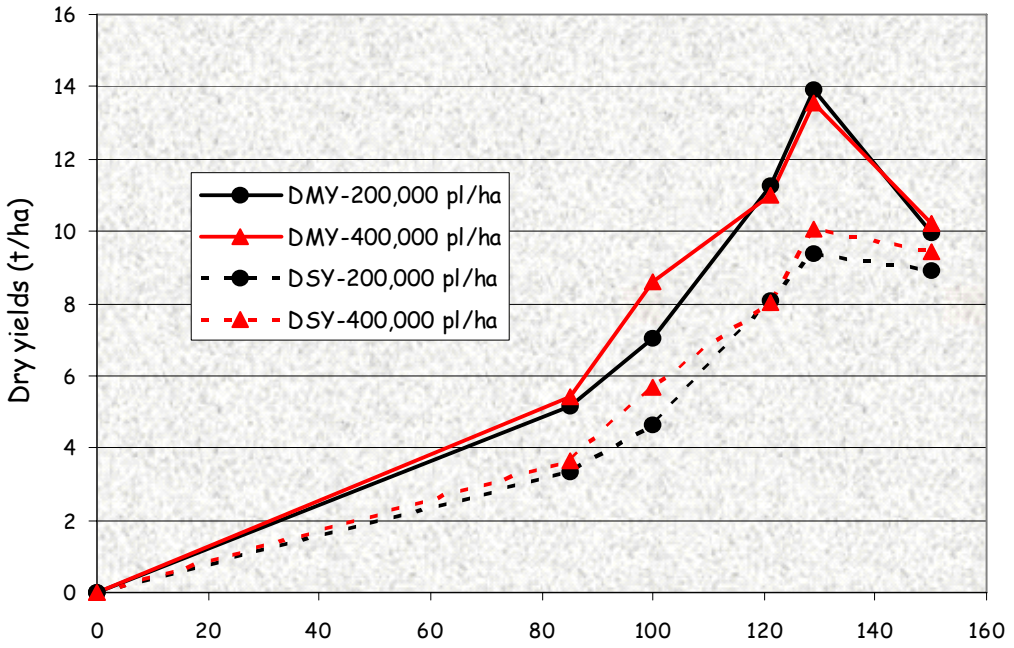
The mean pick LAI values were recorded in September (beginning of the flowering phase) and was 4.9, averaged overall treatments. It should be noted that at that time higher LAI values were recorded for the early sowing (5.22), for the variety Everglades 41 (5.35) and for the low density (5.1)

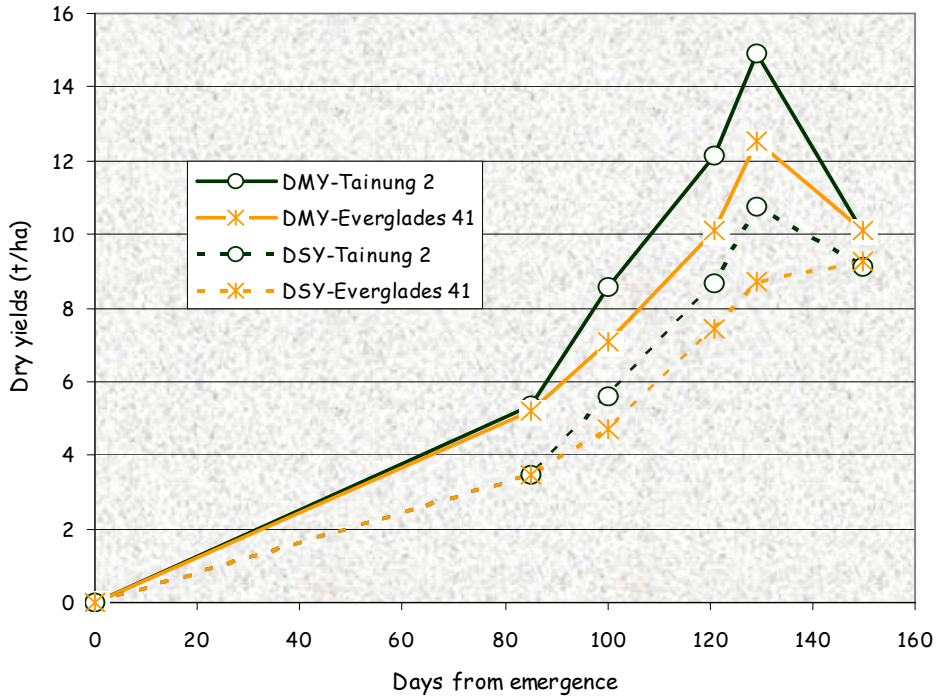




Effect of sowing time on fresh and dry matter yields (t/ha)

- It is quite clear that for the both sowing times the achieved peak fresh and dry matter yields were almost the same.
- More specifically, the peak fresh biomass yields for the early sowing were 53 t/ha (100 days from emergence), while for the late sowing were 55 t/ha (120 days from sowing). The corresponding values for the dry yields were 15 t/ha (129 days from emergence) and 12.5 t/ha (150 days from emergence).
- Until the end of October no statistical significant differences were recorded.



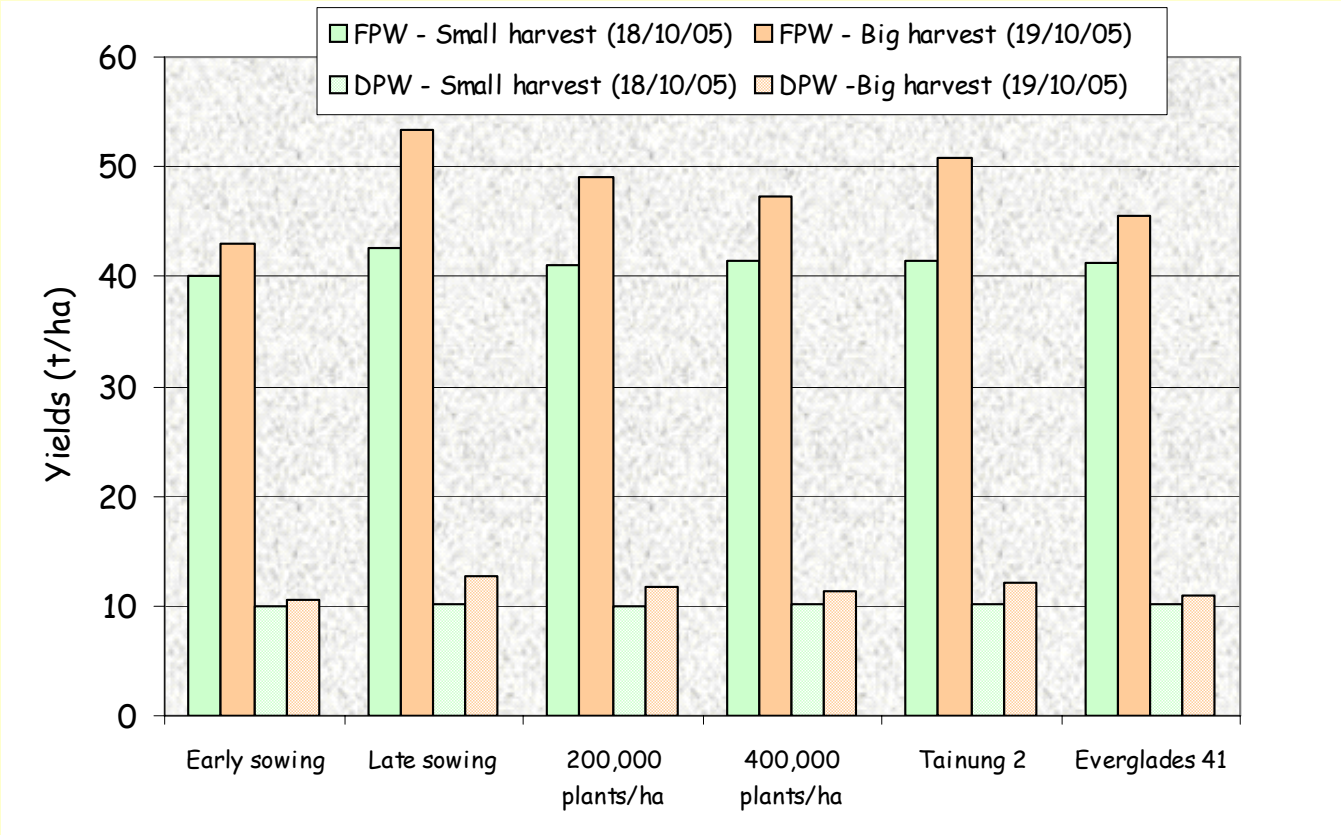


Effect of plant density and variety on dry matter yields (t/ha)

- The achieved dry matter yields were almost the same throughout the third growing period with a slight superiority of the high density over the low one (no statistical significant differences).

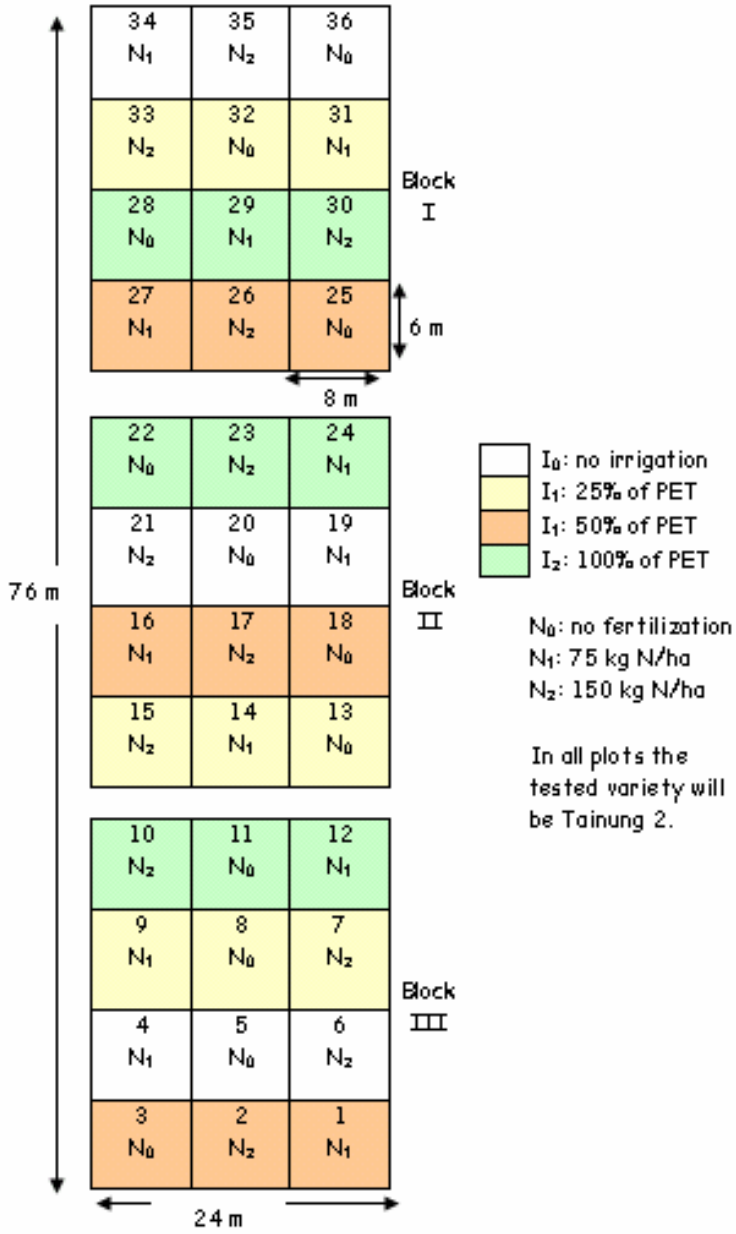
A comparison between the two late varieties (Tainung 2 and Everglades 41) showed a superiority of Tainung 2 over the Everglades 41 (only in few cases statistical differences were recorded).

Fresh and dry matter yields (t/ha) as it was estimated in one small and one large harvest in October 2005



The mean estimated fresh and dry yields were higher in the case of the big harvest. More specifically, the mean fresh biomass yields from the one square meter harvest was 48.1 t/ha, while from the 10 square meter was 41.1 t/ha. The corresponding values for the dry yields were 11.6 t/ha and 10.1 t/ha.

Experimental layout of Task 2.3
Irrigation and nitrogen fertilization rates



Date of sowing: 9/5/05

↓

Date of emergence: 14/5/05

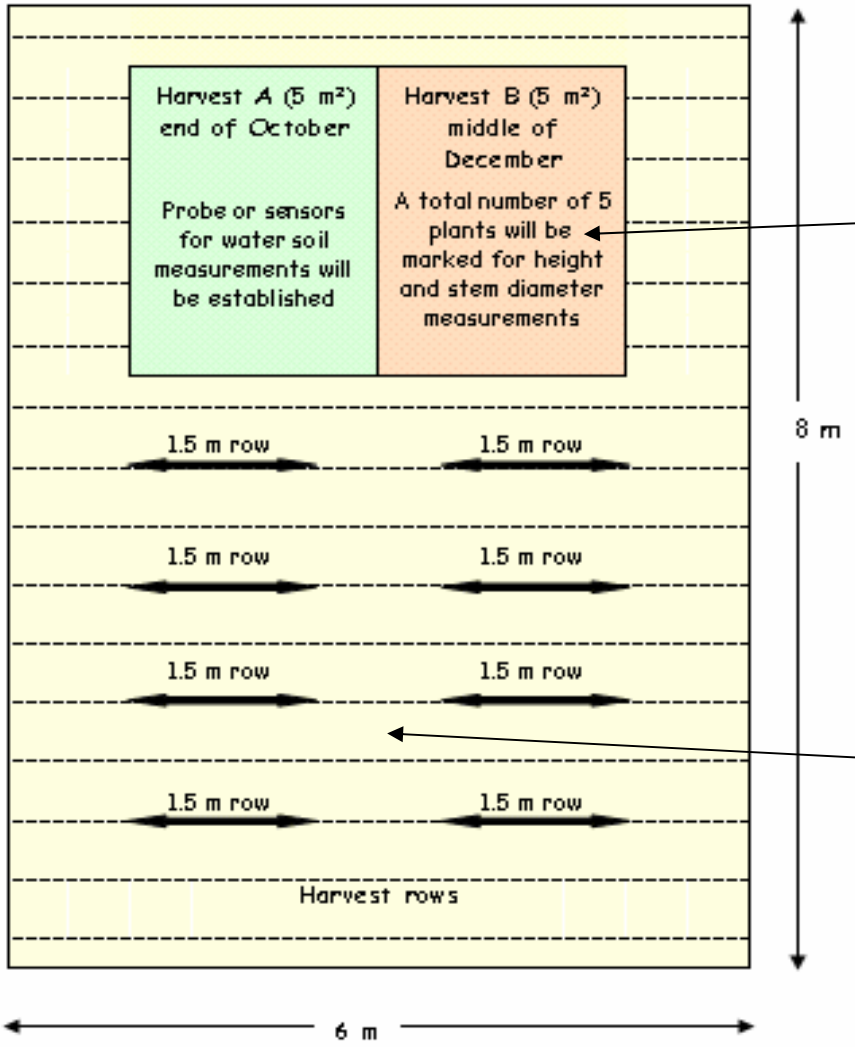
↓

Date of thinning: 10/6/05

↓

The different levels of nitrogen fertilization was applied through the drip irrigation system in the beginning of July 2005

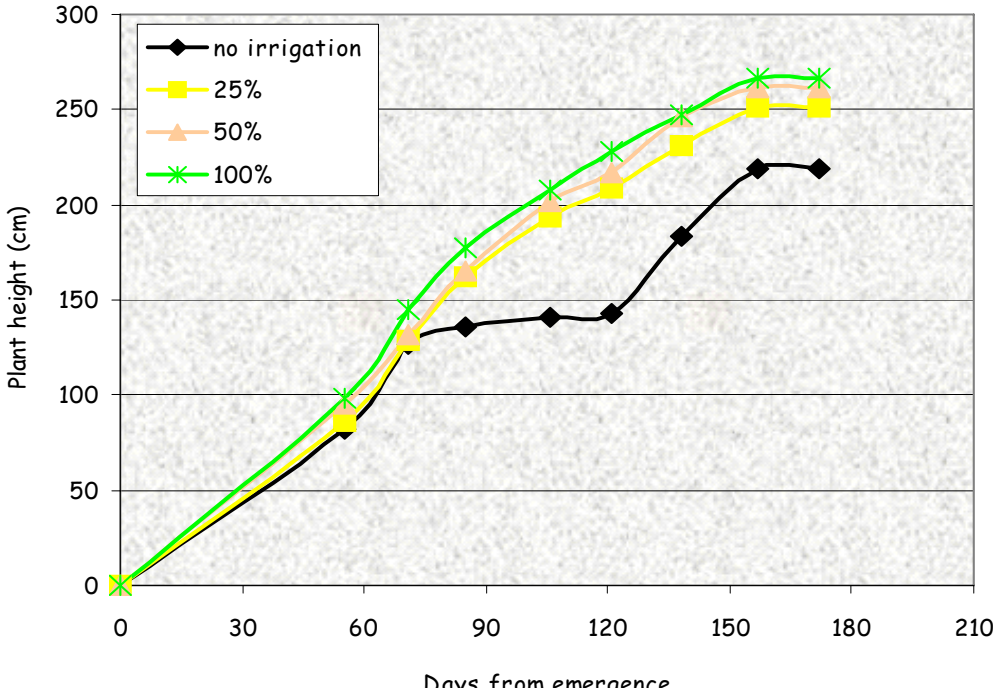
Experimental plot of Task 2.3
Irrigation and nitrogen fertilization rates

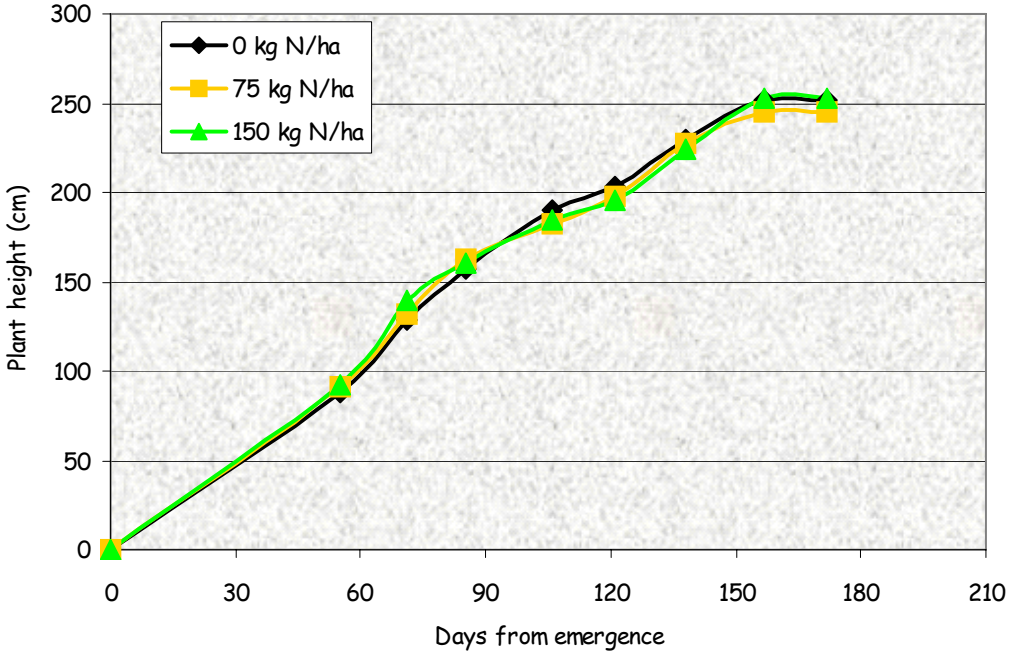


The plant height was measured on five marked plant per plot every two weeks, while on the same plants the basal stem diameter was measured every four weeks.

Harvest dates:
25/7/05
9/8/05
30/8/05
28/9/05
18/10/05
8/11/05

- 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.

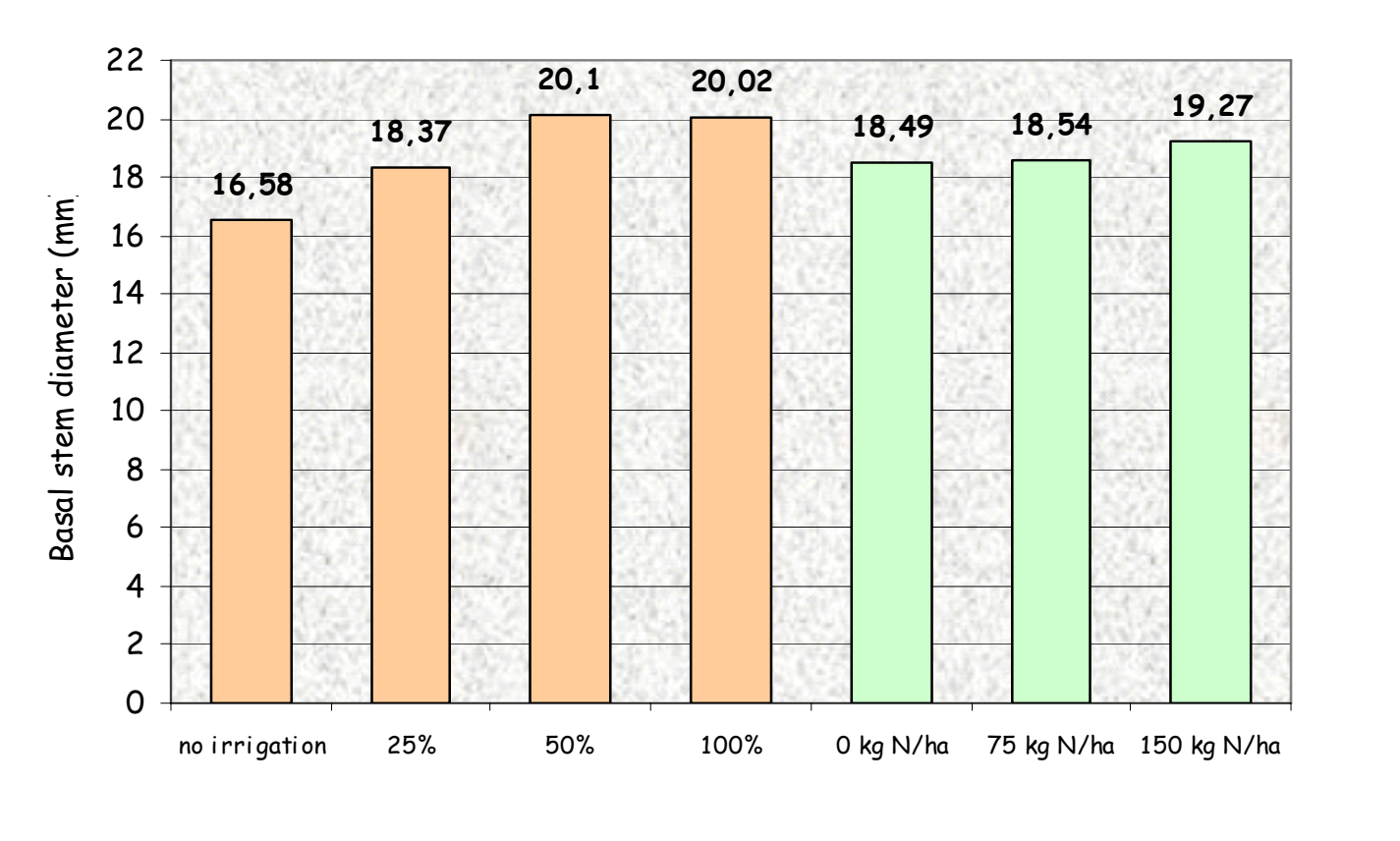




Plant height (cm)

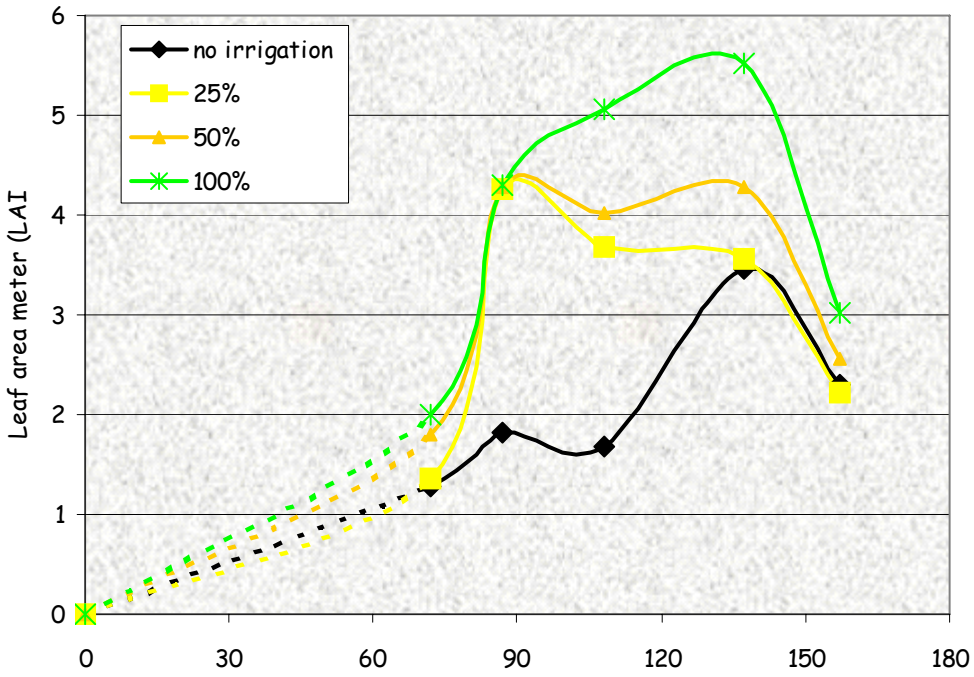
- The plant height found to be significant affected by the irrigation. It should be mentioned that the statistical significant differences were recorded between the irrigated plots (250-270 cm) (low, medium and high) and the no irrigated plots (220 cm).
- On the contrary no effects of nitrogen rates were recorded on plant height (plant height for all nitrogen rates around 250 cm).

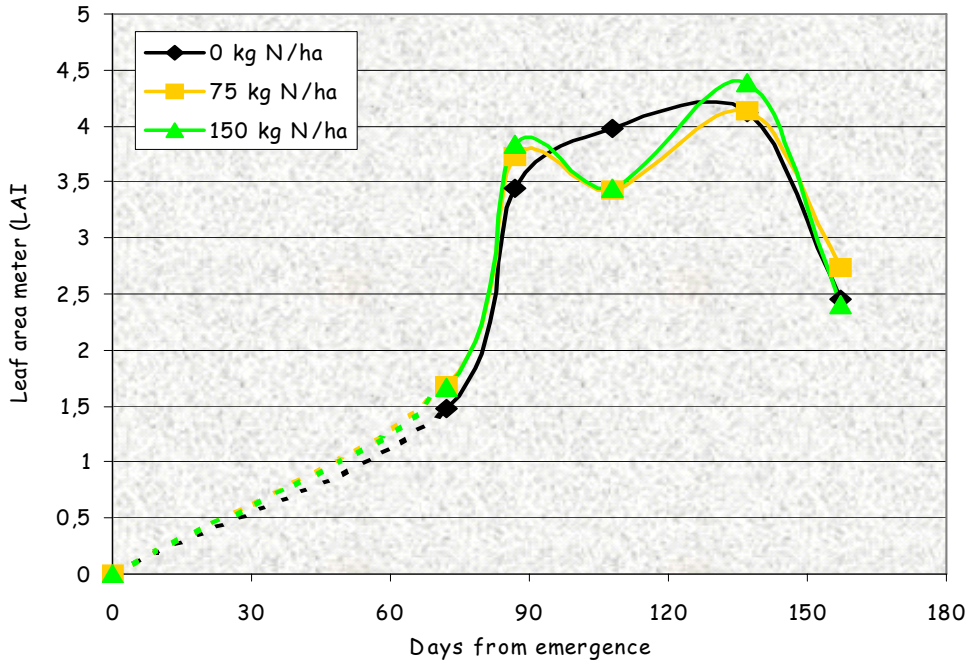
Effect of irrigation and nitrogen rates on basal stem diameter (18/10/05)



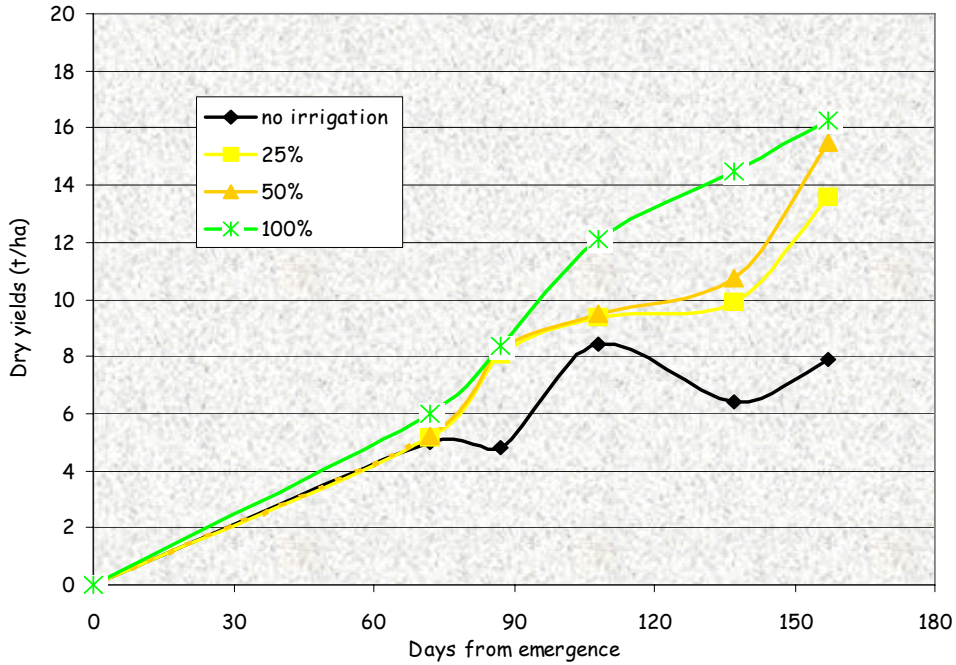
- The basal stem diameter (18/10/05) found to be affected by the irrigation. The medium the high irrigated plots developed plants with a mean diameter of 20 mm, while the no irrigated plots grew up plants with diameter of 16.6 mm.
  No effects of nitrogen rates on stem diameter were recorded

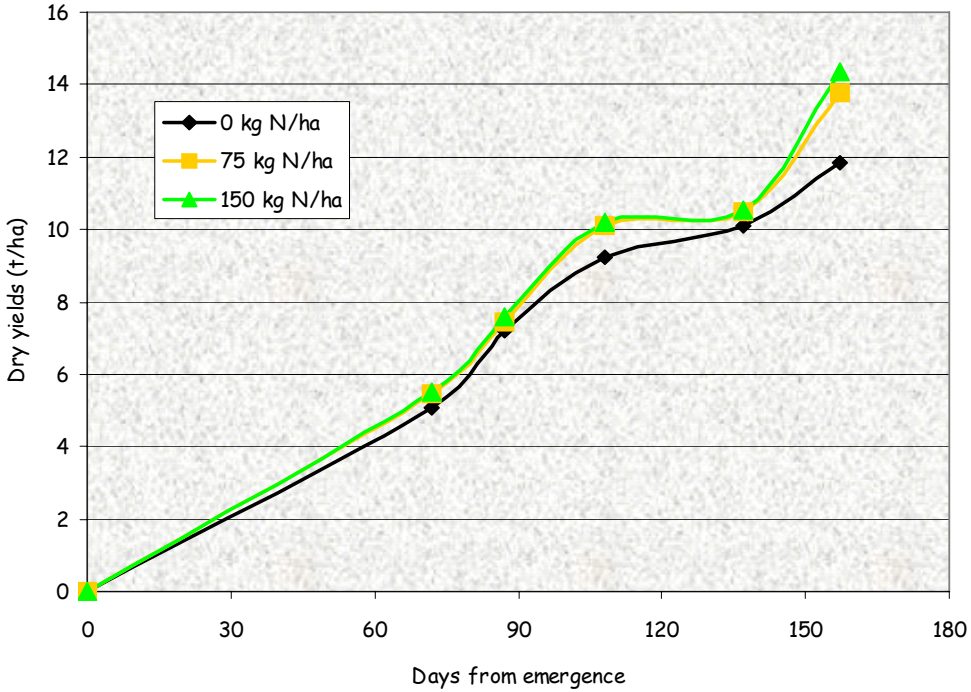
Evolution of leaf area meter (LAI) in 2005





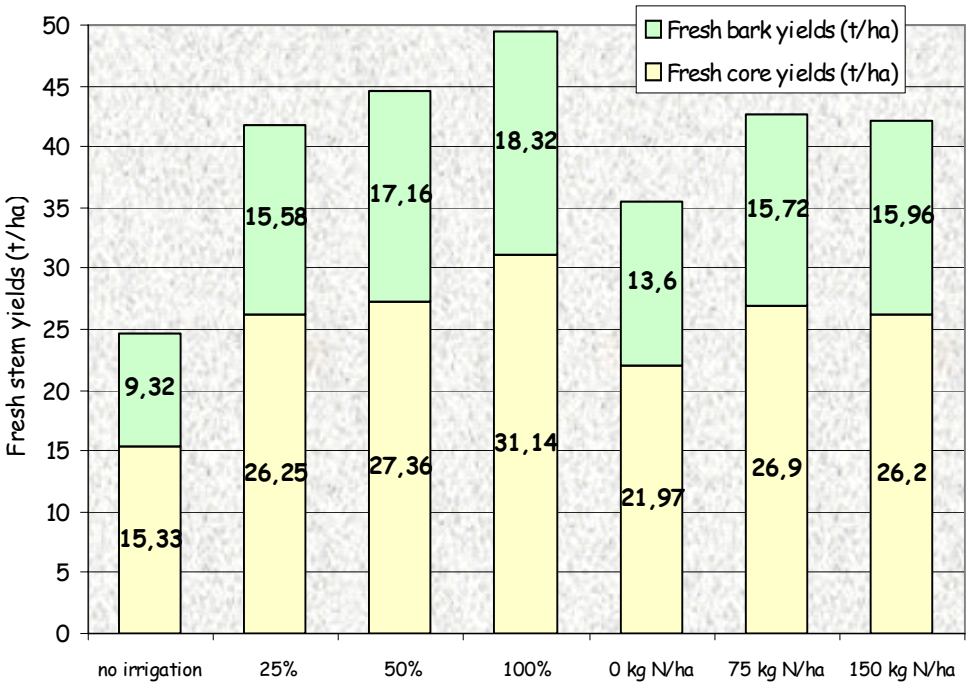
- The pick leaf area values for all treatments were recorded from middle of September to early October and were **3.5 for the no-irrigated plants, 3.6 for the low irrigated, 4.3 for the medium irrigated and 5.5 for the high irrigated ones.**
- It should be pointed out that statistical significant differences were recorded **only among the different irrigation rates.**
- The pick values for the three tested nitrogen rates were **almost the same and ranged between 4.1 (no fertilization) and 4.4 (150 kg N/ha)**

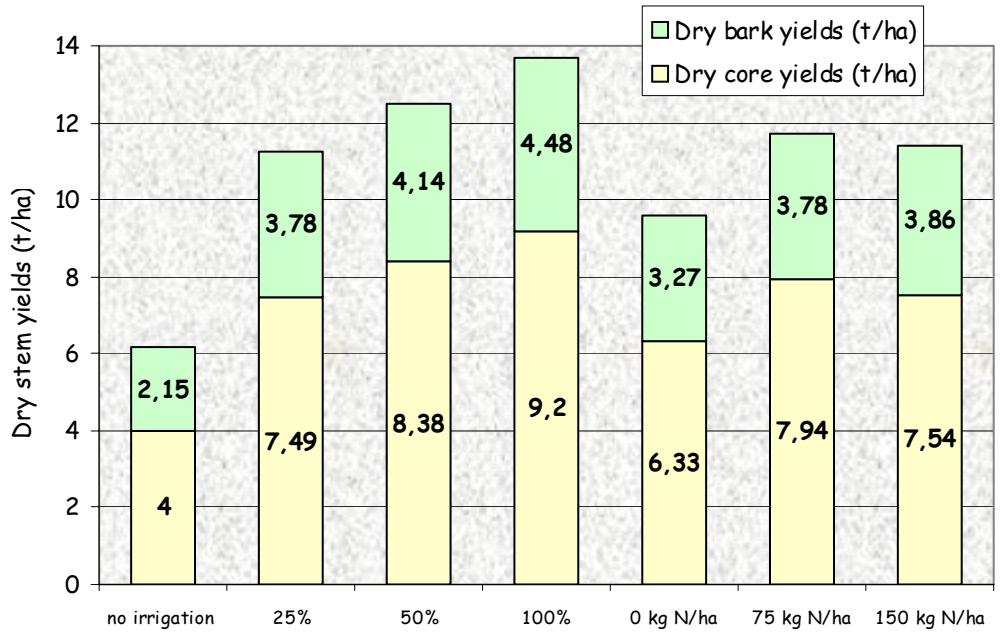




Accumulation of dry matter yields (t/ha) in 2005

- In October 2005 the achieved dry yields were 7.9 t/ha (no irrigation), 13.6 t/ha (low irrigation), 15.5 t/ha (medium irrigation) and 16.2 t/ha (high irrigation). It should be pointed out that statistical significant differences were throughout the growing period among the tested irrigation rates.
- The dry yields among the tested nitrogen rates were almost the same throughout the growing period and so no statistical differences were recorded. In October 2005 the dry yields were 11.9t/ha (no fertilization), 13.8 t/ha (75 kg N/ha) and 14.3 t/ha (150 kg N/ha).

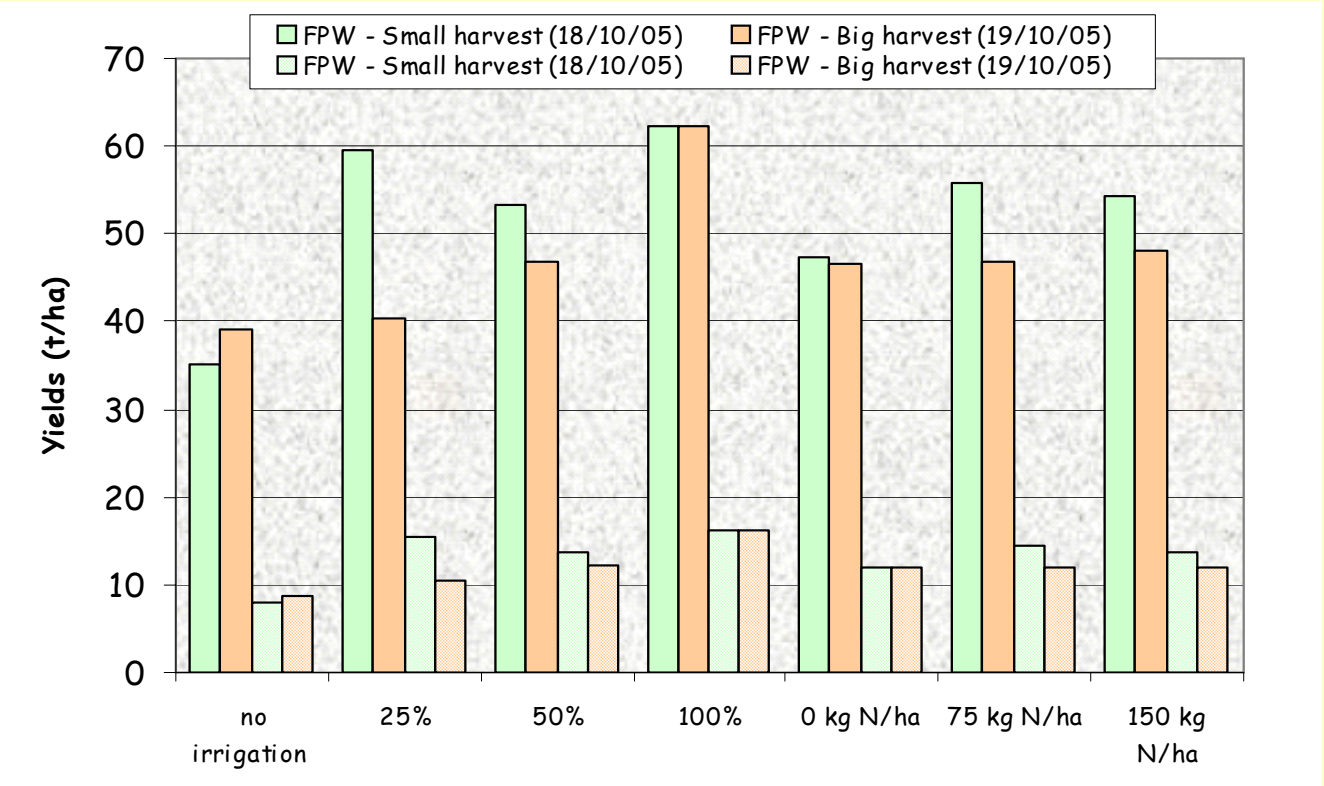




Stem yields (bark and core) on fresh and dry basis at the final harvest (18/10/05)

- The bark percentage (% on dry basis), averaged overall treatments, was 33%.
- It worth mentioning that at the no irrigated plots and at the no fertilized plots the bark percentage was a littlie bit higher 35% compared to the irrigated and well fertilized plots that the bark percentage was between 32 and 33%.

Fresh and dry matter yields (t/ha) as it was estimated in one small and one large harvest in October 2005



The estimated mean fresh biomass yields of one square meter harvest were 53 t/ha, while the estimations based on 10 square meters were 47 t/ha. The corresponding values for the dry matter yields were 12 and 13 t/ha