WP2. Adaptability and Productivity Field Trials

Results from the first six months of the project

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WP2. Adaptability and Productivity Trials

The **main aim** of this work package is determine the sustainable yielding potential of kenaf as an energy crop, at different locations in Southern Europe.

WP2 consists of four tasks:

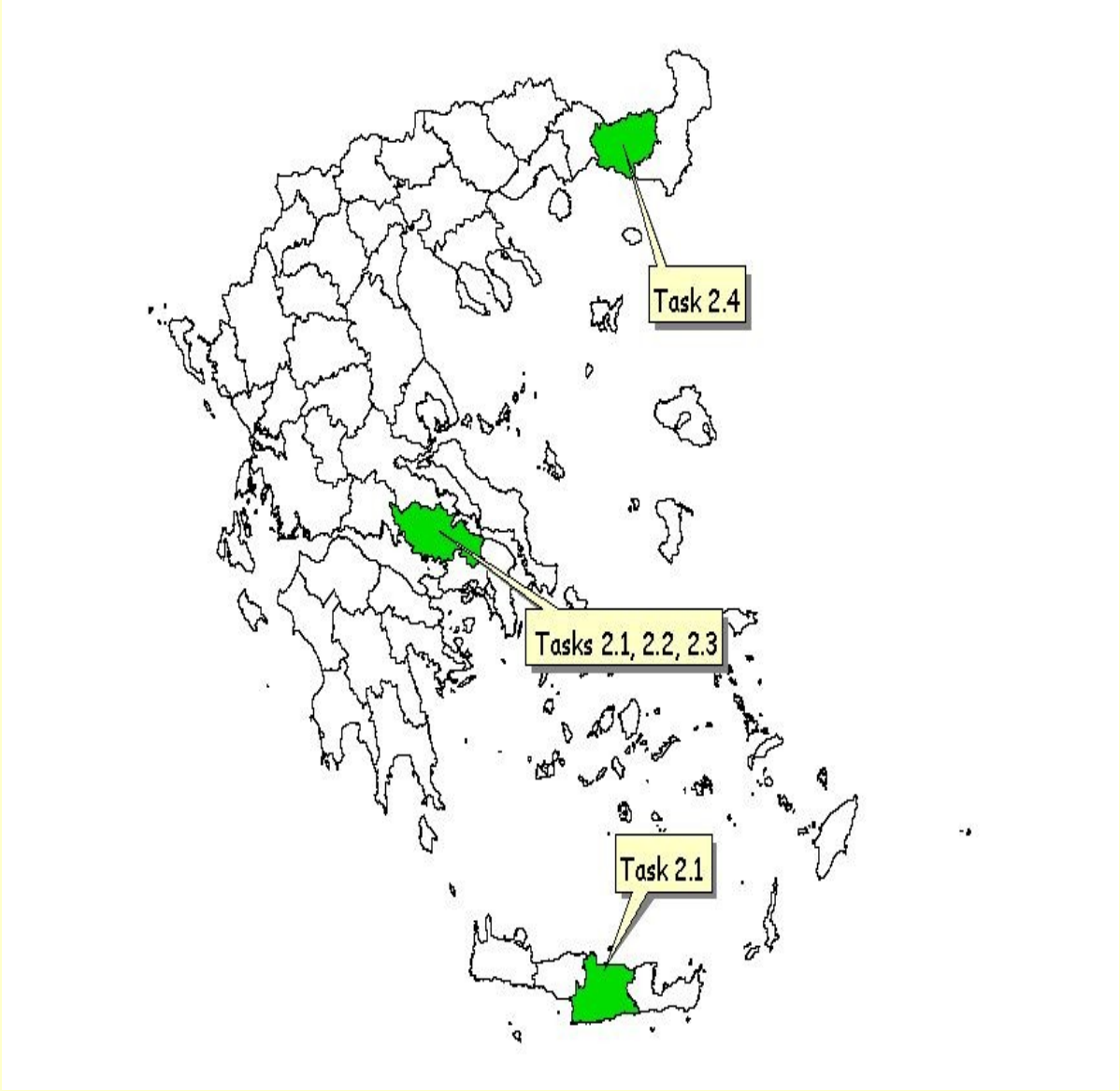
- Task 2.1: Screening trial
- Task 2.2: Effect of sowing dates and plant populations on biomass yields
- Task 2.3: Effect of irrigation and nitrogen fertilisation on biomass yields
- Task 2.4: Kenaf field trials with size of 2ha

Established trials in the first 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
University of Catania	Italy	• Sowing dates and plant densities • Irrigation and fertilization trial
University of Bologna	Italy	• Sowing dates and plant densities • Irrigation and fertilization trial
CETA	Italy	• 1 ha field trial
INIA	Spain	• Sowing dates and plant densities • 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

CRES contribution

- ✓ Task 2.1: Screening trial
- ✓ Task 2.2: Sowing dates and plant populations
- ✓ Task 2.3: Irrigation and fertilization rates
- ✓ Task 2.4: 2 ha field



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

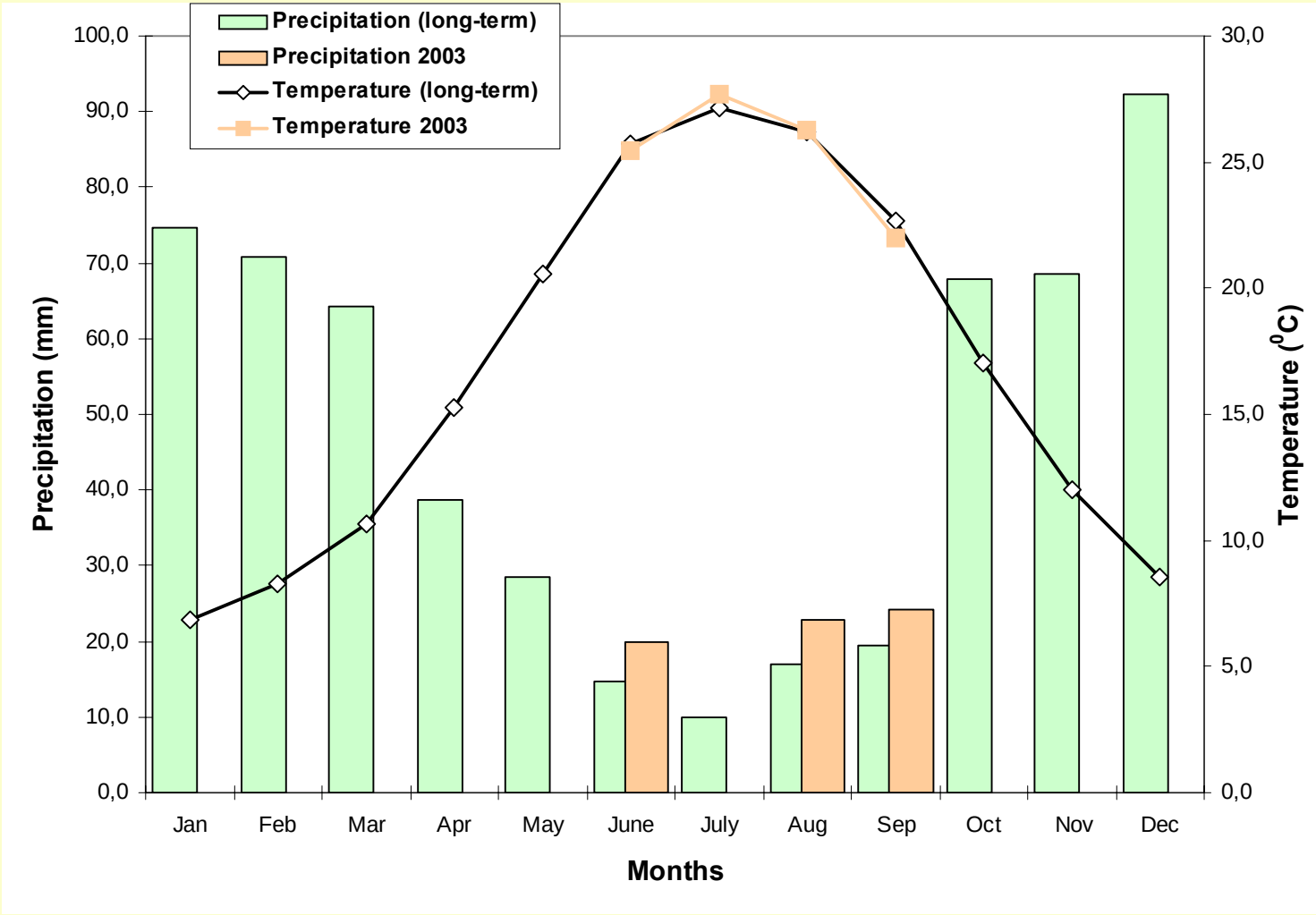
Location: Aliartos (central Greece)

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

Climate: Dry with a 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.

Monthly precipitation (mm) and temperature (^{0}C) in Aliartos (long-term mean and 2003)



From June to September the plants received from rainfalls 66.8 mm of water

Results from the soil analyses (Task 2.1)

	Soil layers				
	0-20	20-40	40-60	60-80	80-100
Soil type	SCL	SCL	SCL	SCL	SC
Electrical conductivity (µMHOS/cm)	85	60	60	120	65
pH	7.8	7.9	7.9	7.9	8
Total Ca (%)	8	9.2	12	36	6
Organic matter (%)	1.2	1.34	1.34	1.2	0.13
Total N (mgr/kg)	0.153	0.137	0.137	0.153	0.058
P_2O_5 (mgr/kg)	2.862	1.145	1.145	1.717	1.145
K_2O (mgr/kg)	6.6	4.2	3.6	6	4.2
MgO (mgr/kg)	5.81	4.98	5.81	13.28	5.81
Na (mgr/kg)	4	2.5	2.5	14	3
Fe (mgr/kg)	1.25	1.25	1	1.25	1
Mn (mgr/kg)	1	1	1.25	3.75	1.5

Results from the soil analyses (Task 2.2 & 2.3)

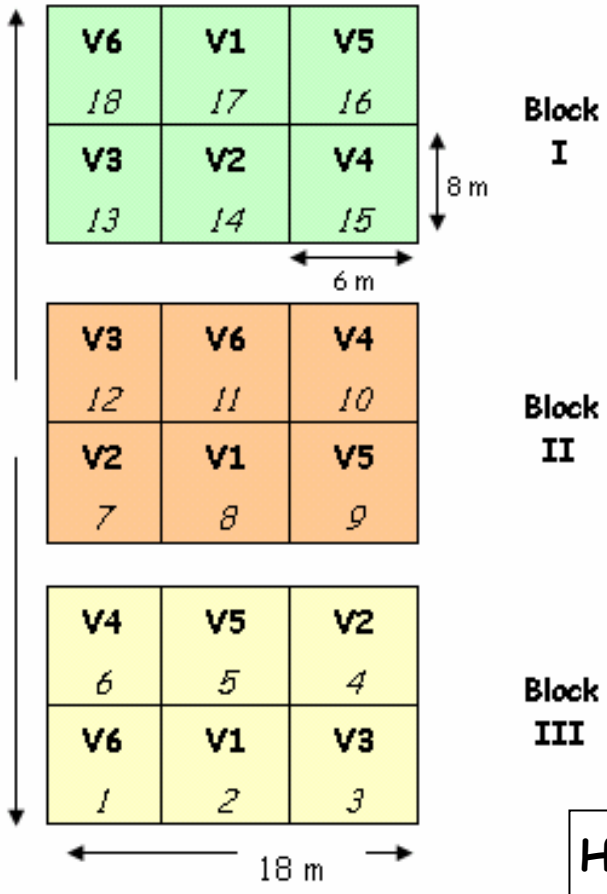
	Layers				
	0-20	20-40	40-60	60-80	80-100
Soil type	SCL	SCL	SCL	SL	SL
Electrical conductivity (µMHOS/cm)	55	60	70	90	65
pH	7.7	7.7	7.7	7.8	7.8
Total Ca (%)	2	2	1.2	1.2	.12
Organic matter (%)	0.8	0.87	0.67	0.6	0.13
Total N (mgr/kg)	0.102	0.106	0.093	0.089	0.058
P_2O_5 (mgr/kg)	1.145	1.145	1.717	1.717	1.145
K_2O (mgr/kg)	4.2	5.4	6	6.6	6
MgO (mgr/kg)	4.15	6.64	5.81	8.3	4.98
Na (mgr/kg)	3	3.5	4.5	5	3
Fe (mgr/kg)	1.25	1	1	1	0.5
Mn (mgr/kg)	1	1	0.75	0.75	0.75

Experimental layout of Task 2.1
Screening trial

Sowing date: 25/5/03 (by hand)

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

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



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

A drip irrigation system was used and apart from rainfalls the plants received a quantity of 410 mm of water.

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

Harvest dates:
20/7/03
11/8/03
30/8/03
21/9/03
5/10/03

* 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

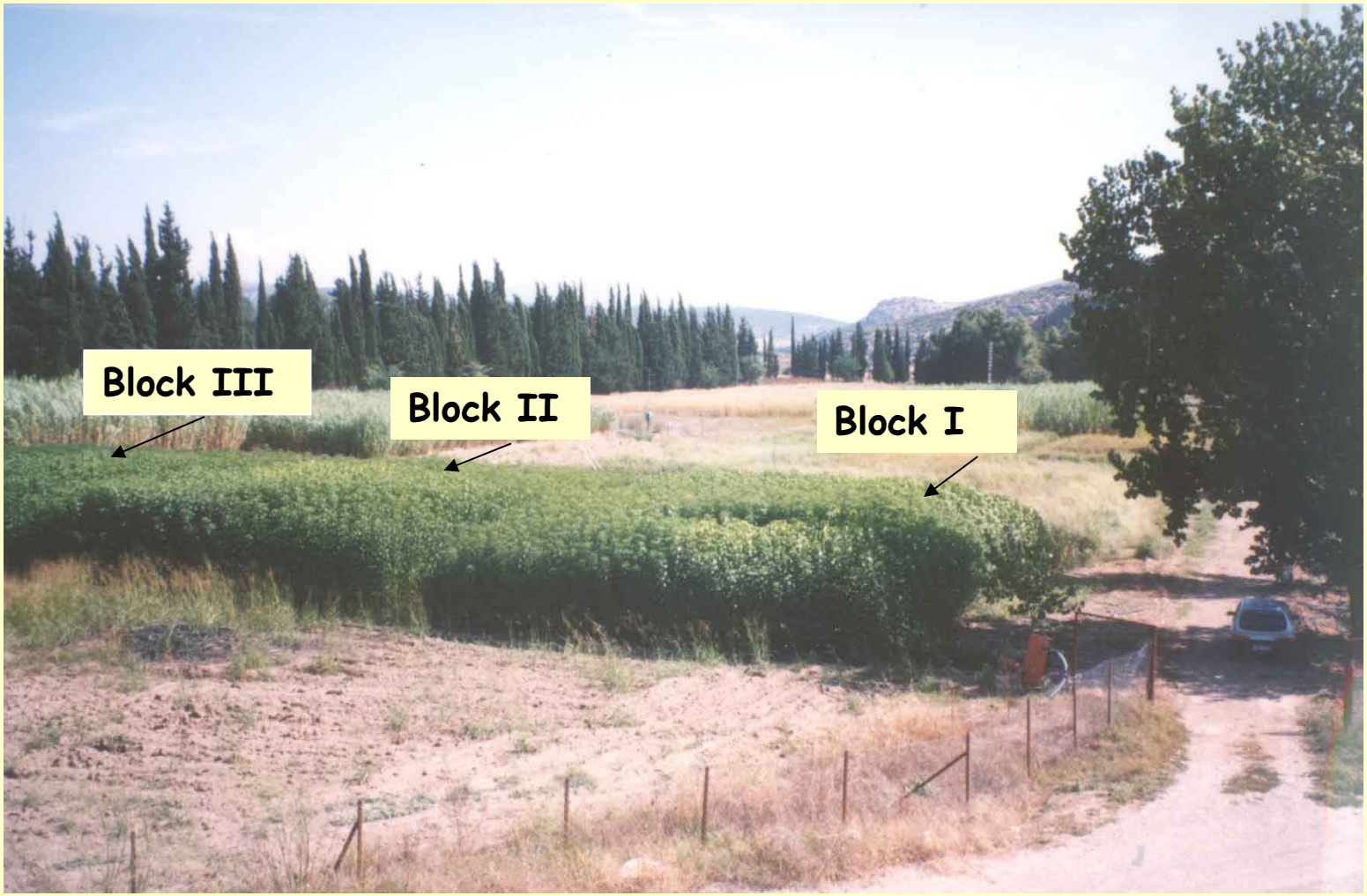
SF 459

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

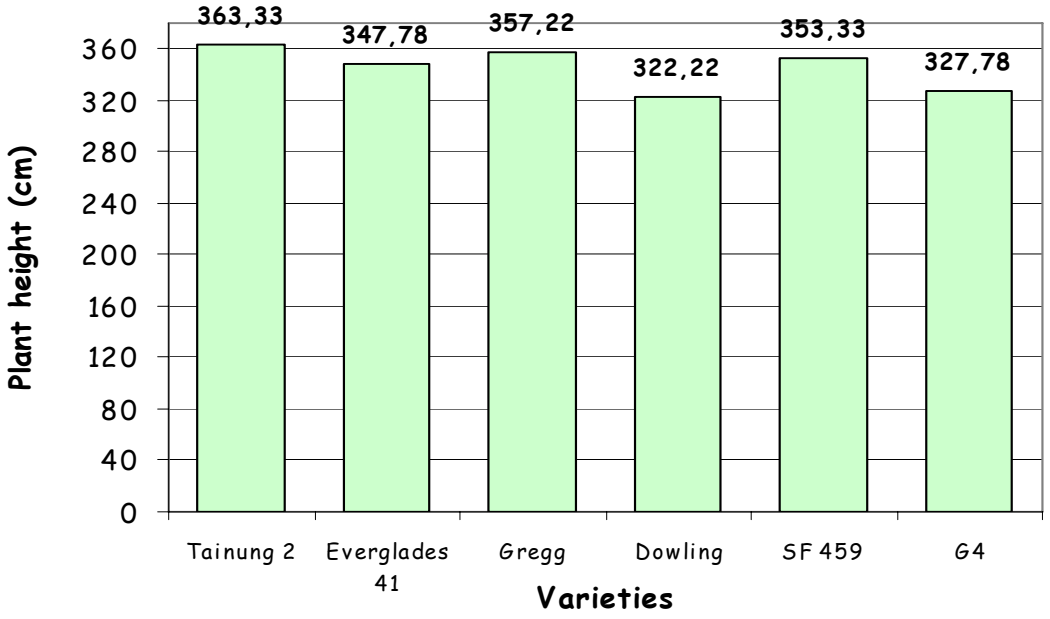
G4

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)

View of the screening trial (10/9/03)



Task 2.1 – Plant height (cm) and basal stem diameter (mm)



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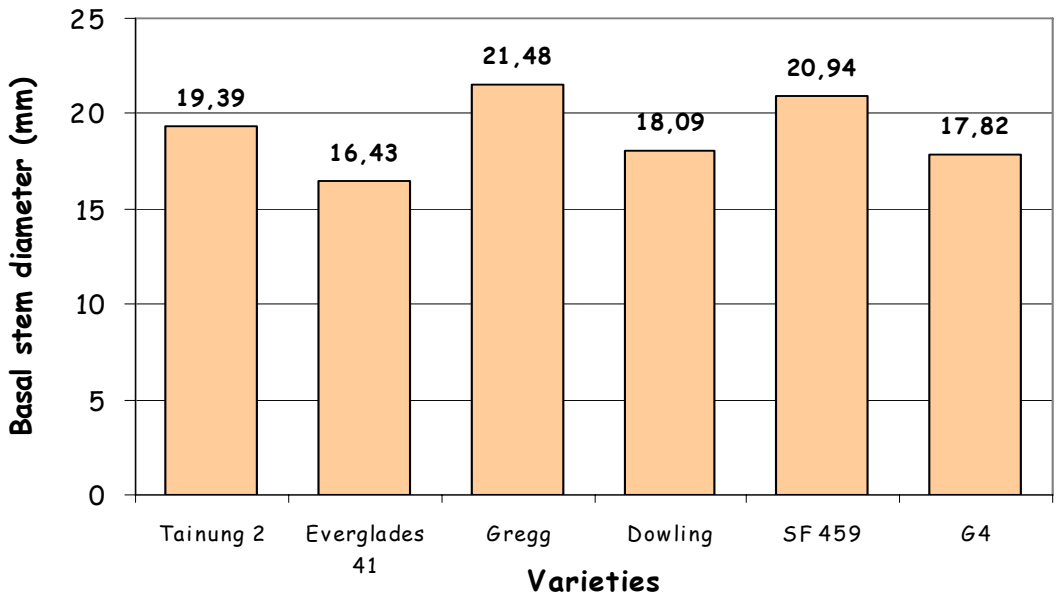
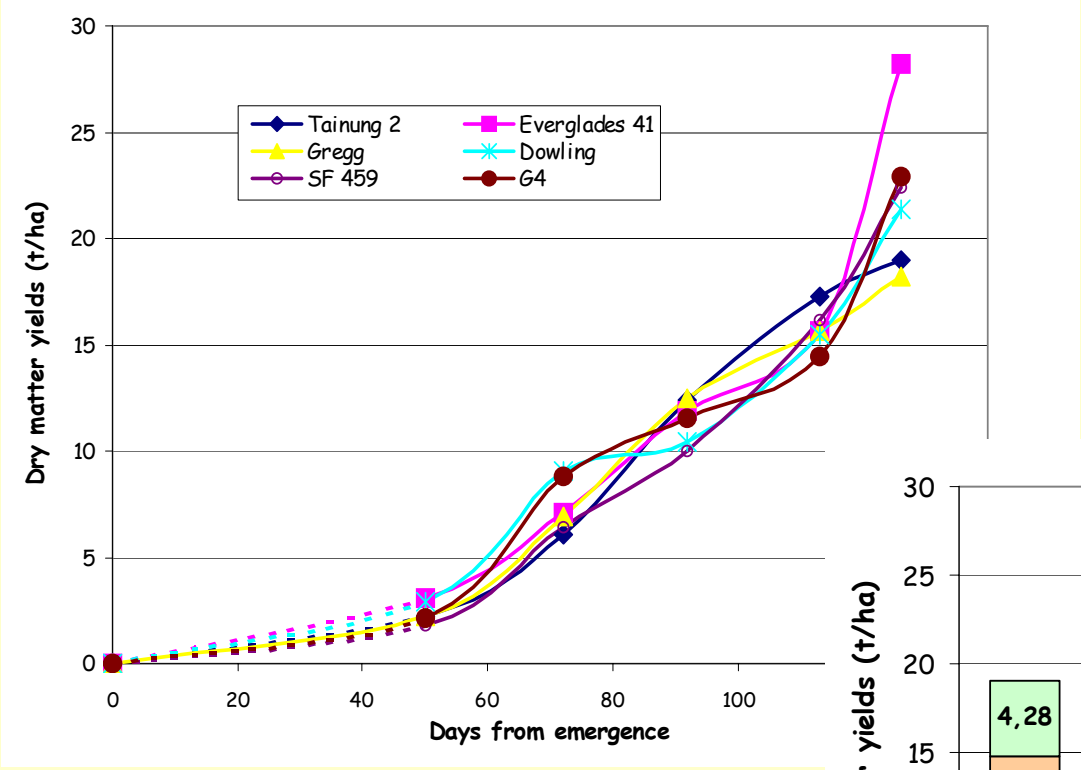
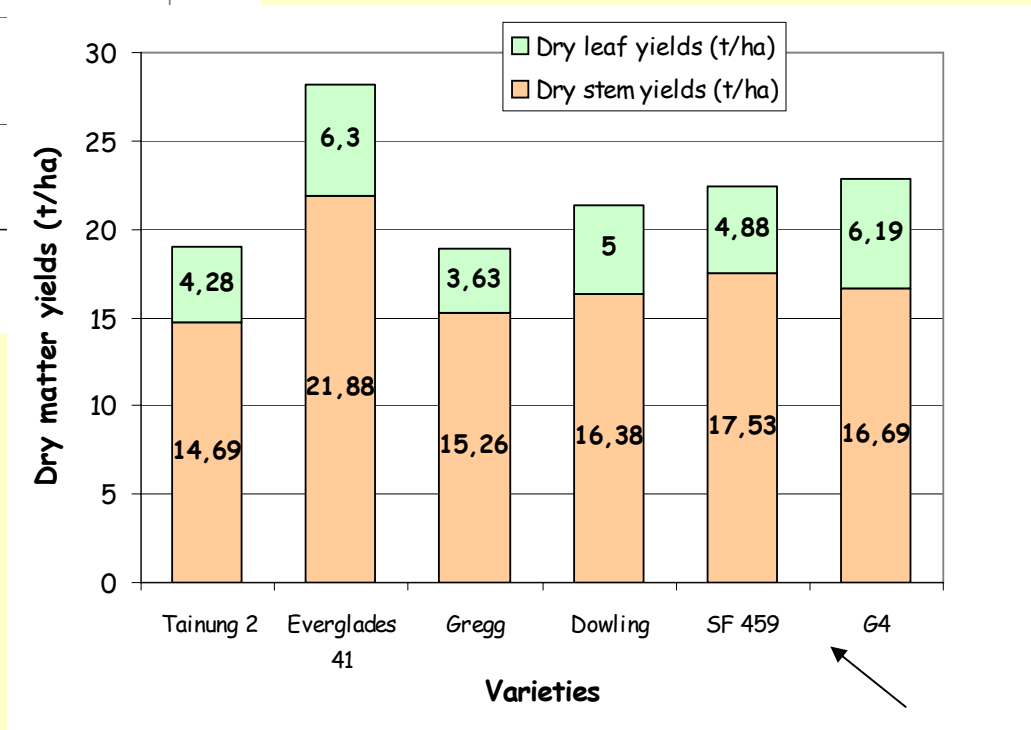


23/9/03

Task 2.1 – Dry matter yields (t/ha)





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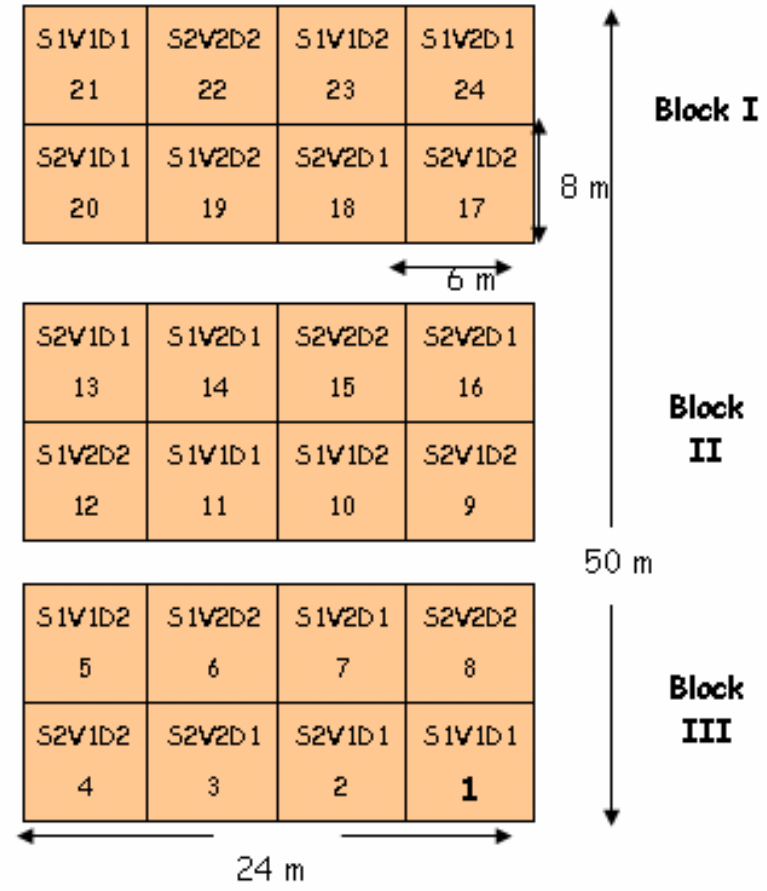
Experimental layout of Task 2.2
Sowing times and plant populations



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

Date of thinning:

S1: 3/6/03

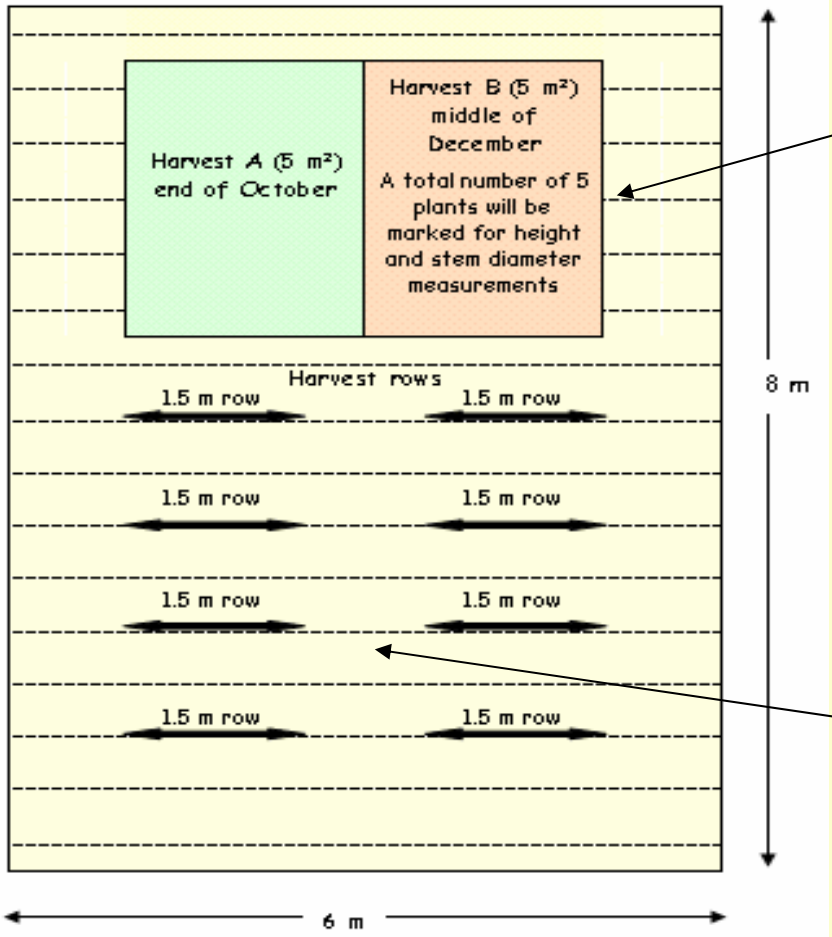
S2: 4/7/03

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

The plants received apart from the rainfalls a total quantity of 400 mm in S1 and 350 mm in S2 of water through a drip irrigation system

The flowering starting at the beginning of October for both varieties and sowing dates. At the moment all the plants had produced flowers.

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:

21/7/03

11/8/03

31/8/03

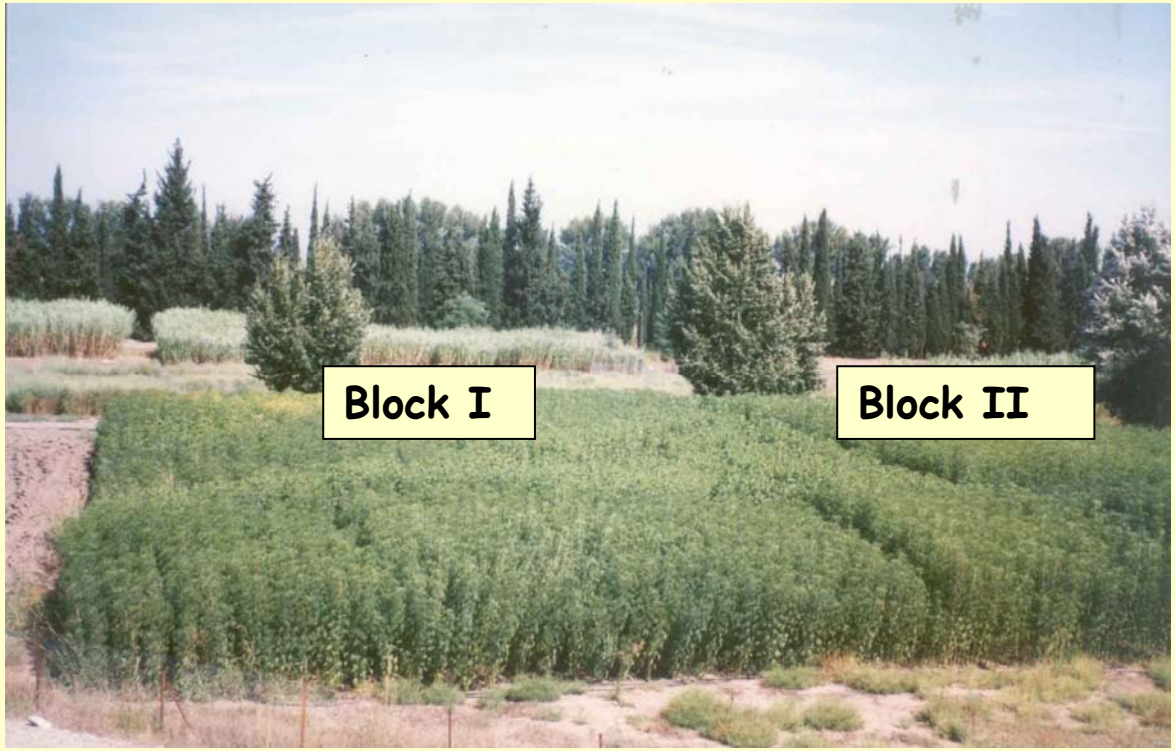
21/9/03

6/10/03

Next harvest:

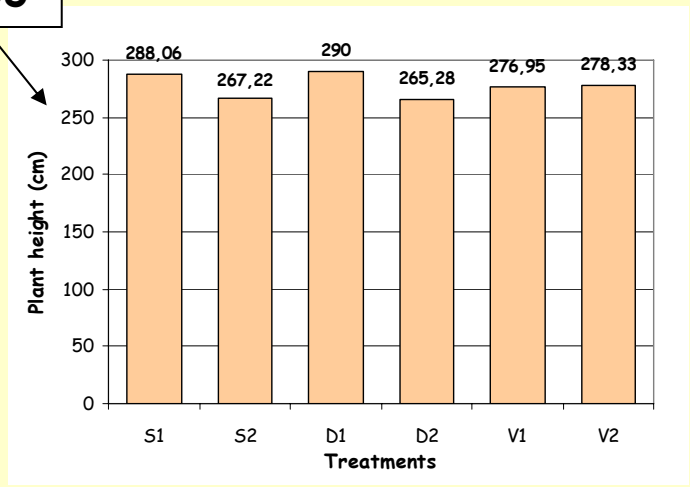
29/10/03

View of the Task 2.2 trial (10/9/03)



Task 2.2 – Plant height (cm), basal stem diameter (mm) and leaf area index (LAI)

7/10/03



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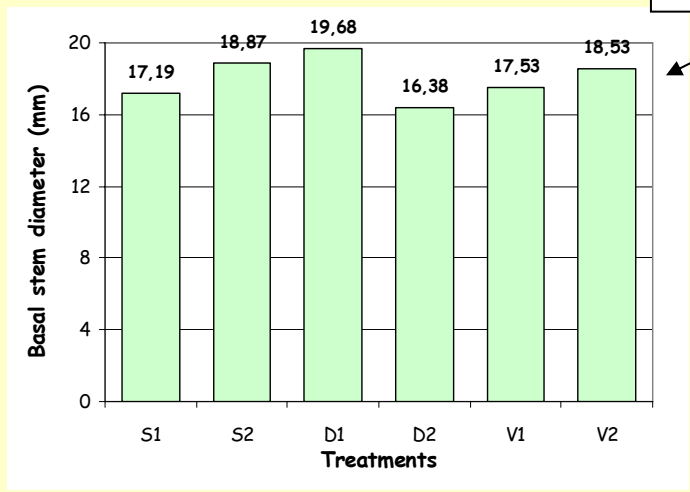
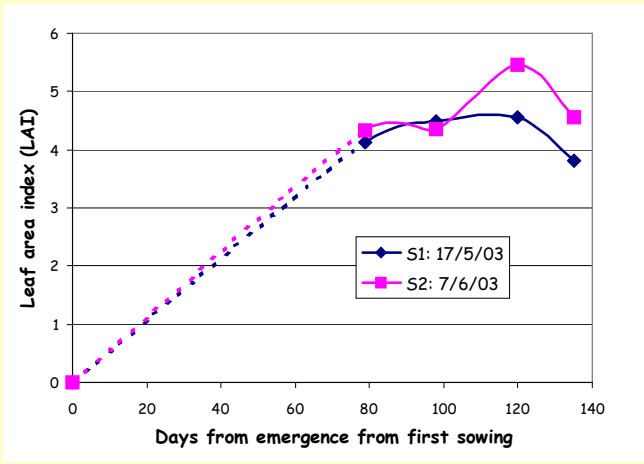
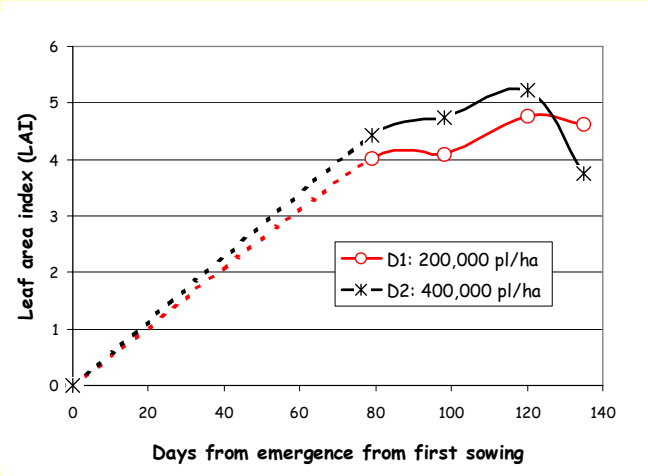
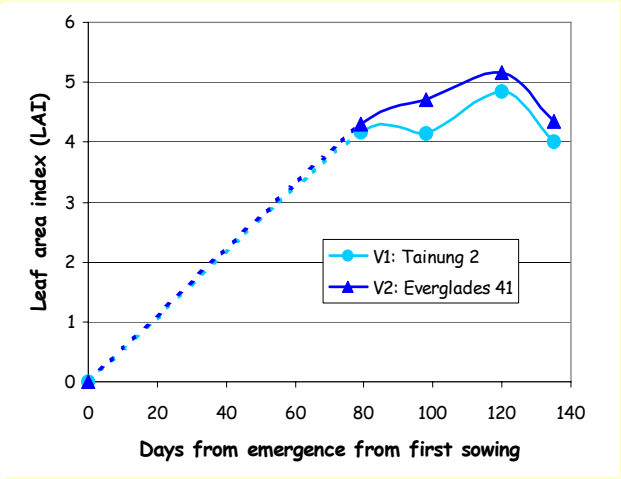
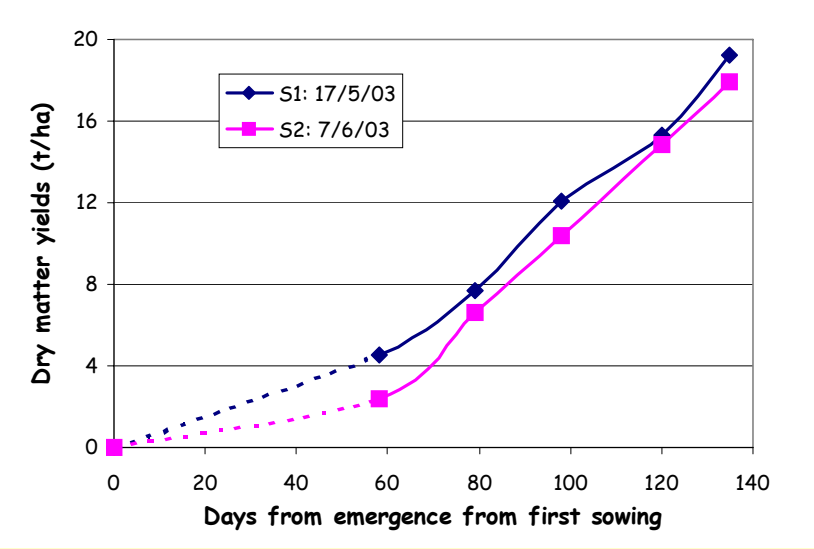


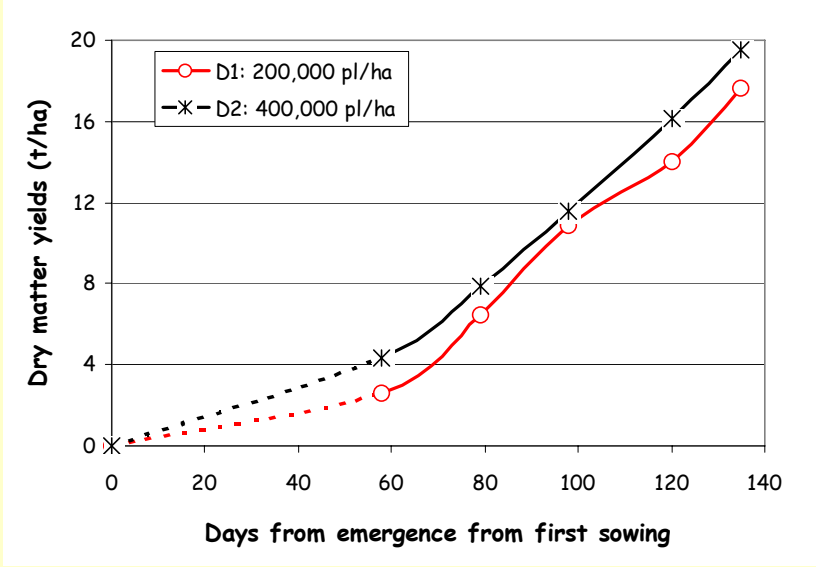


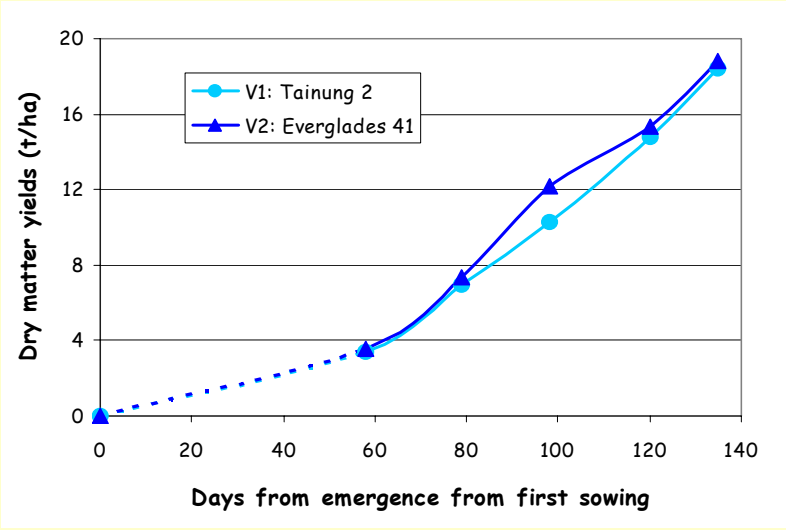


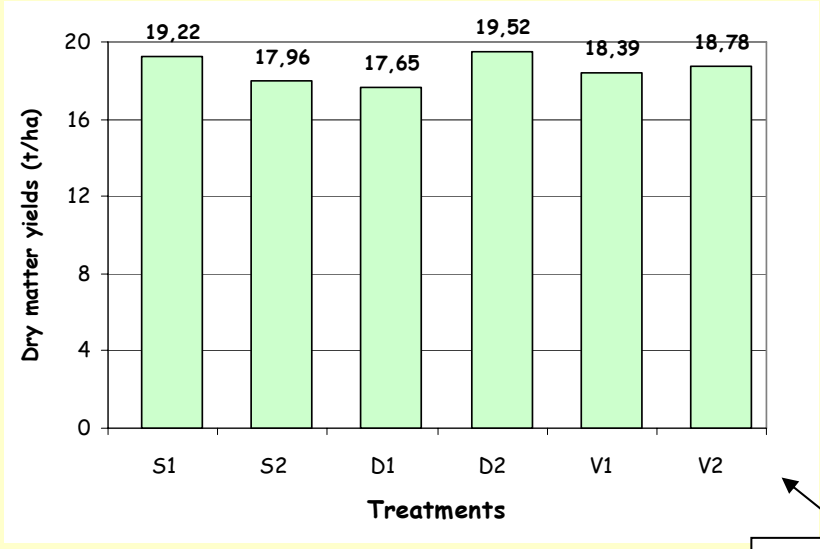


Task 2.2 - Dry matter yields (t/ha)



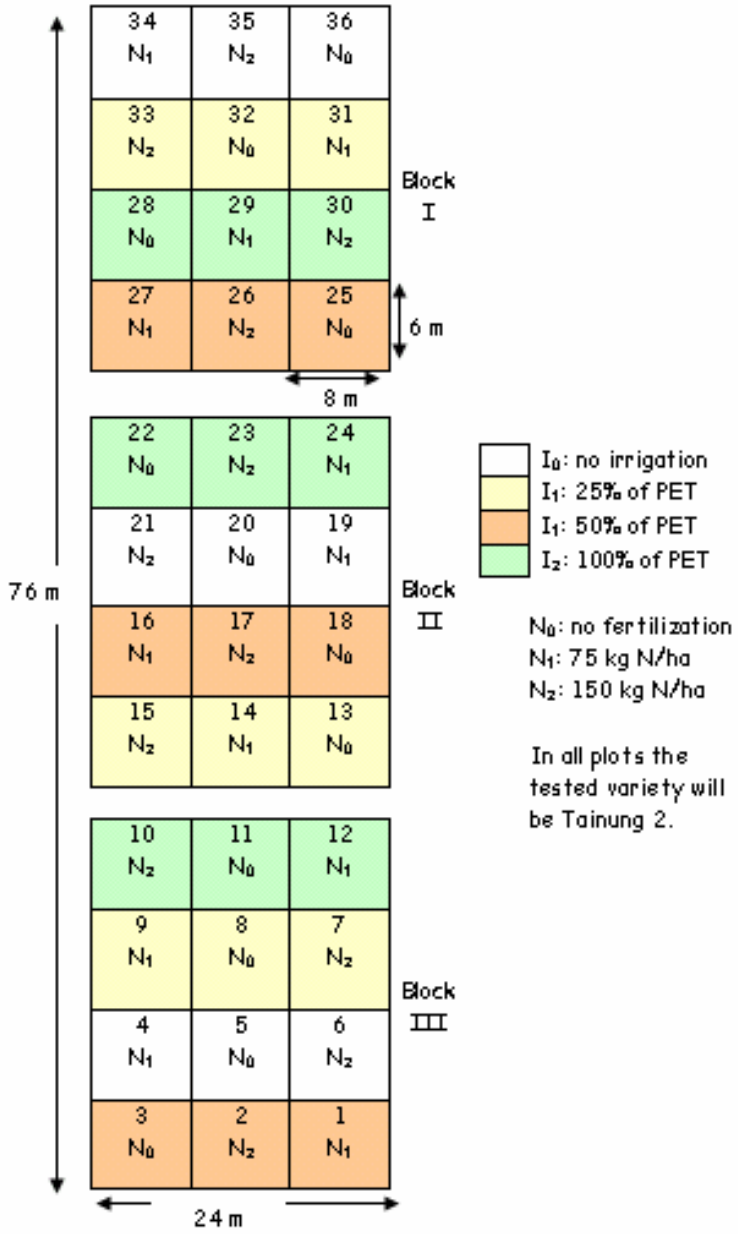






6/10/03

Experimental layout of Task 2.3
Irrigation and nitrogen fertilization rates



Date of sowing: 31/5/03

↓

Date of thinning: 30/6/03

↓

The different levels of nitrogen fertilization was applied through the drip irrigation system in the beginning of July (5/7/03)

↓

The plants received apart from the rainfalls the following irrigation quantities:

I1: 120 mm

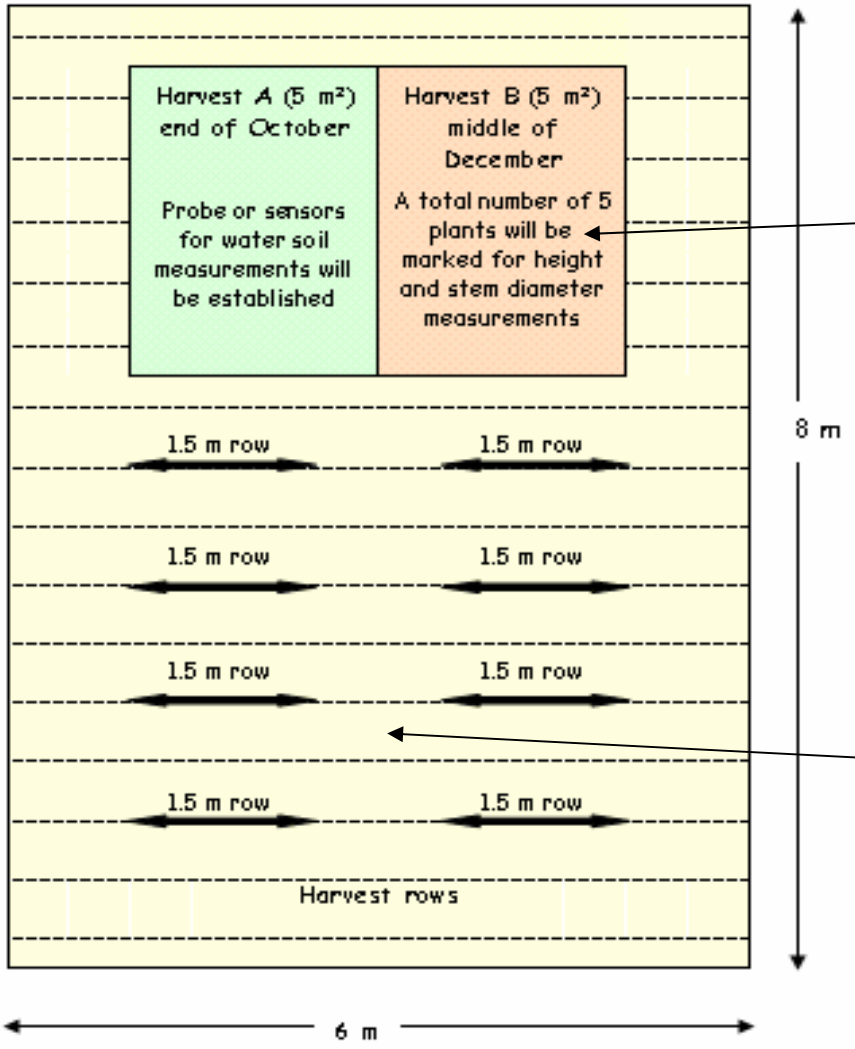
I2: 240 mm

I3: 480 mm

↓

The flowering starting at the beginning of October (2/10/03) and at the moment the flowering is 100%.

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:

21/7/03

11/8/03

31/8/03

21/9/03

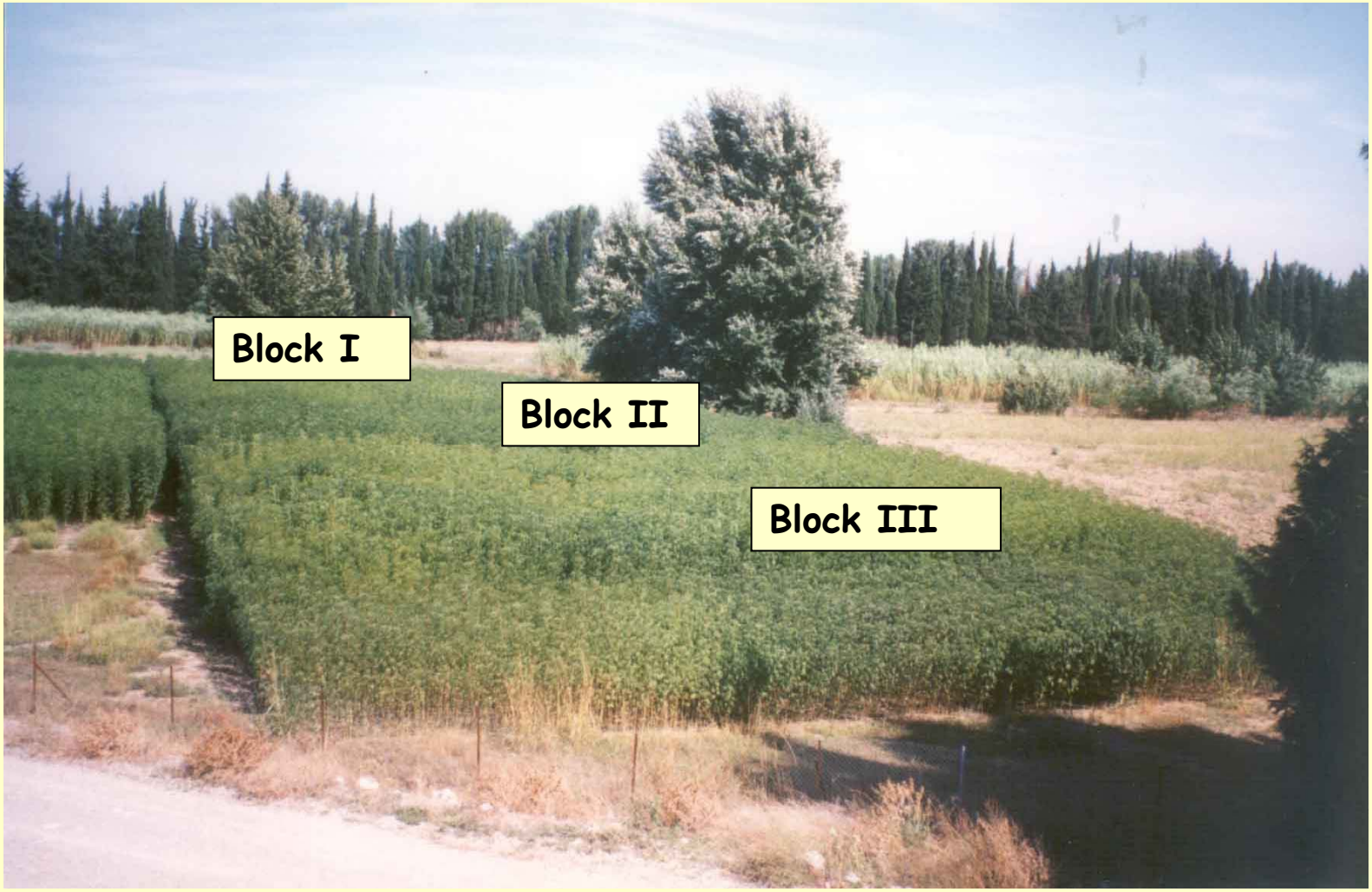
5/10/03

Next harvest:

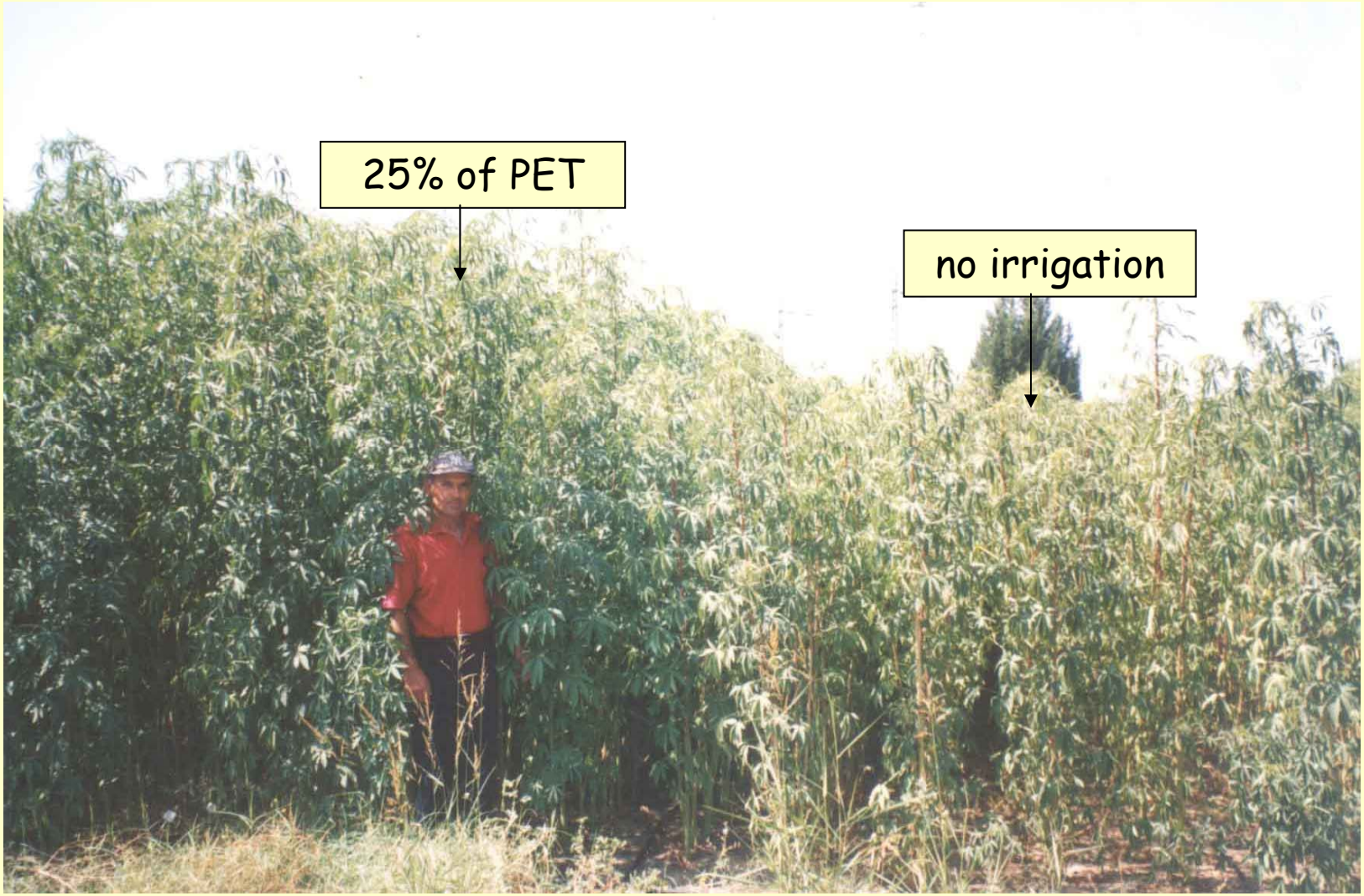
27/10/03

- 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.

View of the Task 2.3 trial (10/9/03)



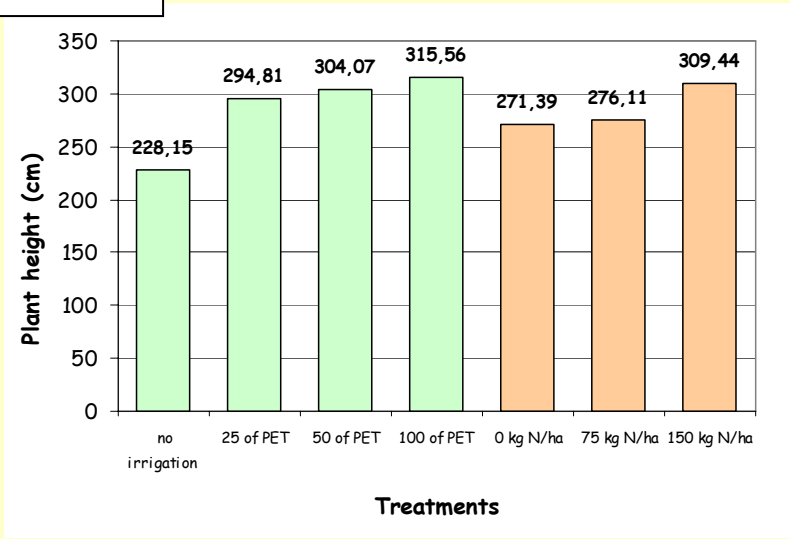
Effect of the irrigation on plant growth (10/9/03)



TDR probes were established in the middle of each plot in Block II of Task 2.3 and we measured the soil moisture in several soil depths (10, 30, 50 70, 90, 110 and 130 cm) before and after each irrigation.

Task 2.3 – Plant height (cm), basal stem diameter (mm) and leaf area index (LAI)

7/10/03



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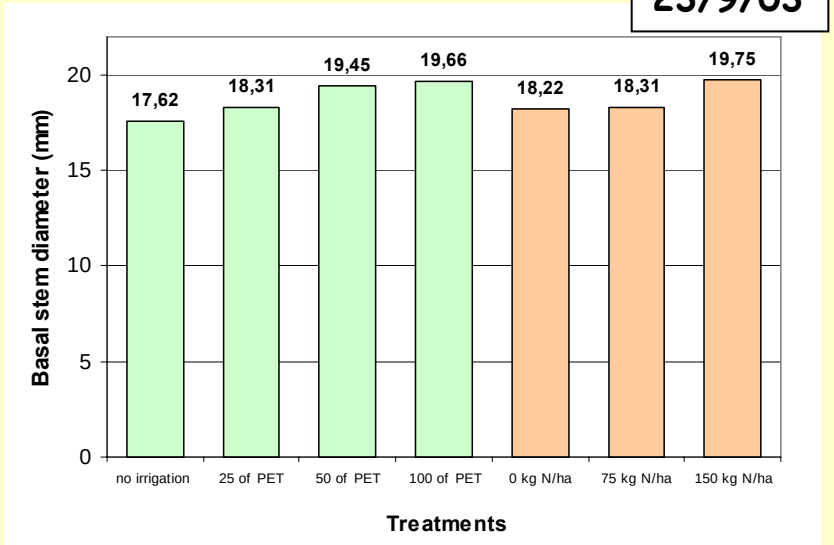

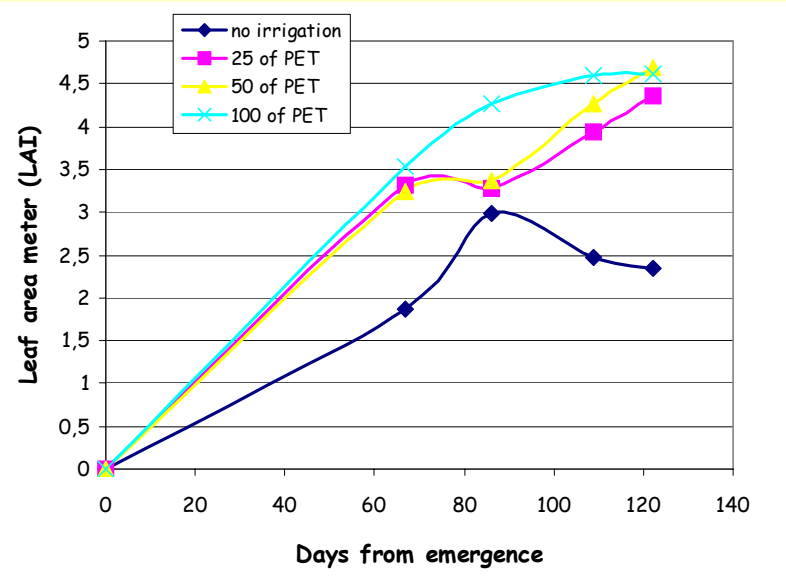

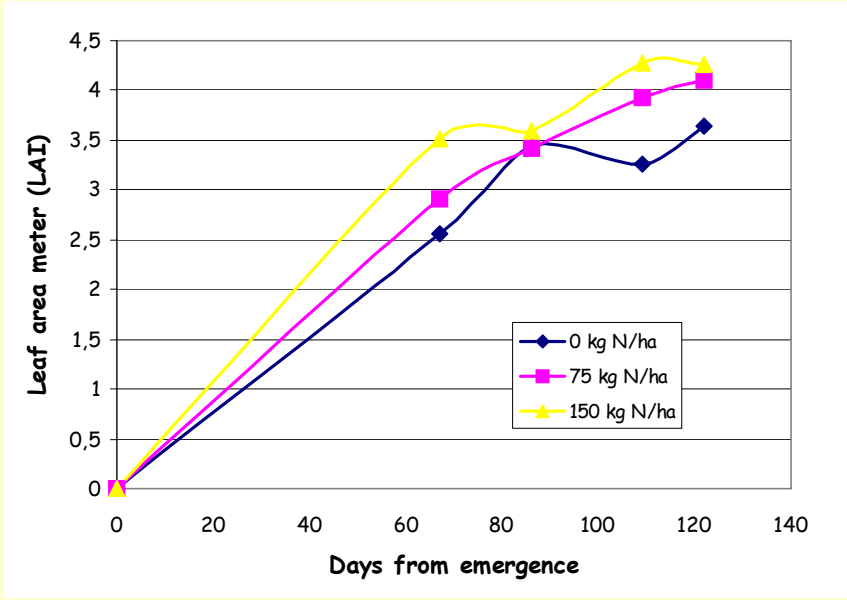

Task 2.3 – Dry matter yields (t/ha)