# WP2
# Adaptability and Productivity Field Trials

## Partner (7)
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*Task 2.2 – Effect of different sowing dates and plant populations on biomass yields*

*Task 2.3 – Effect of irrigation and nitrogen fertilization on biomass yields*


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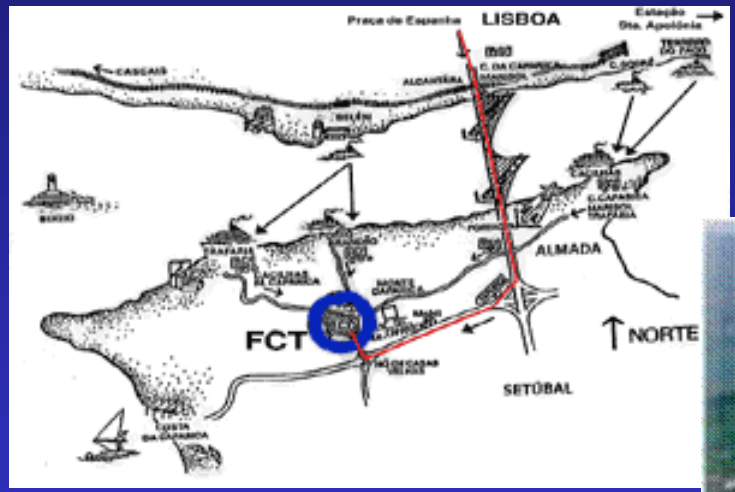
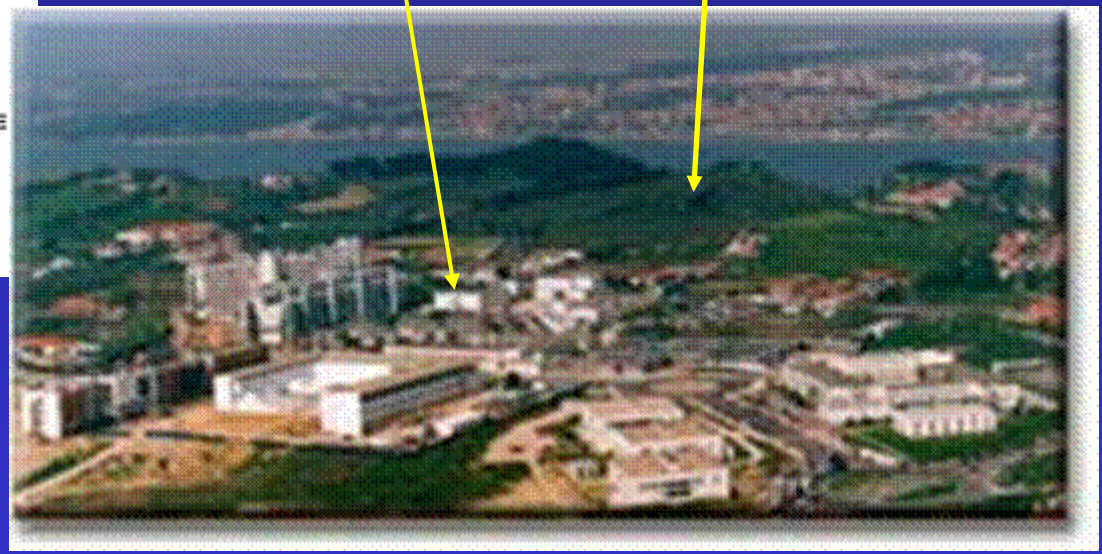
# *Experimental fields*

**Located in Monte de Caparica, in the Peninsula of Setúbal, near the University - near Lisbon, in the south border of river Tejo**




**We are here**

**Fields**

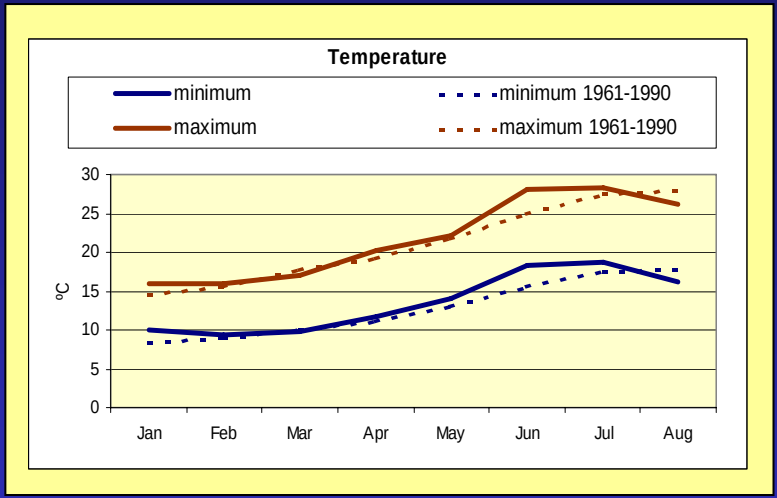


**Latitude:** 38º 40´ N
**Longitude:** 9º W
**Altitude:** 50 m

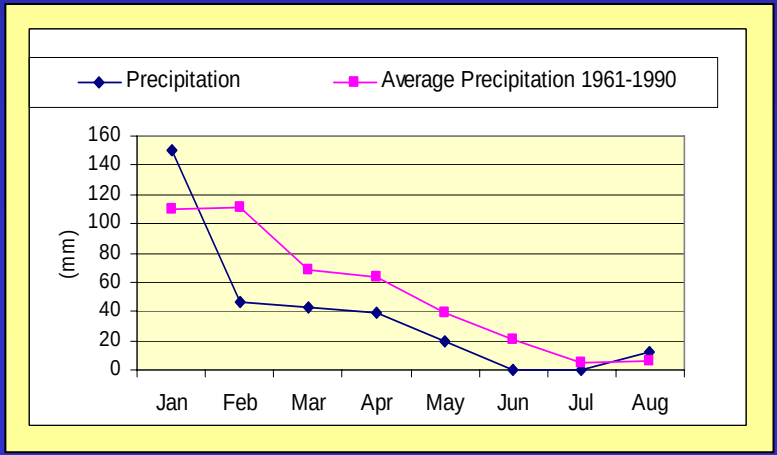
**Urban area near the Atlantic coast and the estuarine zone**

# Climatic conditions at Monte de Caparica

**During the first six months of 2004**




**Temperatures, minimum and maximum, higher than normal values 1961-1990, except in August, where they were lower than normal values**




**Precipitation, lower than normal values 1961-1990, except in January and August, where they were higher than normal values**

*Task 2.2*

*– Effect of different sowing dates and plant populations on biomass yields*

2 sowing dates x 2 varieties x 2 plant densities x 3 replicates

$S_1$: 18/5/2004
$S_2$: 15/6/2004

$V_1$: Tainung 2
$V_2$: Everglades 41

$D_1$: 20 plants/$m^2$
$D_2$: 40 plants/$m^2$

Each field: 8 x 4 $m^2$

75 kg N/ha
120 kg $K_2O$/ha
60 kg $P_2O_5$/ha

First sowing dates,

due to an invasion by the rabbits during the month of June we had to sow again, this time only one block

$S_1$: 12/7/2004
$S_2$: 02/8/2004

New sowing dates

Rabbits eat the plants after emergence, namely $S_2$ plants, and for $S_1$ plants, they eat the leaves and the upper part of the stem.

Last week of June and first week of July were the worst period. But, even until the end of August (time when hunters start their activity) rabbits gave a lot of head aches.

Also, this year, the activity of the rabbits were of major concern because, probably, last year we permited with the first crop, their multiplication.

# *Plants*

**Some observations taken from the first sowing ($S_1$ – 18/5, $S_2$ – 15/6):**

**50% emergence S1 – 7 days after sowing, for both varieties**

**S2 – 4 days after sowing, for both varieties**

**The plants from S1, were growing slower than the plants from S2**

**Second sowing, $S_1$ – 12/7; $S_2$ – 2/8:**

**50% emergence – 4 days after sowing,**

**as for $S_1$ as for $S_2$,**

**as for Tainung 2 as for Everglades 41**

| | |
|---|---|
| **Tainung 2** | **- 90% of the seeds emerged** |
| **Everglades 41** | **- 90 % of the seeds emerged** |

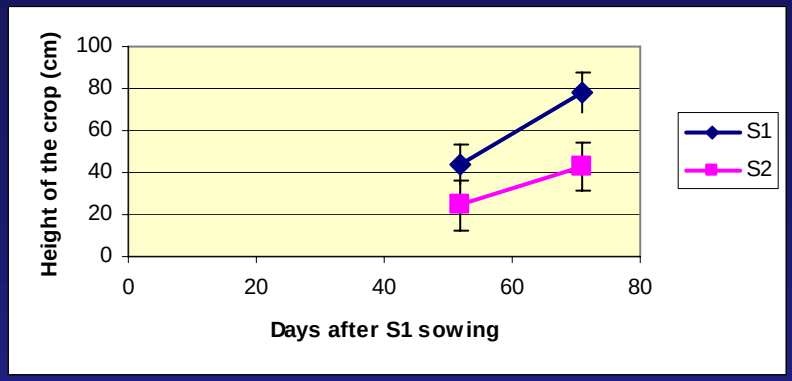
**After 73 days (23$^{th}$ September) after $S_1$ sowing**

**no flowering yet**

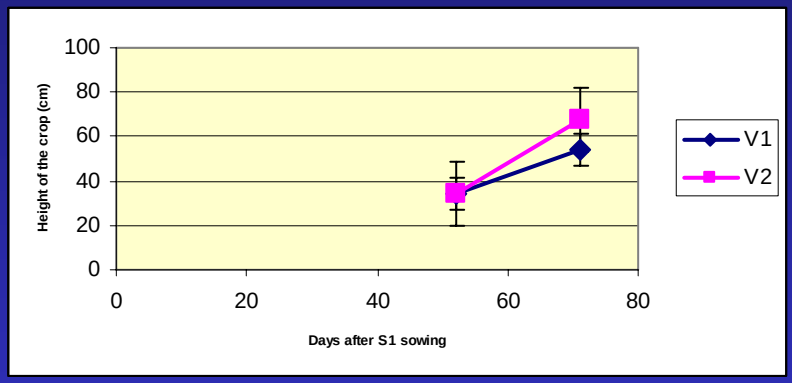
**Plants with 70 days after $S_1$ sowing**

**Plants with 70 days after $S_1$ sowing**

# Height of the crop

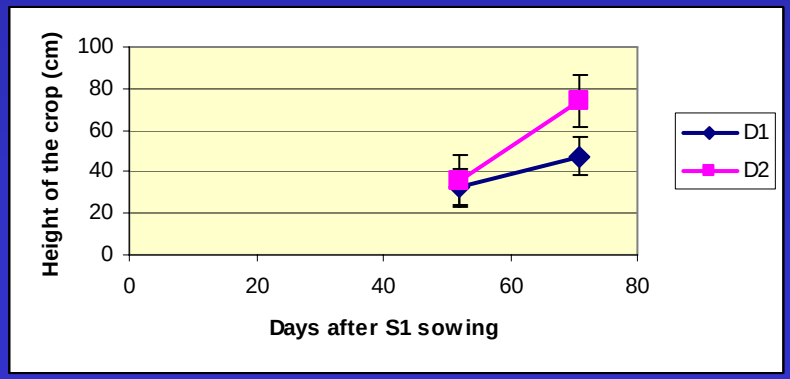



S1 >> S2




Everglades 41 > Tainung 2, but not significant

D2 > D1

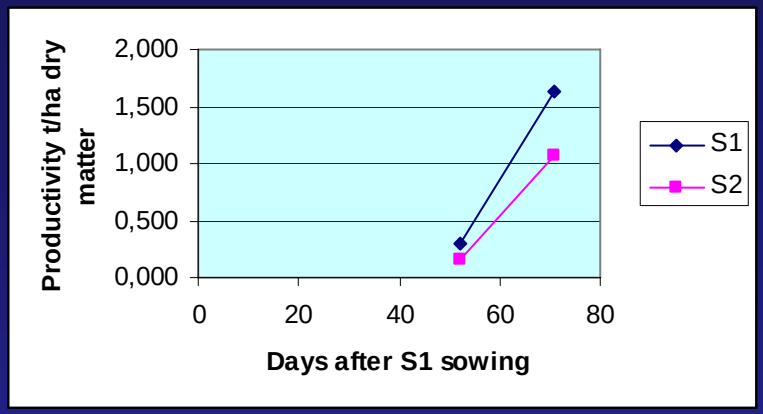



Comparing 2003 with 2004, plants presented a slower growth

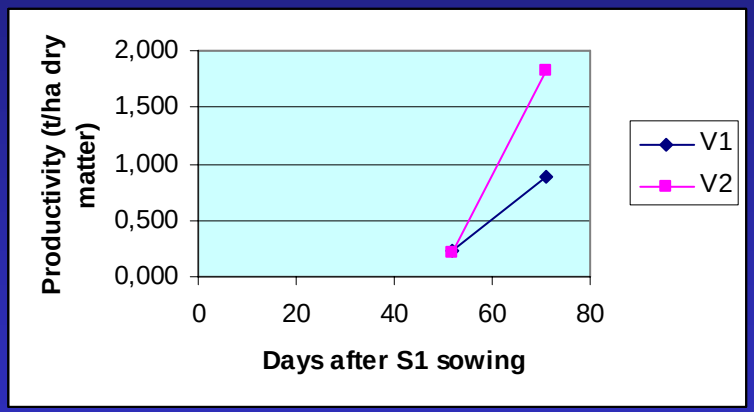
Later sowing than in 2003

Colder weather in August

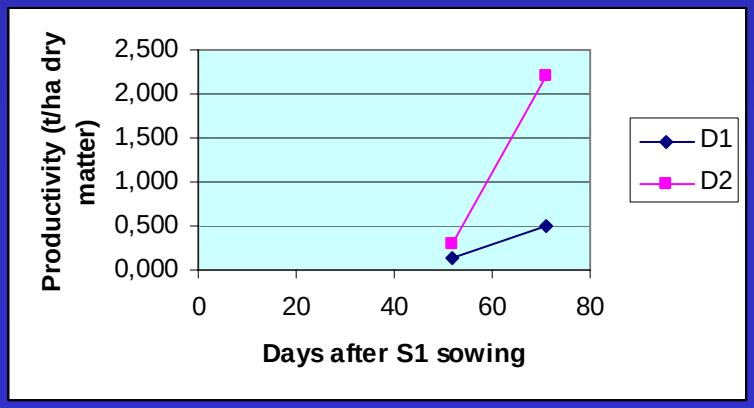
# Productivity




Significant differences between $S_1$ and $S_2$, $S_1$ higher than $S_2$




Significant differences between Tainung 2 and Everglades 41, Everglades 41 more productive, at least at early stages of growth




Fields with 40 plants.m$^{-2}$ more productive than with 20 plants.m$^{-2}$, at least at early stages of growth

## Soil

| | 19/05/2003 | 29/01/2004 | 27/04/2004 | |
|---|---|---|---|---|
| - pH ($H_2O$) | 8.6 | 8.2 | 8.0 | ↓ |
| - pH (KCl) | 7.6 | 7.6 | 7.2 | ↓ |
| - Conductivity ($\mu S.cm^{-1}$) | 190 | 310 | 260 | ↑ |
| - Organic matter (%) | 1.6 | 2.2 | 1.9 | ↑ |
| - $CaCO_3$ (%) | 8 | 8 | 13 | ↑ |
| - N Kjeldahl (% N) | 0.25 | 0.11 | 0.09 | ↓ |
| - $NO_3$ ($mg(N).Kg^{-1}$) | 0.8 | 2.0 | 1.6 | ↑ |
| -$NO_2$ ($mg(N).Kg^{-1}$) | 0.04 | 0.04 | 0.06 | ↑ |
| -$NH_4$ ($mg(N).Kg^{-1}$) | 1.4 | <DL | <DL | ↓ |
| -Extractable P ($mg(P).Kg^{-1}$) | 111 | 475 | <DL | ↓ |
| - Total phosphorus ($mg(P).Kg^{-1}$) | 680 | 700 | 714 | ↑ |
| -Exchangeable K ($mg(K).Kg^{-1}$) | 230 | 280 | 200 | ↓ |
| - Total potassium ($g(K).Kg^{-1}$) | 6.0 | 8.6 | 5.0 | ↓ |

*Task 2.3*

*– Effect of irrigation and nitrogen fertilization on biomass yields*

**The same problems occurred in the fields with the rabbits**

**4 irrigation levels x 3 nitrogen fertilization x 3 replicates**

$I_1$: 0% PET
$I_2$: 25% PET
$I_3$: 50% PET
$I_4$: 100% PET

$N_1$: 0 kg N/ha
$N_2$: 75 kg N/ha
$N_3$: 150 kg N/ha

At early stages of growth, all the fields were fully irrigated in order to compensate the water deficit of the soil
49 days after sowing, 06/09/2004, irrigation was differentiated

Variety: Tainung 2
Sowing: 02/6/2004
20 plants/$m^2$

Each field: 8 x 5 $m^2$
120 kg $K_2O$/ha
60 kg $P_2O_5$/ha

New sowing date 19/07/2004,

Only one block

**Some observations taken from the first sowing (2/6)**

**50% emergence - 5-6 days after sowing**

**Second sowing – 19/7:**

**50% emergence – 4-5 days after sowing**

**85% of the seeds emerged**

**After 66 days (23th September) after sowing**

**no flowering yet**

**Comparing 2003 with 2004, plants presented a much slower growth**

**Later sowing than in 2003**

**Colder weather in August**

**Plants with 63 days after sowing**

**Plants with 63 days after sowing**

# Soil

| | 19/05/2003 | 29/01/2004 | 27/04/2004 | |
|---|---|---|---|---|
| - pH ($H_2O$) | 8.6 | 8.2 | 7.7 | ↓ |
| - pH (KCl) | 7.6 | 7.6 | 7.1 | ↓ |
| - Conductivity ($\mu S.cm^{-1}$) | 190 | 300 | 280 | ↑ |
| - Organic matter (%) | 1.6 | 1.8 | 2.0 | ↑ |
| - $CaCO_3$ (%) | 8 | 8 | 12 | ↑ |
| -Extractable P ($mg(P).Kg^{-1}$) | 111 | 450 | 32 | ↓ |
| -Total phosphorus ($mg(P).Kg^{-1}$) | 680 | 640 | 790 | ↑ |
| -Exchangeable K ($mg(K).Kg^{-1}$) | 230 | 280 | 170 | ↓ |
| -Total potassium ($g(K).Kg^{-1}$) | 6.0 | 7.1 | 6.3 | ↑ |
| | | $N_0$ - $N_{75}$ - $N_{150}$ | $N_0$ - $N_{75}$ - $N_{150}$ | |
| - N Kjeldahl (% N) | 0.25 | 0.09 – 0.09 – 0.09 | 0.08 – 0.07 - 0.07 | ↓ |
| - $NO_3$ ($mg(N).Kg^{-1}$) | 0.8 | 2.7 - 1.8 - **3.7** | 2.4 - 2.9 - **4.9** | ↑ |
| -$NO_2$ ($mg(N).Kg^{-1}$) | 0.04 | 0.07 - 0.02 - 0.06 | 0.10 - 0.07 - 0.08 | ↑ |
| -$NH_4$ ($mg(N).Kg^{-1}$) | 1.4 | <DL - <DL - >DL | <DL - <DL - <DL | ↓ |