BIOKENAF

BIOMASS PRODUCTION CHAIN AND GROWTH SIMULATION MODEL FOR KENAF

QLK5 CT2002 01729

CETA

Centro di Ecologia Teorica ed Applicata

Centre for Theoretical and Applied Ecology

Scientific Team

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- **WP 2**: Adaptability and Productivity Field Trials
  - Task 2.4: Kenaf Field Trials with Size 2 ha

- **WP 4**: Harvesting and Storage Trials
  - Task 4.1: Harvesting Trial
  - Task 4.2: Storage Trial

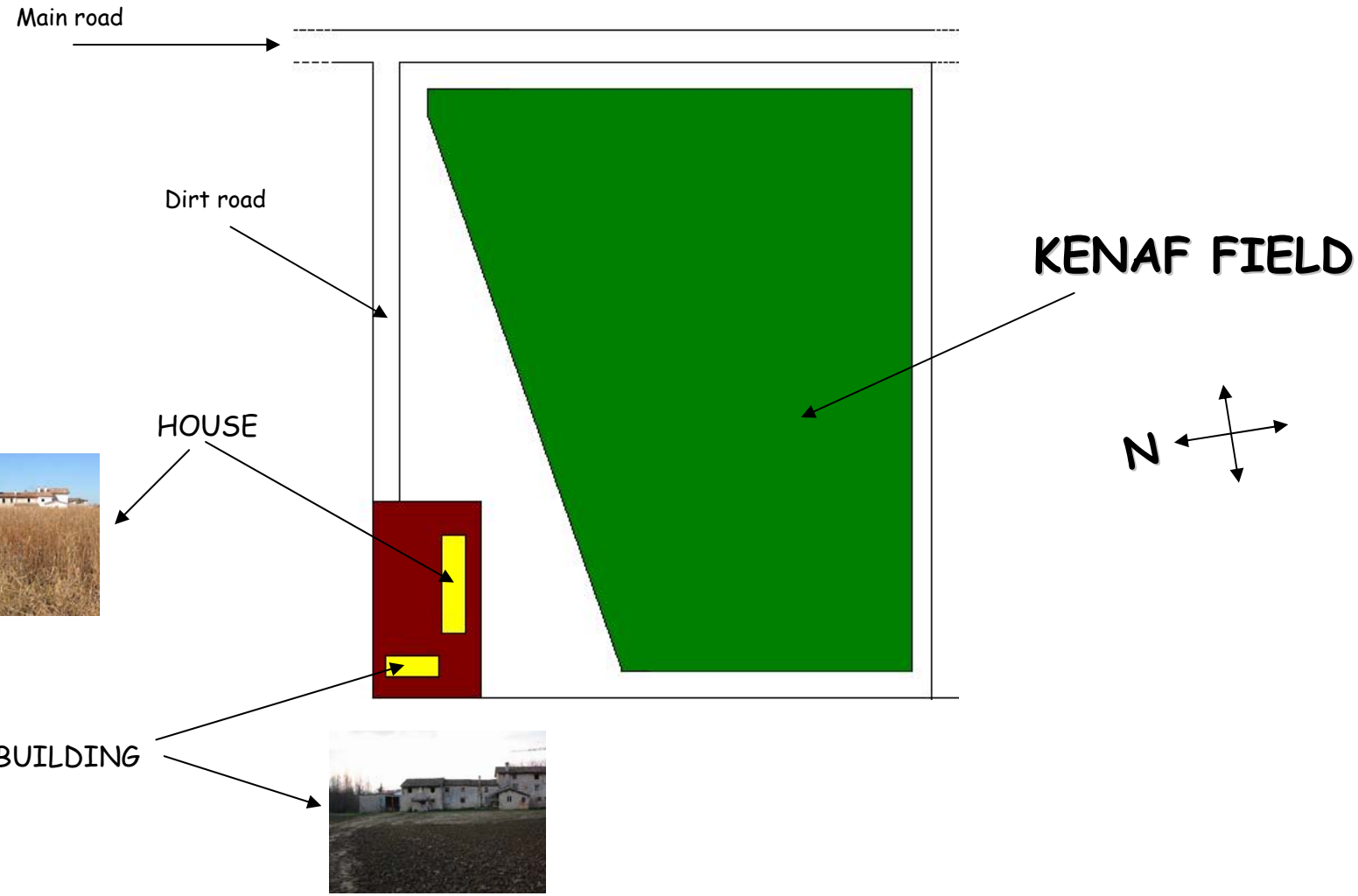
SITE DESCRIPTION

Cervignano del Friuli (UD)

North East Italy

- Latitude: 45° 51′ N
- Longitude: 13° 20′ E
- Altitude: 8 m above sea level
- Soil texture: fine silty-clayey soil

EXPERIMENTAL FIELD



PRE-SOWING WORKS

- PLOWING
- HARROWING
  - (Seedbed Preparation)

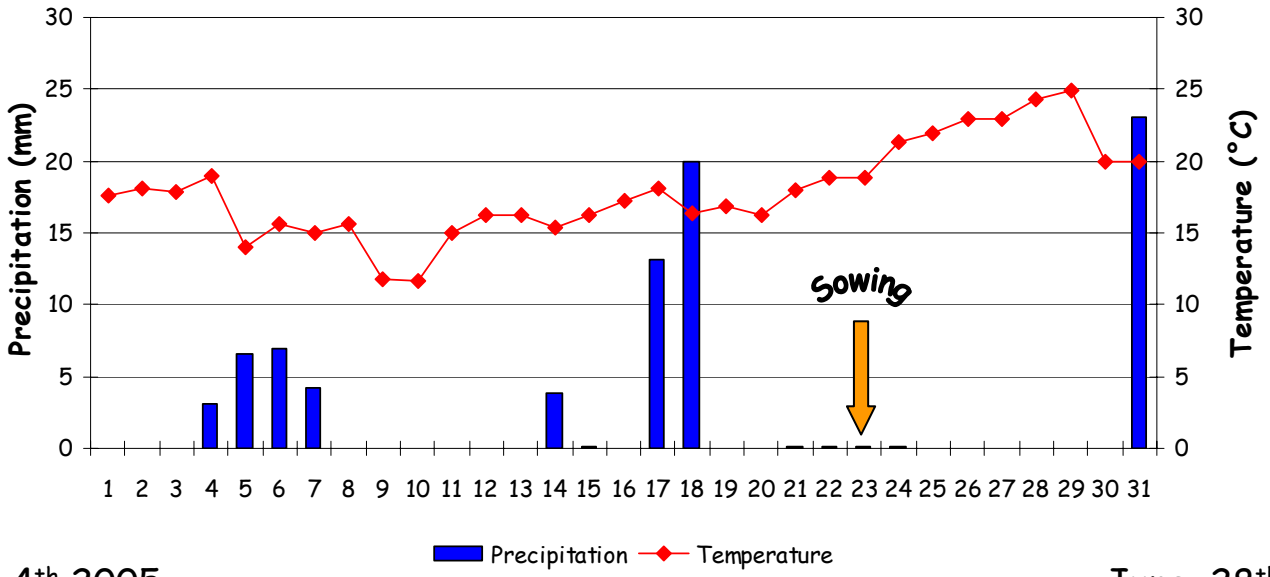
BESIDES

- NO CHEMICAL FERTILISATION
- NO CHEMICAL HERBICIDE
- NO IRRIGATION

SOWING PARAMETERS

KENAF VARIETY	EVERGLADES 41
DATA	**23/05/2005** (ten days after last year sowing)
FIELD SIZE	1,10 ha
PLANT POPULATION	440.000 plants/ha (to obtain 400.000 plants/ha)
SPACE BETWEEN PLANTS	5 cm X 45 cm
SOWING DEPTH	3 – 4 cm

SOWING PARAMETERS



June, 4th 2005

Two different germination periods

1) germination at the end of May

2) germination at the beginning of June

June, 28th 2005

KENAF DEVELOPMENT

June, 4th 2005

Kenaf Situation on June, 10th 2005

Plant population: 350,000 plants/ha

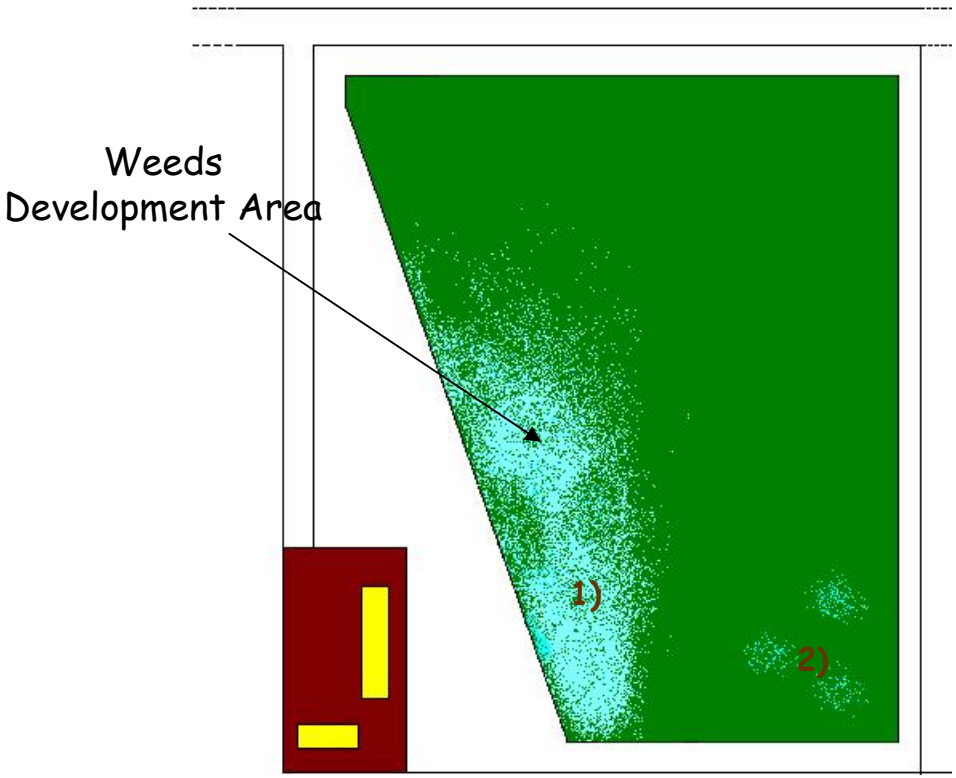
Medium plant height: 4.4 cm

KENAF DEVELOPMENT

Kenaf Situation on June, 20th 2005

Problems with weeds (*Sorghum halepense*)

WEEDS DEVELOPMENT



1)

2)

Chemical Weed Control - Post Emergency

AGIL (Du Pont): 1.2 l/ha (a.s.: **Propaquizafop**)

KENAF DEVELOPMENT

Kenaf Situation on June, 28th 2005

Plant population: 350,000 plants/ha

Medium plant height:

- 26 cm (no weeds)
- 12 cm (weeds or germination postponed)

KENAF DEVELOPMENT

Kenaf Situation on July, 26th 2005

Medium plant height: 95 cm

(range 70 - 130 cm)

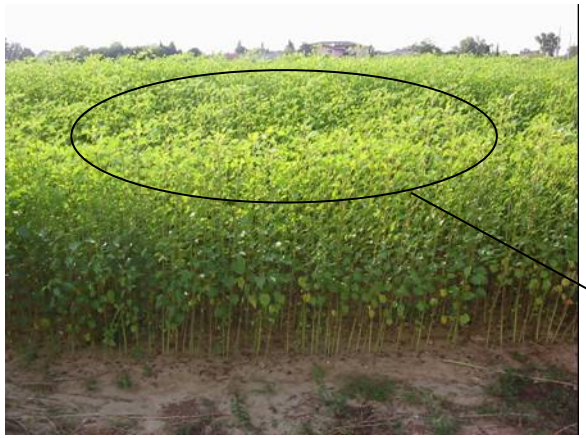
KENAF DEVELOPMENT

Kenaf Situation on September, 1st 2005

Medium plant height: 170 cm (130 - 220)

Medium stem diameter: 1.5 cm

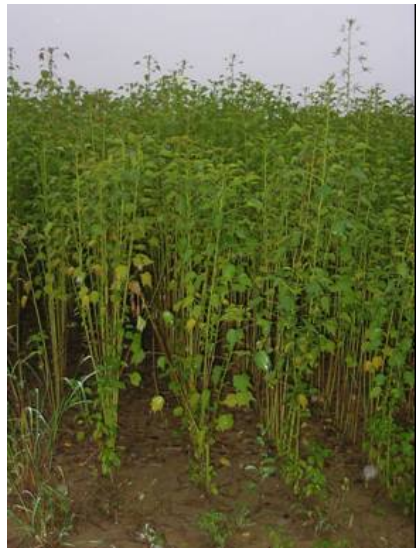
KENAF DEVELOPMENT



High difficulty to have a correct sampling

???

KENAF DEVELOPMENT

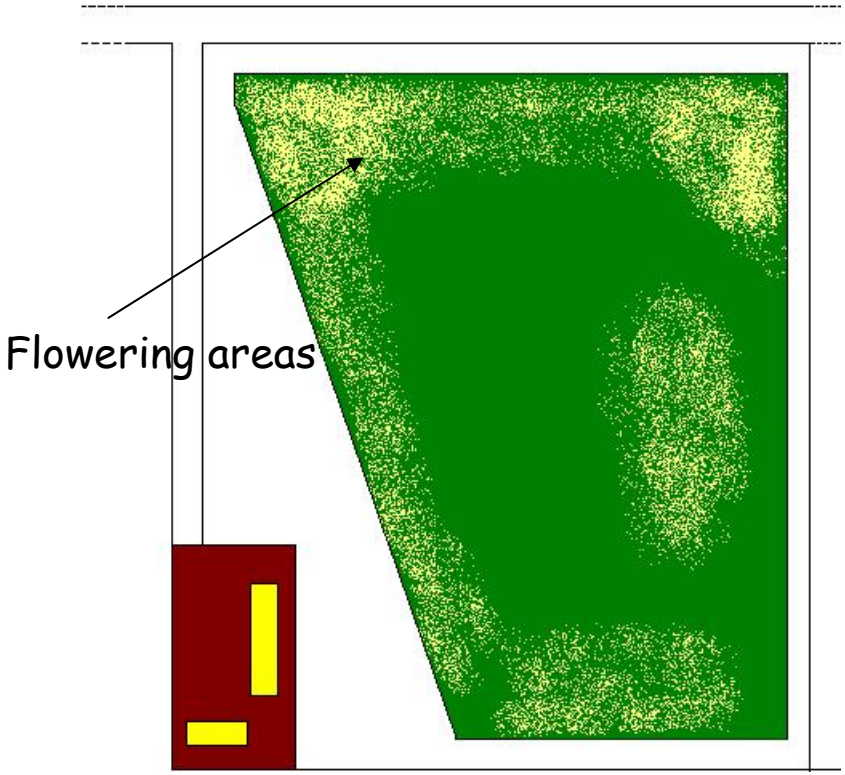


Kenaf Situation on October, 19th 2005

Medium plant height: 185 cm (130 - 330)

Medium stem diameter: 1.5 cm

KENAF FLOWERING



Starting of flowering period:

at the end of September

(few flowers)

Best flowering period:

at the beginning of November

(10-15% of plants)

KENAF DEVELOPMENT

Kenaf Situation on November, 9th 2005

Kenaf Sampling

Fungin disease
in many plants

KENAF DEVELOPMENT

Kenaf Situation on November, 9th 2005

Plants show a partial defoliation

(especially in the west side of the field)

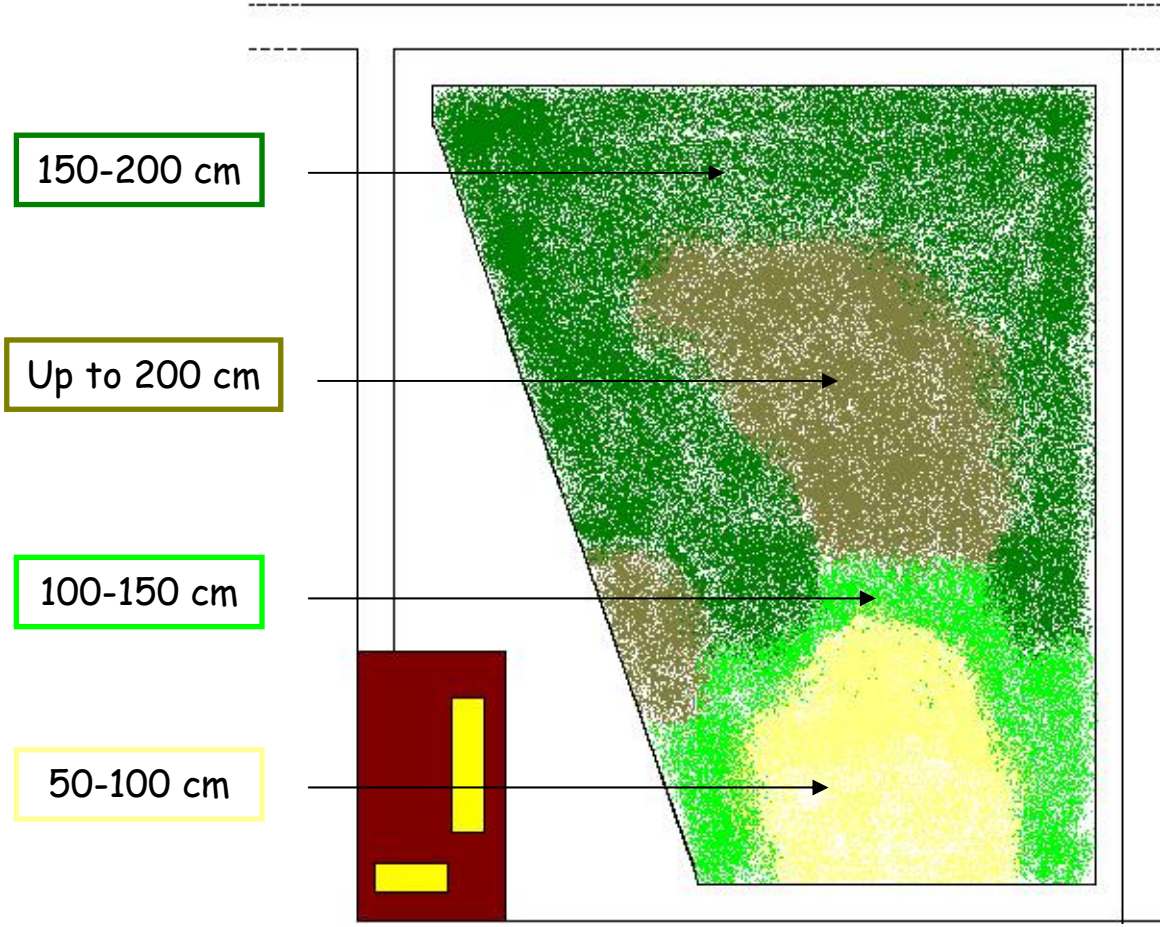
KENAF DEVELOPMENT

Kenaf Situation on November, 9th 2005

		Medium value	Area's Range	Plants' Range
HEIGHT	(cm)	171	130 - 220	60 – 330
STEM DIAMETER	(cm)	1.4	0.9 – 1.9	0.4 – 3.0
KENAF MOISTURE	(%)	75	-	-
ESTIMATE YIELD (Fresh Matter)	(t/ha)	34	23 - 50	-
ESTIMATE YIELD (Dry Matter)	(t/ha)	8.5	-	-

KENAF DEVELOPMENT

Kenaf Situation on November, 9th 2005



Problems with water stagnation?

RUN OFF direction

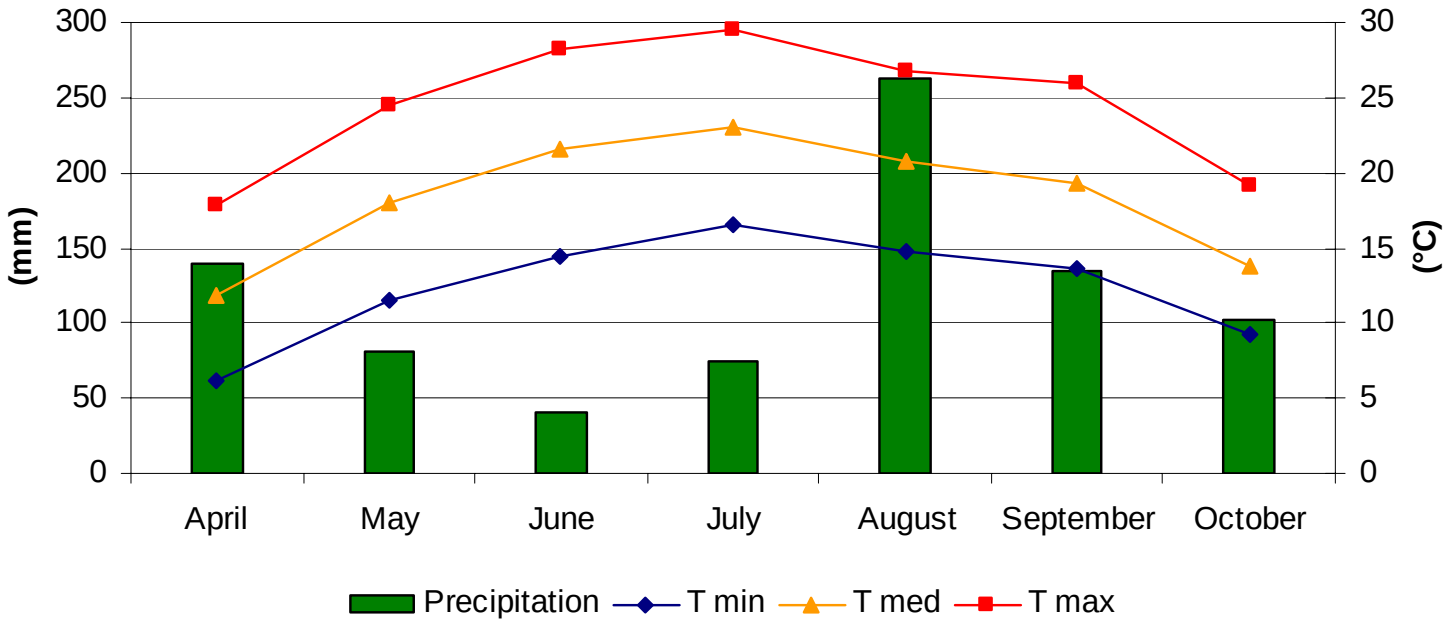
NEMATODES

Pictures of radical apparatus of smaller plants

Third year of kenaf culture in the same field

→ No problems with nematodes

TEMPERATURE (°C) and MONTHLY PRECIPITATION (mm) IN VEGETATIVE PERIOD IN CERVIGNANO DEL FRIULI (UD)



TERRIBLE AUGUST!!

COLD AND RAINY… not only for kenaf!

KENAF DEVELOPMENT

- The lack of precipitations after the sowing caused a reduced seed germination (only **50%** of plants). Owing to a serious of rainy events at the end of May and at the beginning of June, it was noted a postponed germination (about **30%** of plants). However it was observed a contraction of the expected % of seed germination. Only the 80% of seeds germinated to obtain a final plant density of 350,000 plants/ha.
- The high plant population choice, theoretical density of 400,000 plants/ha, didn't allow ramified plants to develop.
- It was observed a clear plant development unhomogeneity. There were areas where average plant height was 130 cm and areas where average plant height was 220 cm.
- The average temperature in October allowed the kenaf flowering.
- Stems present fungin disease.
- No attack from the root-knot nematode *Meloidogyne incognita* was recorded.

OBSERVATIONS

WHAT ABOUT THE REGISTERED LACK OF HOMOGENEITY IN THE PLANT DEVELOPMENT?

- During the past years of the project it was established a correlation between the plants size and the areas with water stagnation problems. This year it was possible to point out a relation between the direction of the run off of water and the kenaf plant development. This was due to the soil characteristics and the rising problems with water stagnation along the field.

- In other areas the limited kenaf growth was caused by the competition with weeds during the germination, in particular *Sorghum halepense*. The treatment with chemical herbicide was done late and this caused a slowdown development of part of the plants, only partially compensated by the larger development of other ones (that could be an explanation for the overlapping of the areas with high plants and areas strongly infested by weeds).

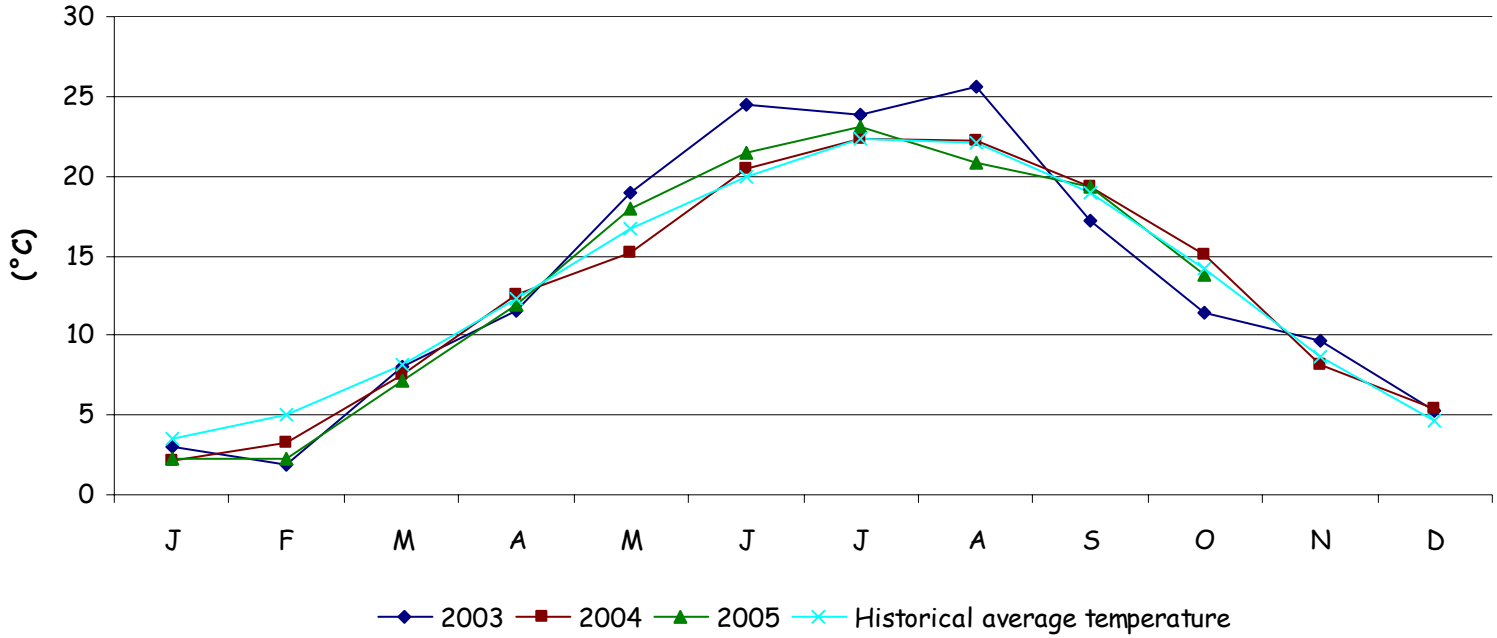
OBSERVATIONS

DISCUSSION ABOUT THE COMPARISON BETWEEN THE THREE YEAR YIELD RESULTS

	2003	2004	2005
MEDIUM STEM HEIGHT (cm)	200	160	170
MEDIUM BASAL STEM DIAMETER (cm)	1.7	1.2	1.4
KENAF STEM YIELD (t dry matter/ha)	11.0	4.8	8.5*
RAMIFIED STEMS	YES	NO	NO
FLOWERING	NO	YES	YES
NEMATODES	NO	NO	NO

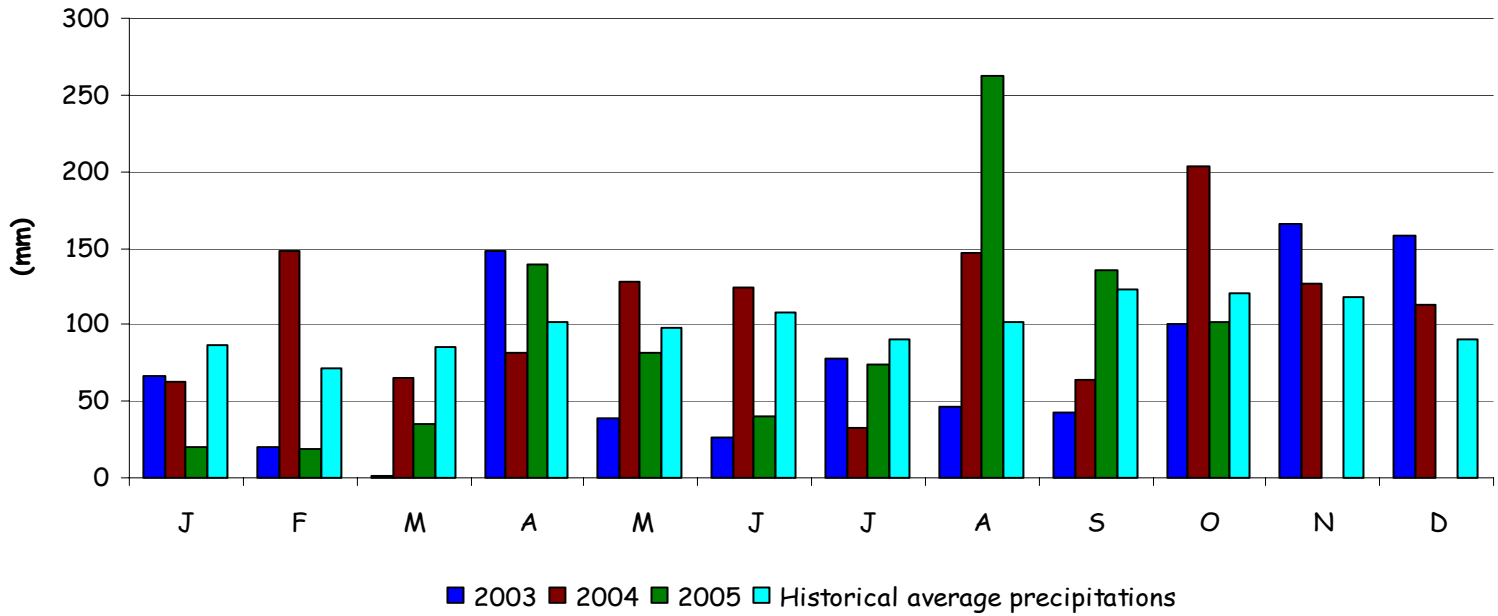
* Stems with a minimum part of leaves

COMPARISON BETWEEN AVERAGE TEMPERATURE AND RELATIVE PRODUCTION



In the second and in the third year average temperatures, in the norm for this lands, matched the historical data, whereas in the first year clearly higher temperatures were registered during the summer but lower temperatures were registered in September and October: high yield but no flowering.

COMPARISON BETWEEN AVERAGE PRECIPITATIONS



	2003	2004	2005	Historical Average Precipitations
Annual Precipitations (mm)	892	1295	- (909*)	1193
Precipitations between May and October - Vegetative Period (mm)	333	698	696	640

* until October

OBSERVATIONS

DISCUSSION ABOUT THE COMPARISON BETWEEN THE THREE YEAR YIELD RESULTS

- The factors **MEDIUM STEM HEIGHT**, **STEM DIAMETER** and **RAMIFIED STEMS** are directly related to the double plant population.

- The factor **FLOWERING** is directly related to the temperature. The low temperatures in September and October registered in 2003 didn't allow the flowering.

OBSERVATIONS

DISCUSSION ABOUT THE COMPARISON BETWEEN THE THREE YEAR YIELD RESULTS

• The differences in **KENAF STEM YIELD** are due to a series of different factors:

- **Climatic conditions**: in 2003 high temperatures (indicated for kenaf) and low precipitations (less problems with water stagnation) allowed high yield.
- **Weeds**: in 2004 serious problems with weeds (no chemical weed control was done). High reduction of kenaf yield.
- **Germination**: in 2005 it was observed a postponed germination (the second germination gave smaller plants).
- **Soil conditions**: it could be a progressive impoverishment of the soil. For three years there was no fertilization. Before 2003 this soil was cultivated with maize, so high level of fertilization was done.

BIOKENAF

C.E.T.A.

Partner n. 5

Work Package 2

Task 2.4