Generation Challenge Programme

CULTIVATING PLANT DIVERSITY FOR THE RESOURCE POOR

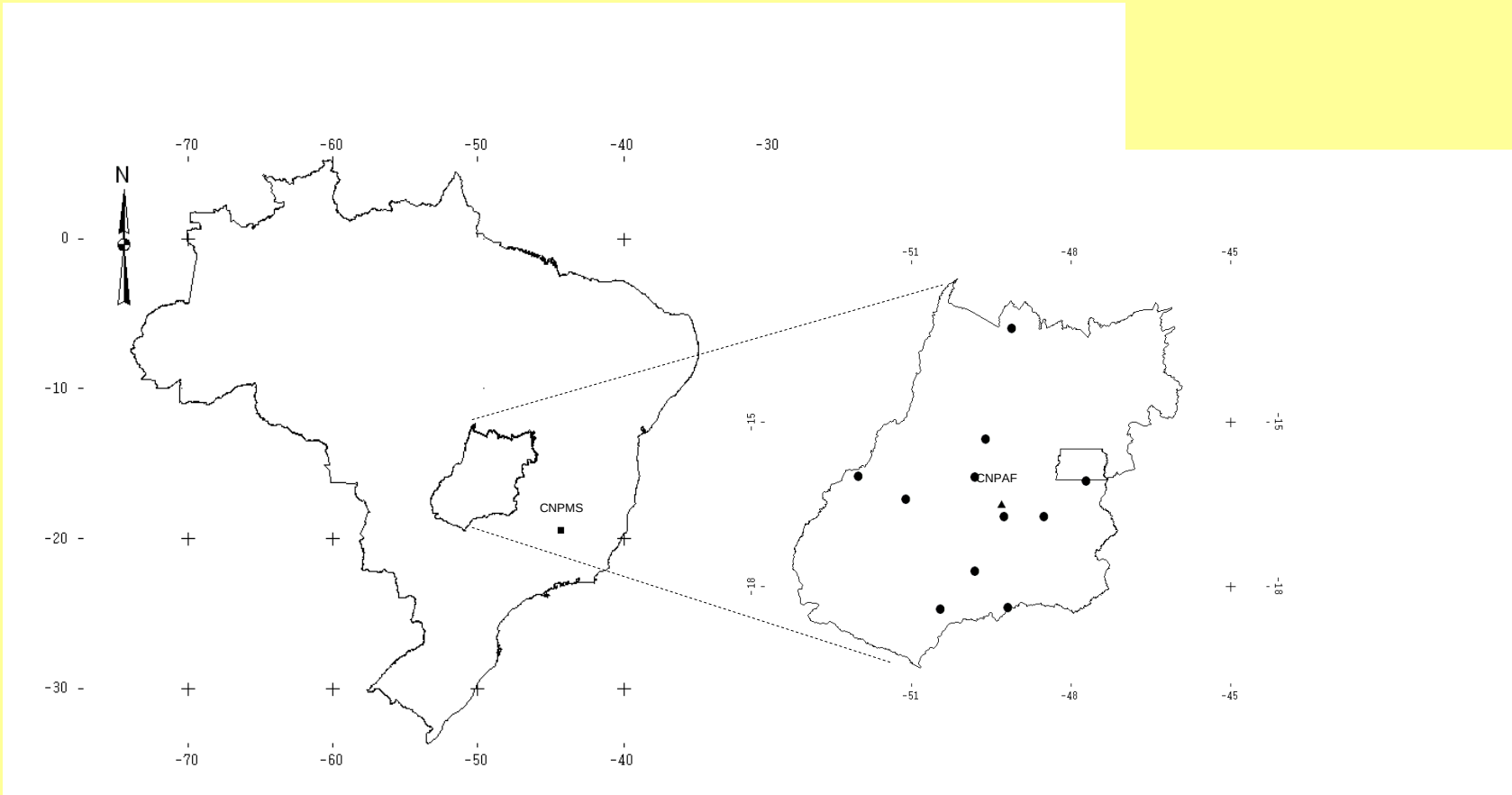
Crop model assisted characterization of appropriate traits for the rice TPE in Brazilian Cerrados

Heinemann, A. B.; Luquet, D.;
Dingkuhn, M.; Chapman, S.

CIRAD Embrapa Arroz e Feijão CSIRO

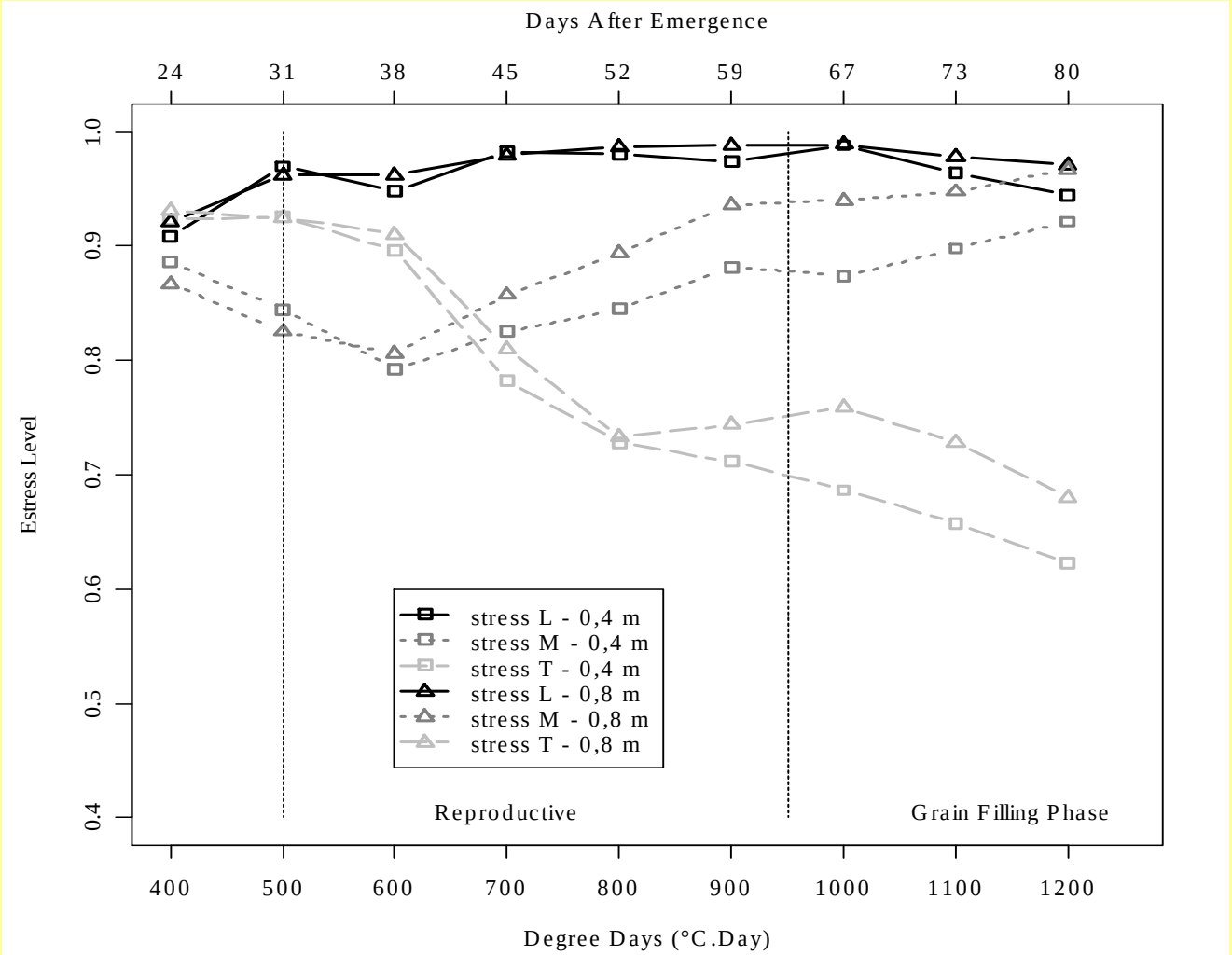
Introduction

- **Region of Study:**



Introduction

- **Short rice TPE caracterization**



Objective

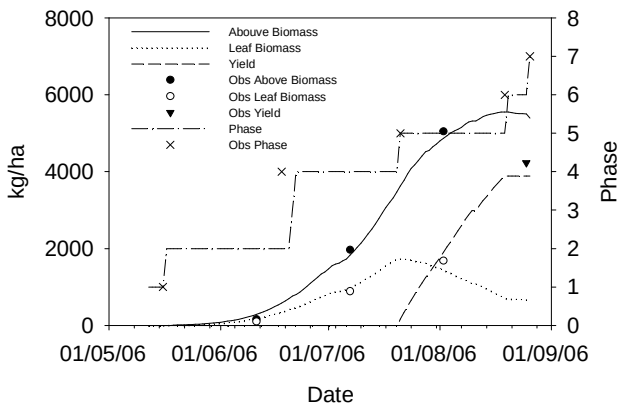
- **Evaluate how to combine key phenotypic traits (parameter) to optimize grain yield in the upland rice TPE of Goiás state, Brazil**

Material and Methods

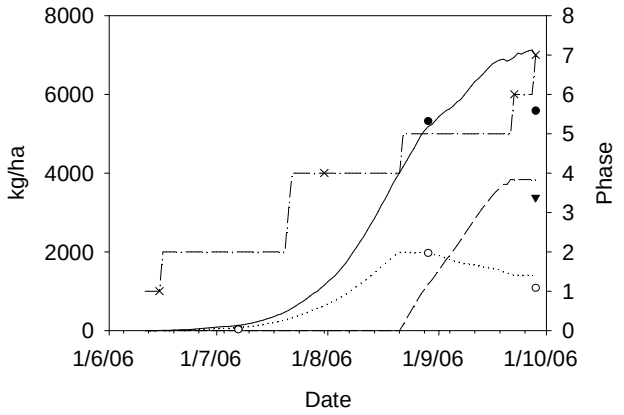
- **Crop Model Parametrization and Validation:**
  - **Short cultivar “Guarani”;**
  - **3 different environments Irrigated and No Irrigated (Porangatu - 12/05/2006; Porangatu - 11/06/2006; Goiânia – 11/01/2006).**

Material and Methods

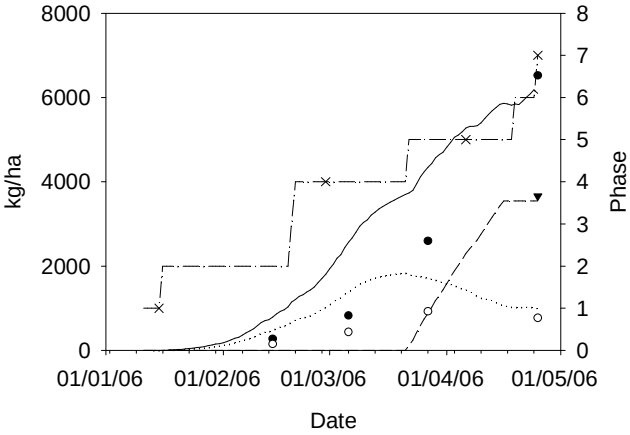
Porangatu - Irrigated - 1

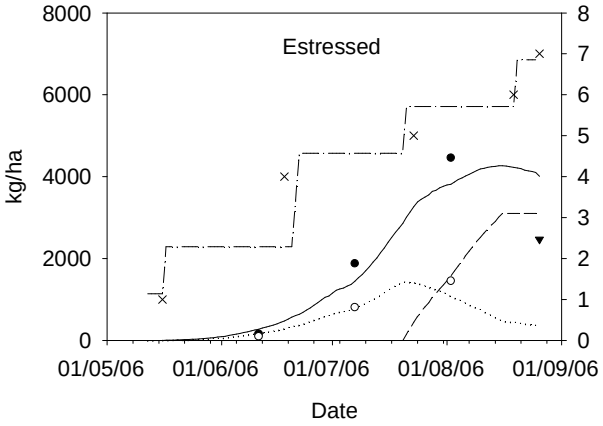


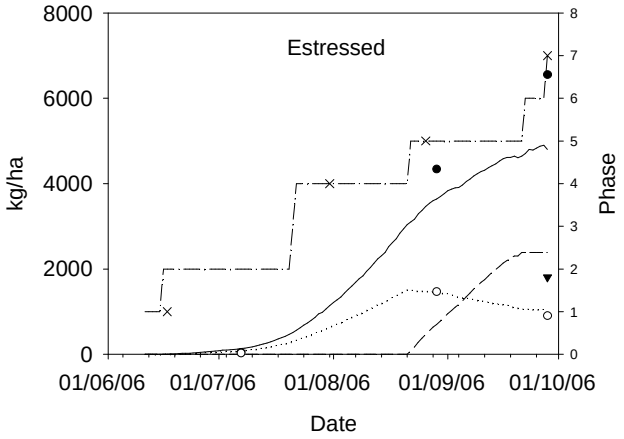
Porangatu - Irrigated - 2



Goiânia - Irrigated

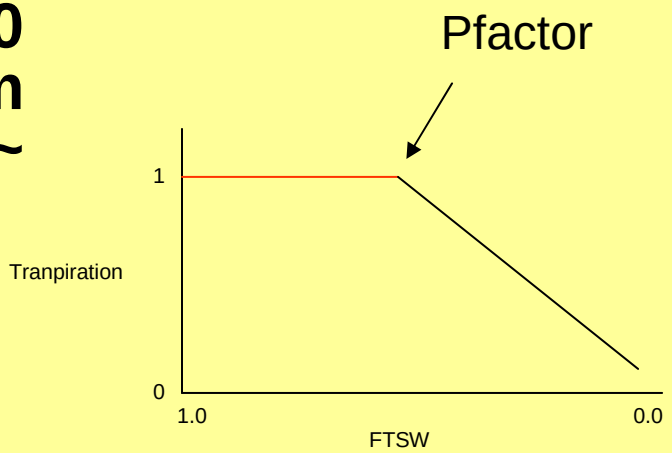


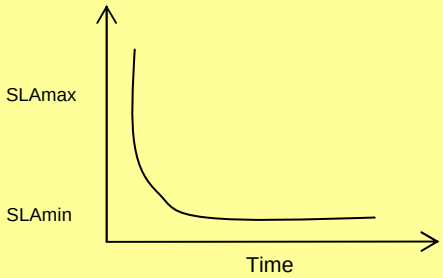




Material and Methods

- **Generated 17 genotypes based on the "standard coefficients genotypes" modifying 3 different parameters.**
- **Parameters Modified:**
  - **Vegetative Period: 490 and 700 C.days (value from a medium cultivar parametrized) - (1 week ~ 100 C.days);**
  - **Pfactor: 0.2, 0.35, 0.5; (response to drought - stress sensitivity);**
  - **Max and Min SLA (Amplitude);**
    - **MaxSLA and MinSLA are input data;**
    - **"Michaelis-Menten model";**
    - **LAI = SLA * Leaf Biomass.**





Material and Methods

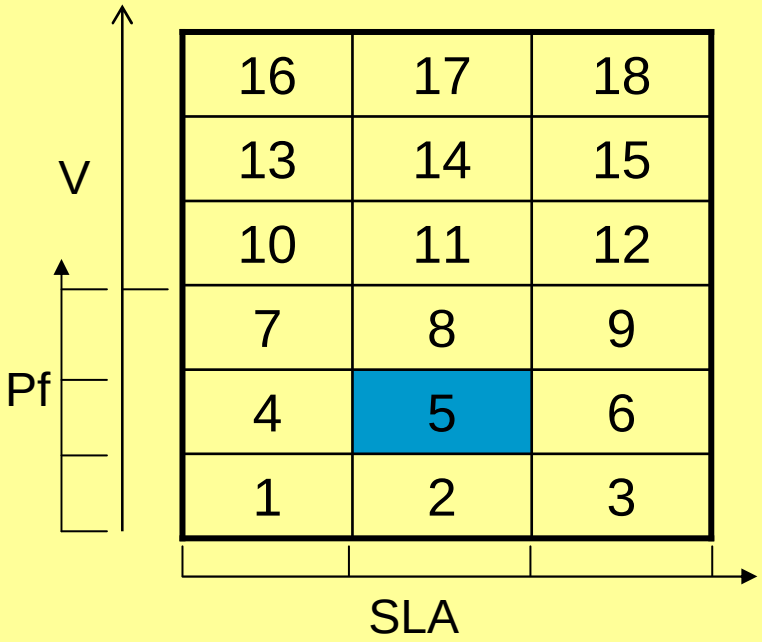
•Coefficient values used to created genotypes:

Genotype	Pfactor	SLAmax	SLAmin	SLA Amplitude	Difference SLAmax and SLAmin	TxConvers	V
1	0.200	0.00640	0.00088	1	0.00552	3.30	490
2	0.200	0.00800	0.00110	2	0.00690	3.00	490
3	0.200	0.00960	0.00132	3	0.00828	2.70	490
4	0.350	0.00640	0.00088	1	0.00552	3.30	490
5	0.350	0.00800	0.00110	2	0.00690	3.00	490
6	0.350	0.00960	0.00132	3	0.00828	2.70	490
7	0.500	0.00640	0.00088	1	0.00552	3.30	490
8	0.500	0.00800	0.00110	2	0.00690	3.00	490
9	0.500	0.00960	0.00132	3	0.00828	2.70	490
10	0.200	0.00640	0.00088	1	0.00552	3.30	700
11	0.200	0.00800	0.00110	2	0.00690	3.00	700
12	0.200	0.00960	0.00132	3	0.00828	2.70	700
13	0.350	0.00640	0.00088	1	0.00552	3.30	700
14	0.350	0.00800	0.00110	2	0.00690	3.00	700
15	0.350	0.00960	0.00132	3	0.00828	2.70	700
16	0.500	0.00640	0.00088	1	0.00552	3.30	700
17	0.500	0.00800	0.00110	2	0.00690	3.00	700
18	0.500	0.00960	0.00132	3	0.00828	2.70	700

Material and Methods

- **Resulting matrix:**

Environment 1- Root Deep 0,8 m



16	17	18
13	14	15
10	11	12
7	8	9
4	5	6
1	2	3

Environment 2- Root Deep 0,4 m

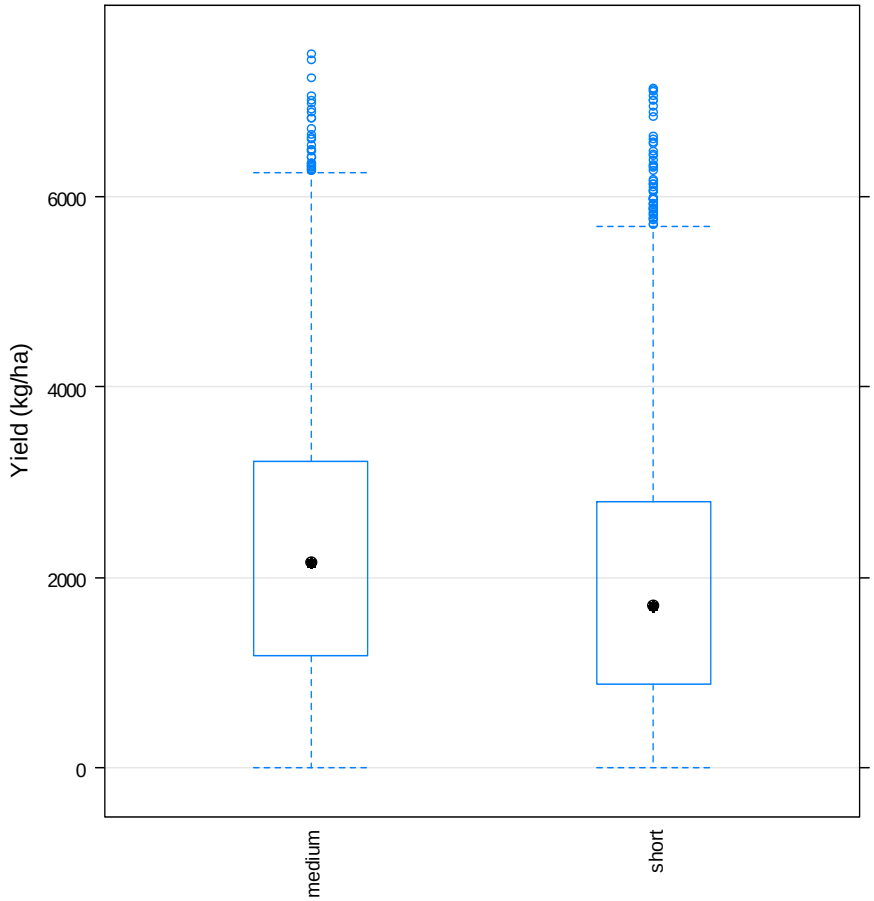
16	17	18
13	14	15
10	11	12
7	8	9
4	5	6
1	2	3

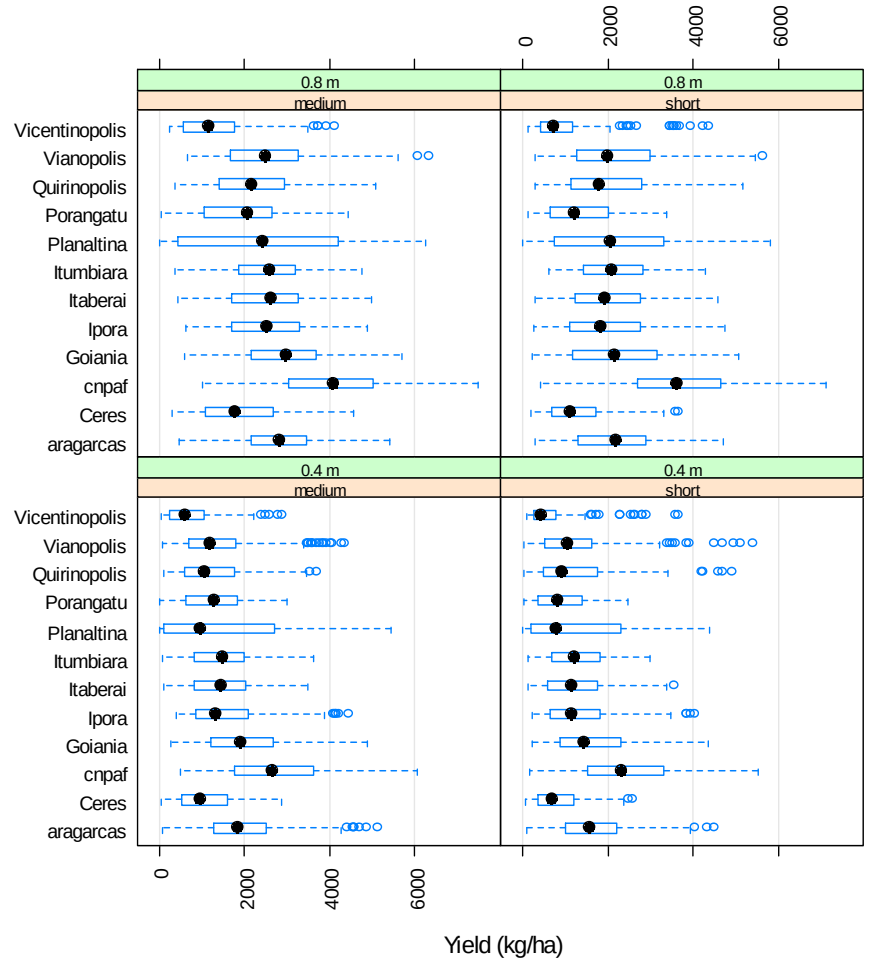
Material and Methods

- **Crop Model Rice06;**
- **Plataform Ecotrop;**
- **12 Sites; Five Planting Dates;**

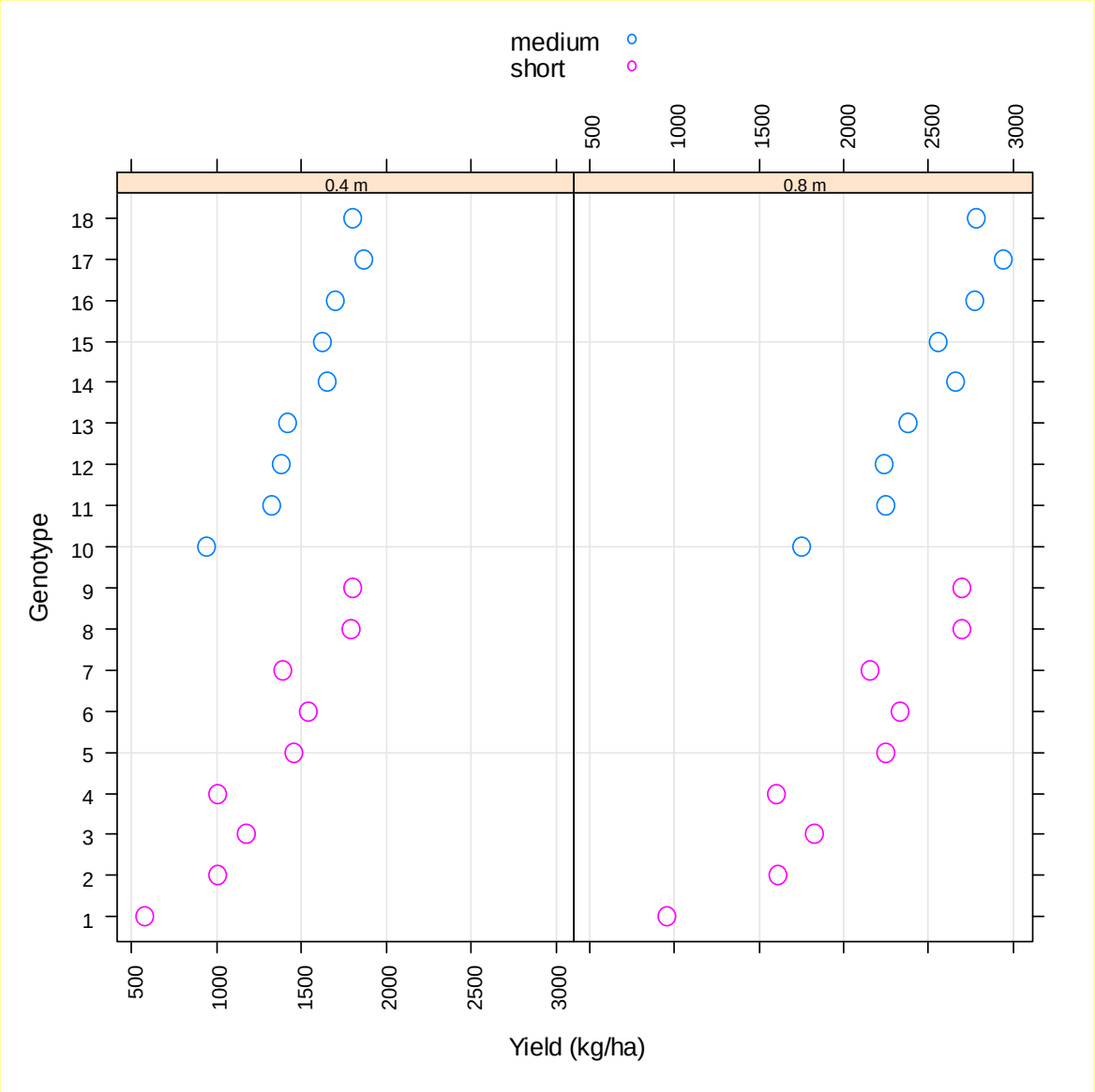
Site	Latitude	Longitude	Altitude (m)	N° of years
Aragarças	-16.00	-52.00	310	6
CNPAF	-16.50	-49.30	741	22
Ceres	-15.33	-49.60	739	6
Goiânia	-16.73	-49.25	749	6
Iporá	-16.41	-51.11	688	6
Itaberai	-16.01	-49.78	1001	6
Itumbiara	-18.40	-49.18	449	6
Planaltina	-16.08	-47.70	1007	6
Porangatu	-13.30	-41.11	391	6
Quirinópolis	-18.43	-50.40	633	6
Vianópolis	-16.80	-48.48	1110	6
Vicentinópolis	-17.70	-49.78	648	6

Preliminary Result: Vegetative (V)

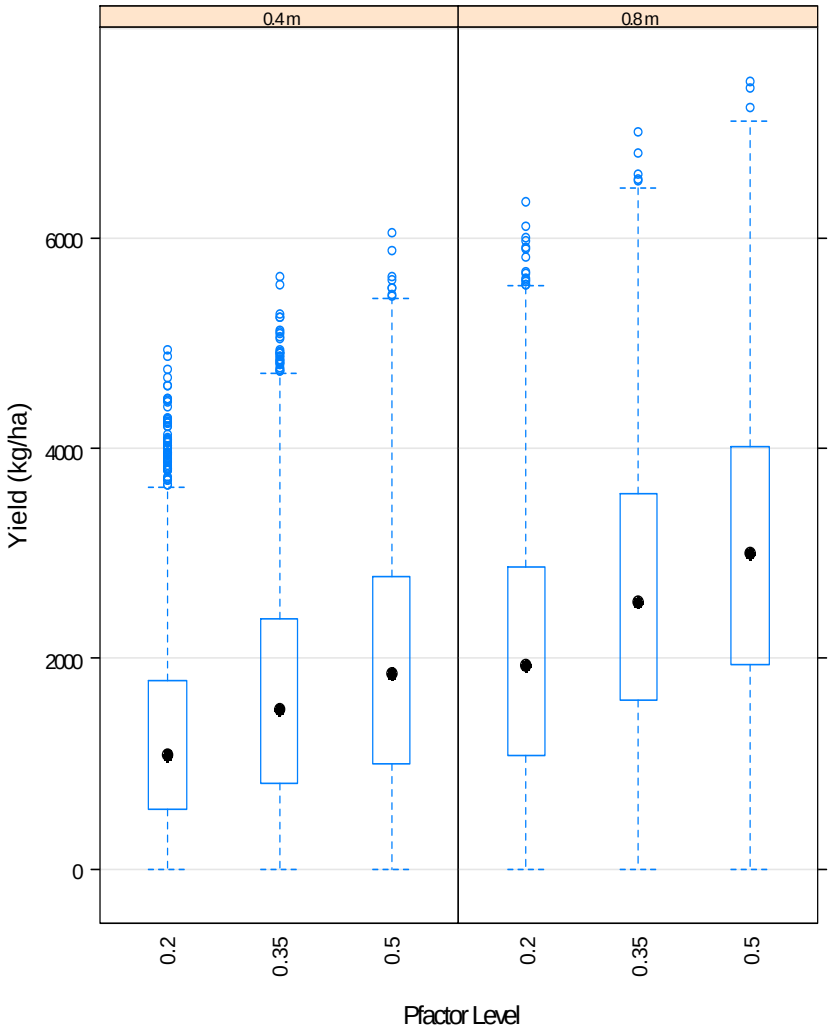


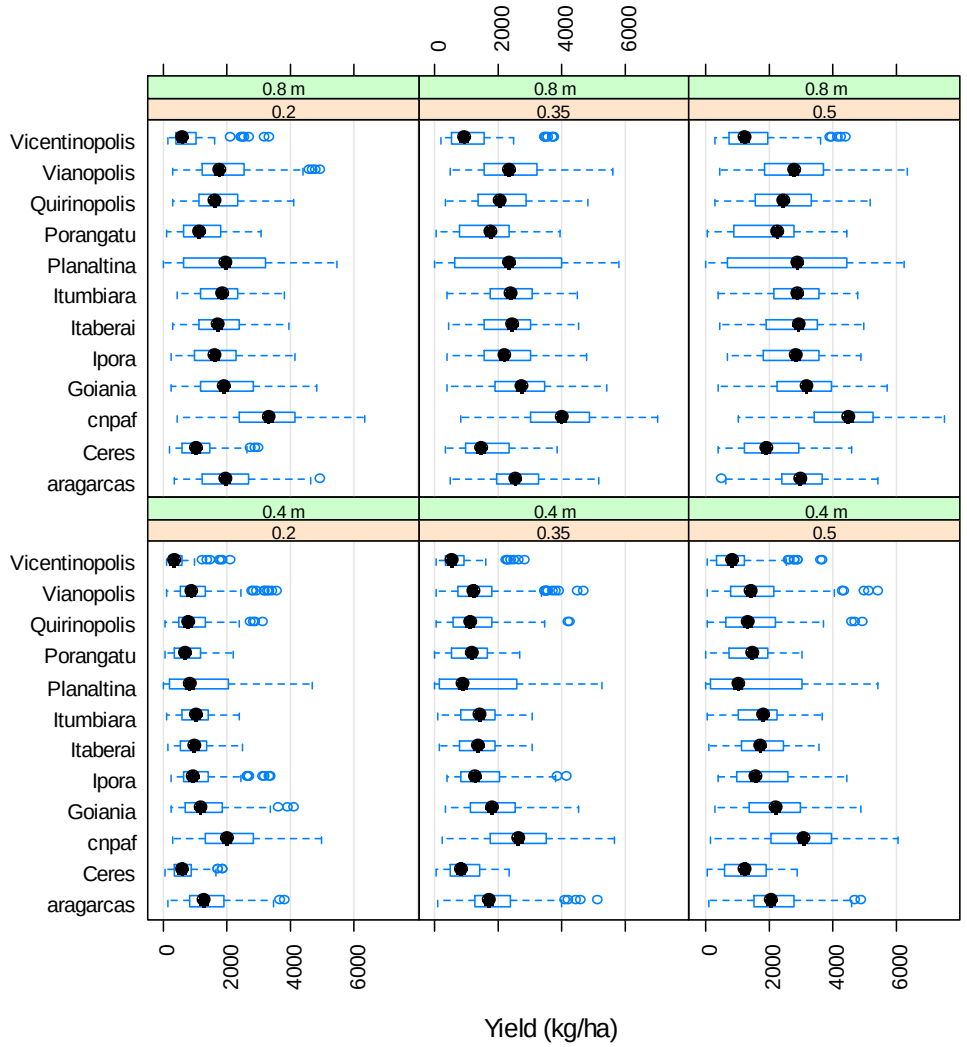


Preliminary Results: Vegetative (V)

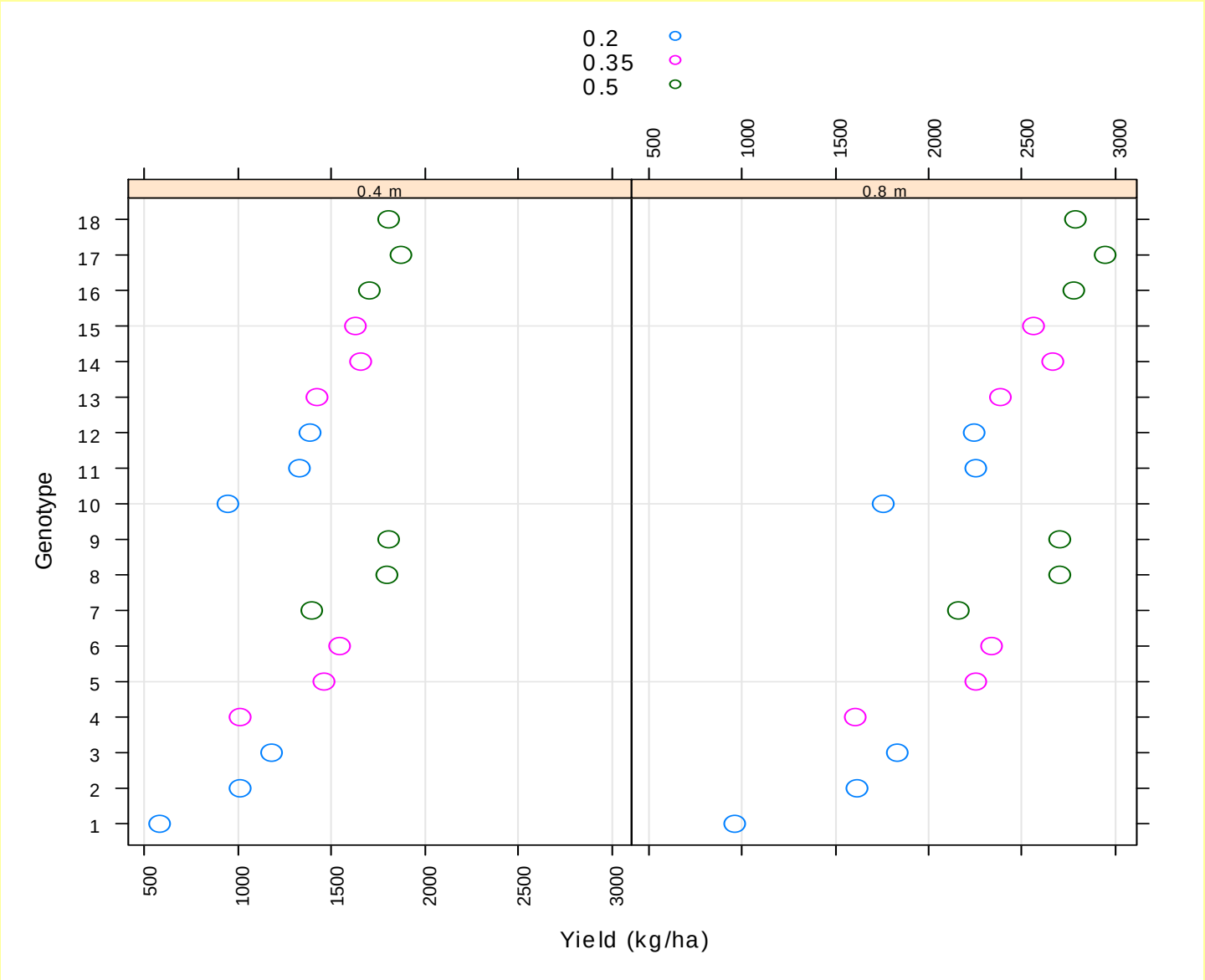


Preliminary Results: Pfactor (Pf)

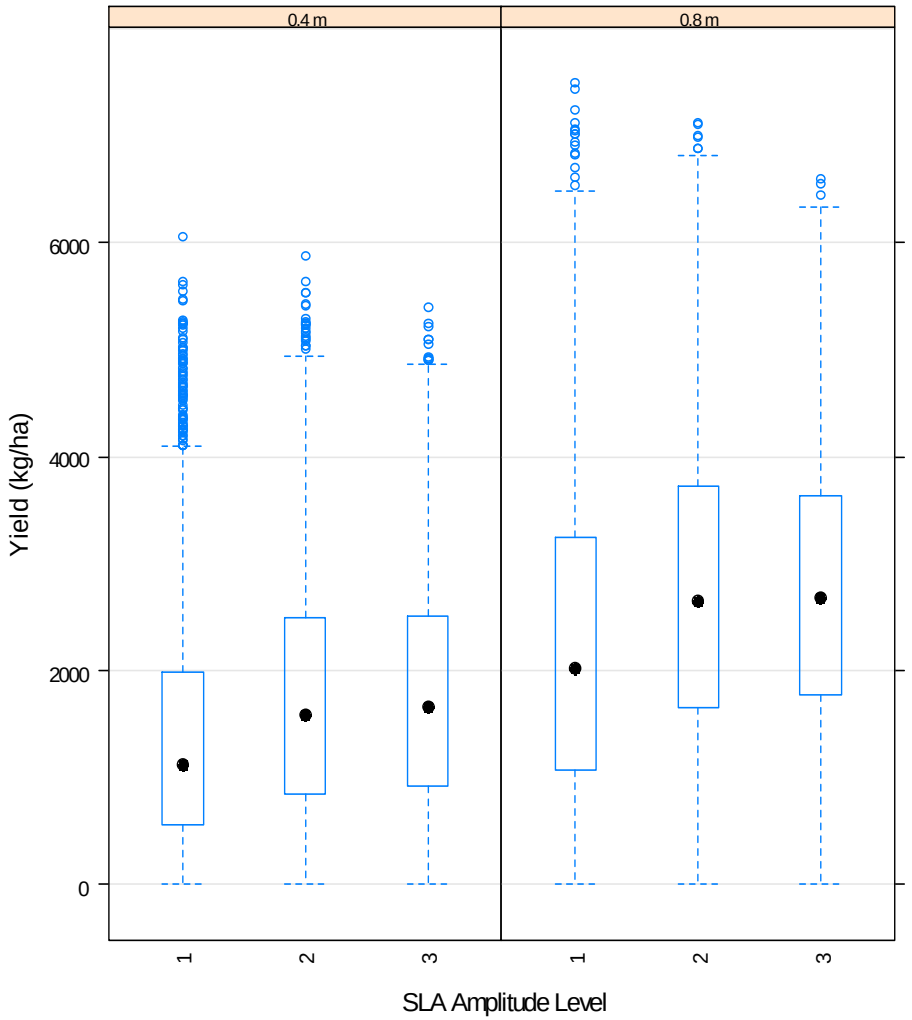


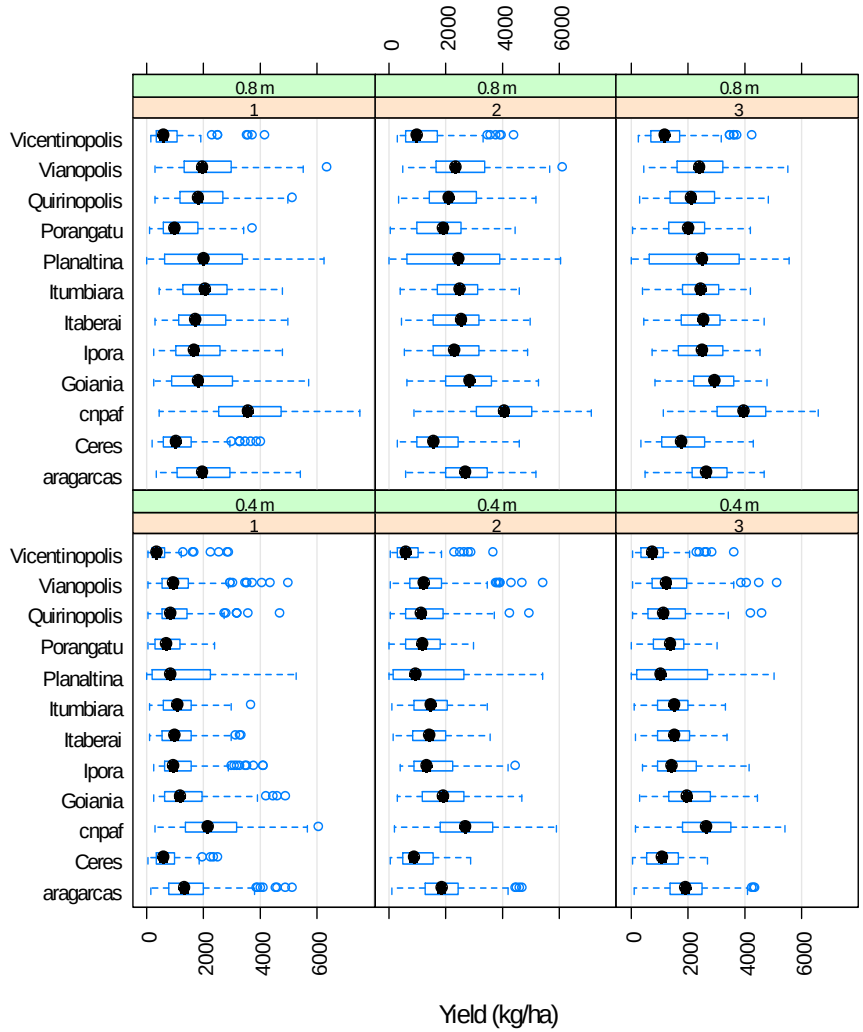


Preliminary Results: Pfactor (Pf)

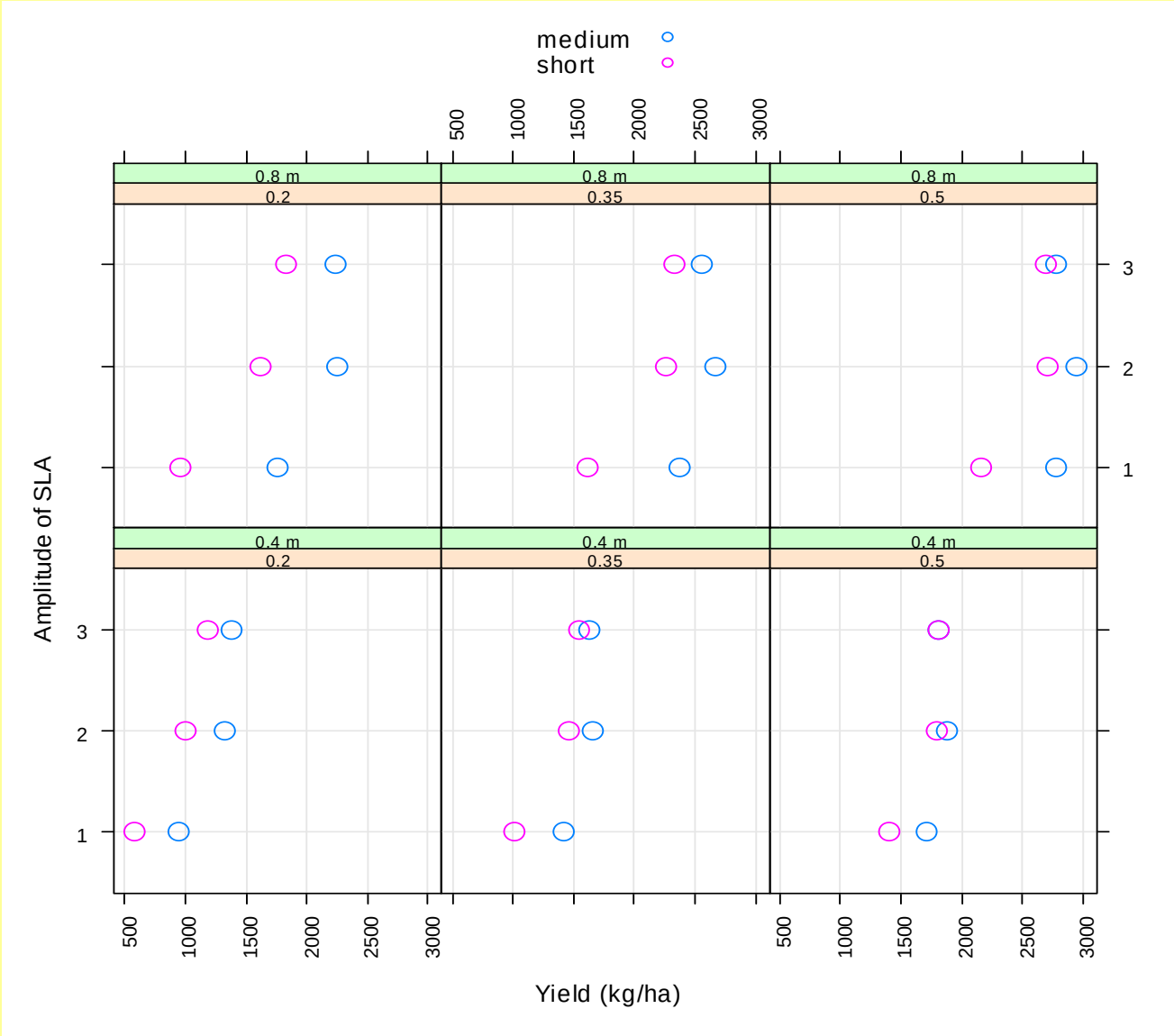


Preliminary Results: SLA

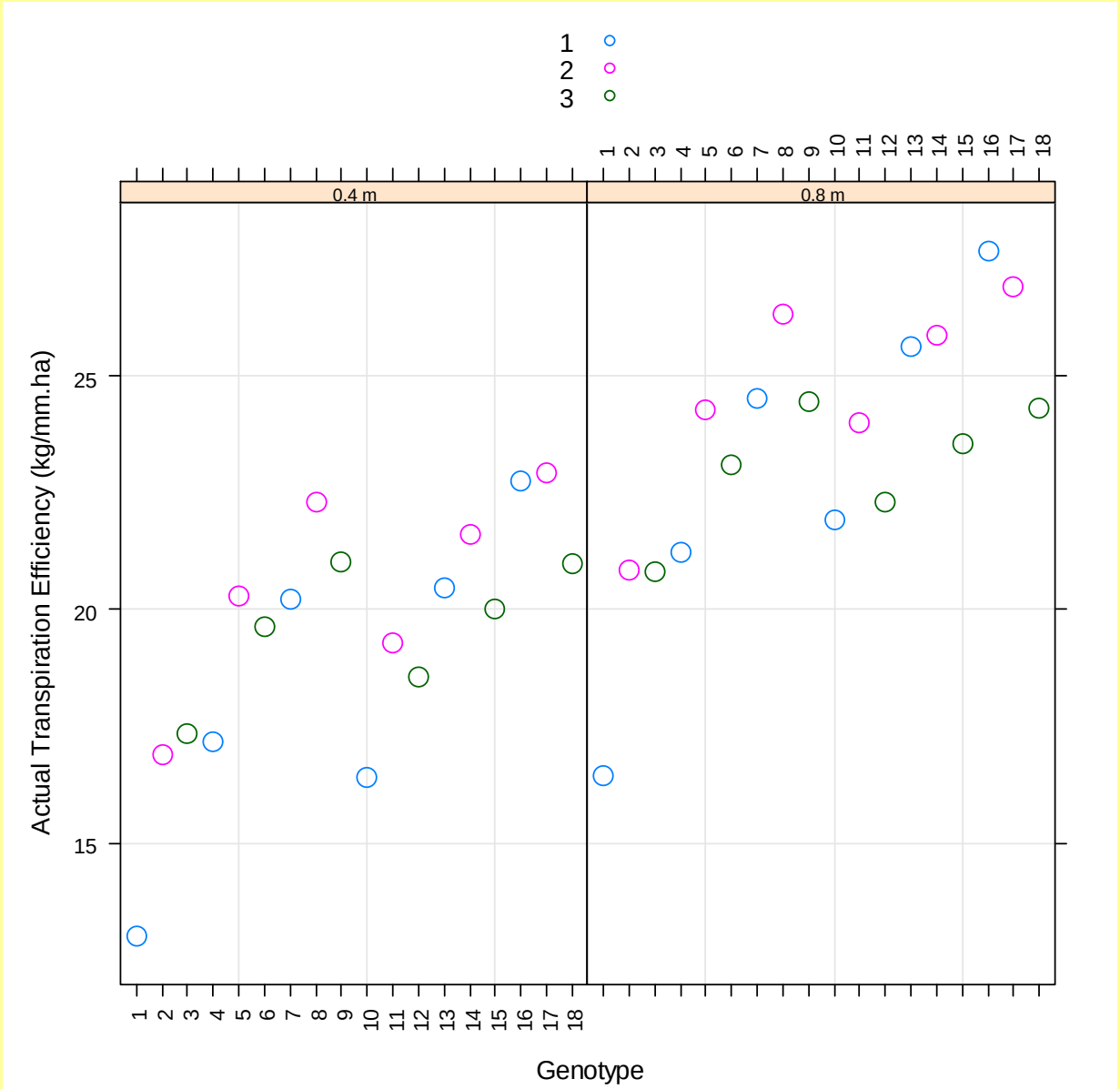




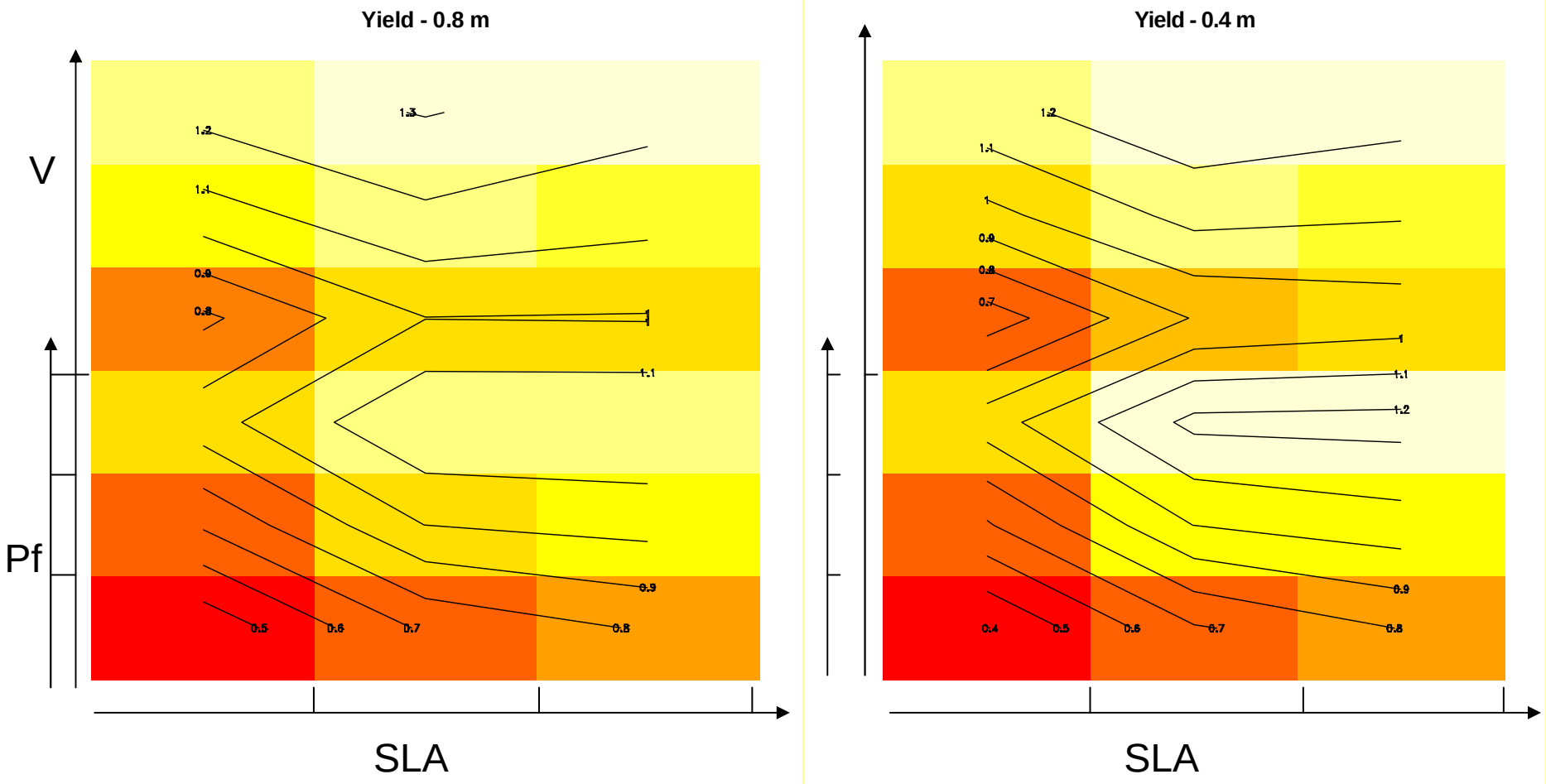
Preliminary Results: SLA



Preliminary Results: SLA



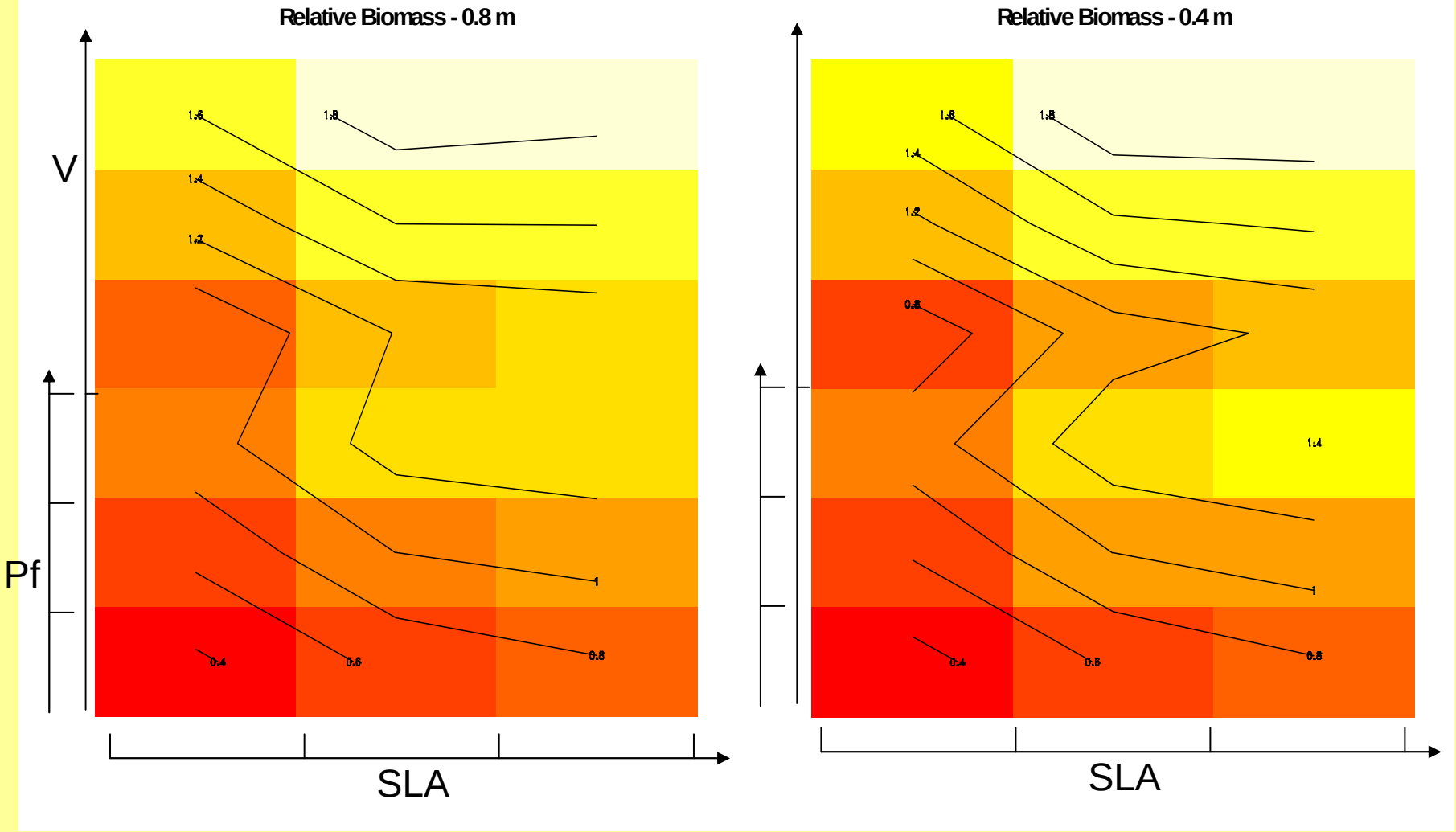
Preliminary Results : Relative YIELD



Preliminary Conclusions

- For this TPE, increasing the vegetative period will lead for higher yields;
- The increase of biomass for this TPE is limited by a decrease in the Actual Transpiration Efficiency, which results in a yield reduction.

Preliminary Results : Relative Biomass



Preliminary Results : Relative Actual Transpiration Efficiency