
GREEN PALM

Breeding for Sustainable High Yielding Oil Palm (Elaeis guineensis Jacq.) at P.T. Socfindo

By

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Introduction

Talking about P.T. Socfindo

- Located in North Sumatra and D.I. Aceh
- 37,000 ha of oil palm plantations
- 10,000 ha of rubber plantations
- 9 oil palm mills
- 1 refinery
- 3 latex processing units

Talking about Cirad-CP

- Department of a French public organisation specialised in tropical and sub-tropical areas agronomy
- in charge of research projects concerning cacao, coconut, coffee, oil palm and rubber

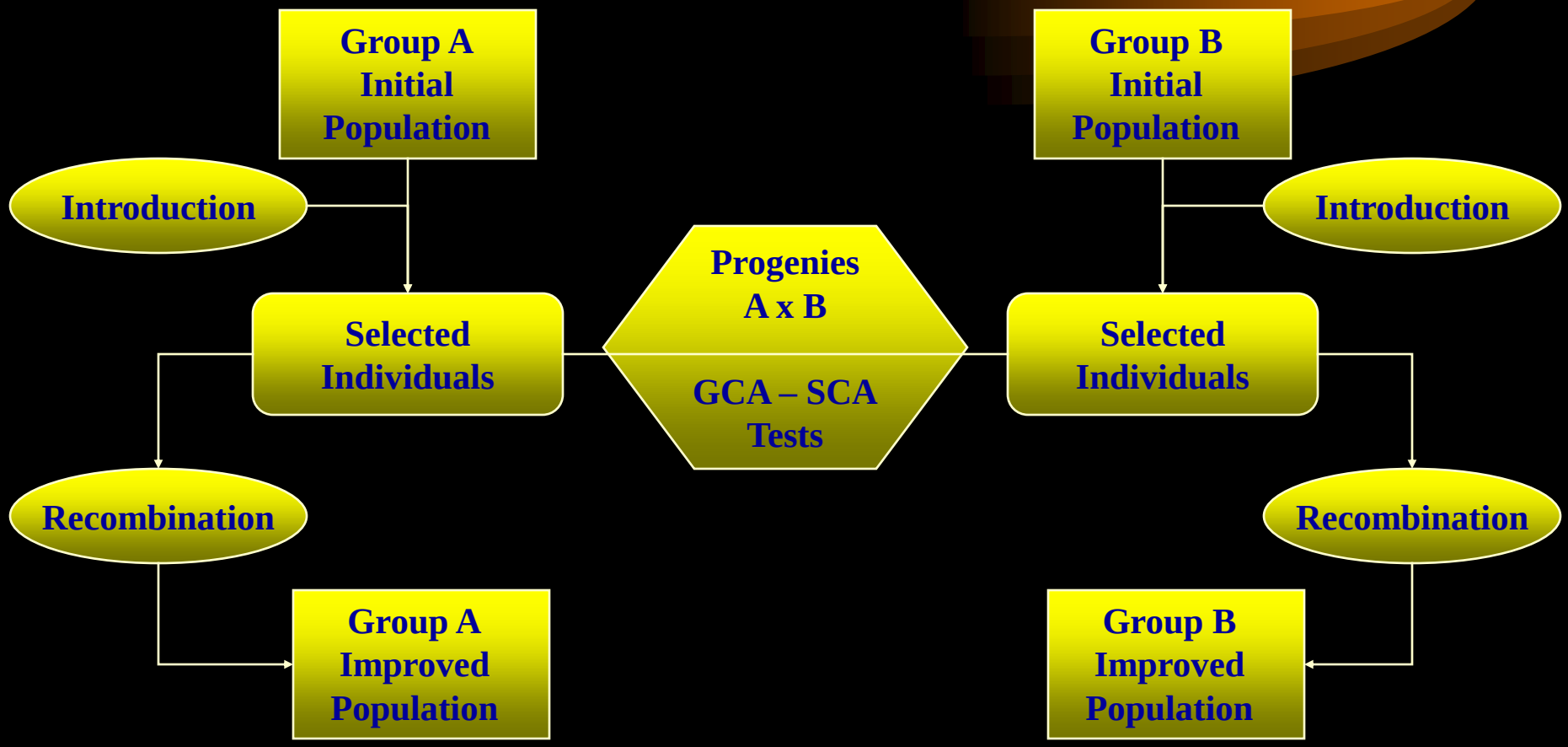
Two genetic blocks implemented by the Company

- Aek Kwasan Genetic Block (1975 - 1978)
- Aek Loba Timur Project (1[illegible] - 2000)

Fully connected to the other RRS team-mates headed by Cirad

Oil Palm Improvement at PT Socfindo

Scheme of RRS Program



Breeding History at P.T. Socfindo

- 1920s : 17 Dura Deli and 8 Tenera Kuala Krapuh
- 1927 – 1943 : Three generations of mass selection
- 1933 – 1934 : First genetic field planted at Bangun Bandar
- 1970 : Introduction of the RRS concept at P.T. Socfindo
- 1973 – 1978 : First cycle trials at Bangun Bandar
- 1975 – 1979 : Aek Kwasan Genetic Block
- 1979 – 1994 : Second cycle trials at Bangun Bandar
- 1995 – 2000 : Aek Loba Timur Project

Since 1970, 51 trials testing

- 1061 D*T, T*D and D*P progenies for its mainstream

The Aek Loba Timur Project

- Improving the Socfindo planting material for palm oil / ha
- Following on the breeding work started with Aek Kwasan Block
- Establishing RRS genetic blocks testing Pobé and PSBB parental material

The project

- Comprises 25 progeny trials and 3 clonal tests
- covers 489 ha and 5 years of planting
- tests 482 different D*T, T*D and D*P crosses
- tests 45 clones

The project is divided into 3 parts:

- 18 trials testing SRPH Pobé second cycle parents
- 7 trials testing PSBB second cycle parents
- 3 clonal tests

Group A Grandparents:

D Socfindo	BB126D, BB129D, BB150D, BB177D, BB206D
D Socfin	LM269D, LM404D
D Dabou	DA3D, DA5D, DA10D, DA115D, DA128D, DA300D, DA551D, DA767D
Deli*Angola	LM5448T

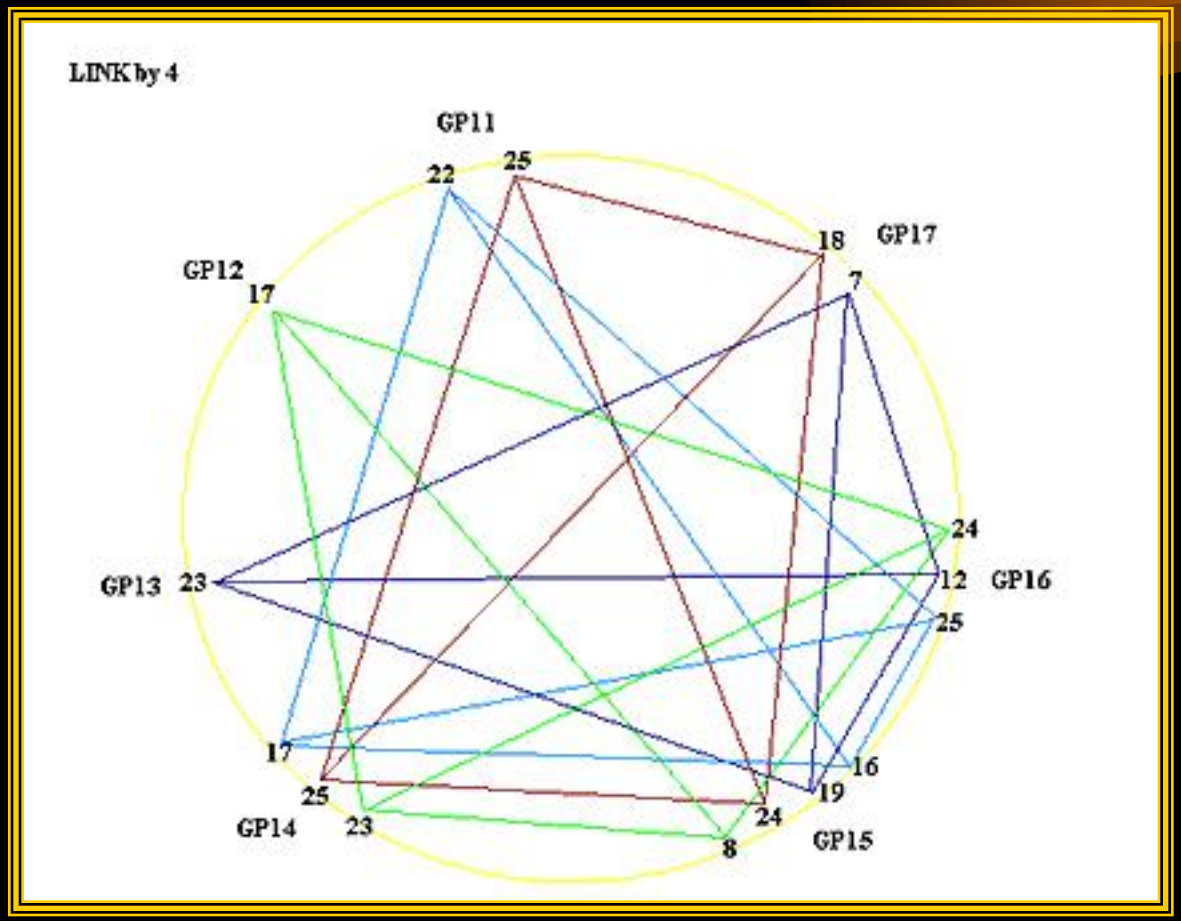
Group B Grandparents:

Kuala Krapuh	BB20T, BB85T
Côte d'Ivoire	LM2T, LM5T, LM9T, LM10T, LM13T, LM311P
Nigeria	PO1876T, PO1879T
Ya / Si	LM238T, LM511P, LM718T

Control network:

- Between the ALT trials: 55 progenies and 1 clone
- With other RRS trials:
  - LM2T*DA10D
  - LM2T*DA115D

Example: link by 4 common progenies



Breeding for the Ganoderma tolerance

Aim of the programme:

- First step: developing a less susceptible planting material to BSR
- Second step: developing Ganoderma tolerant planting material

The scheme:

- SP01: Search of possible sources of tolerance in the third germplasm recombination
- SP02: Search of possible sources of tolerance in the current hybrids produced for commercial seeds
- SP03: Search of possible sources of tolerance in some genotypes tested at ALT

The current situation:

- 300 h

BRS prevalence exceeding 60%

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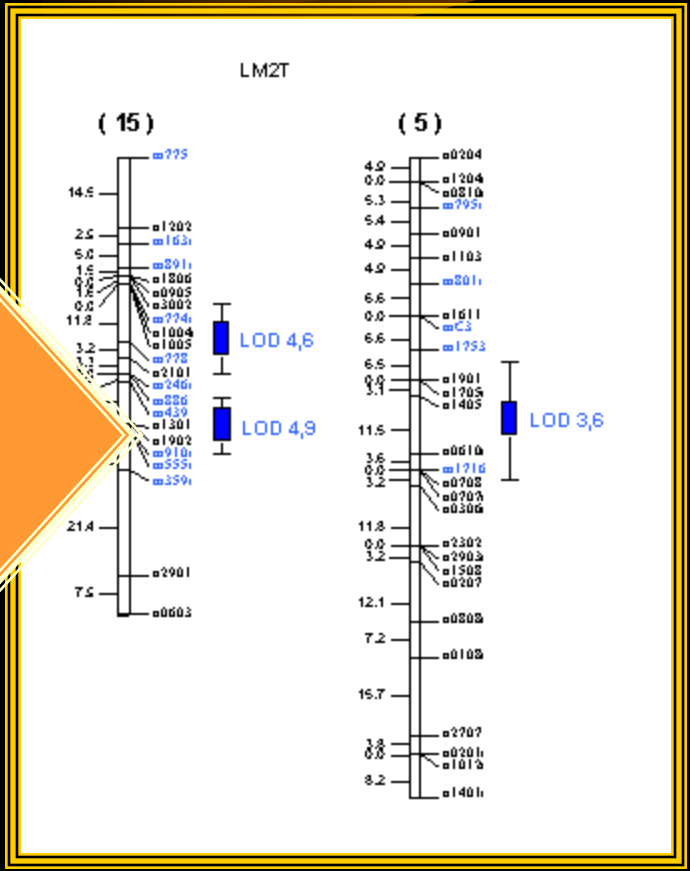
  - Mata Pao
  - Tanah Gambus

Adapted statistical design

Marker-assisted Breeding

Construction and exploitation of high density DNA marker and physical maps in the perennial tropical oil crops coconut and oil palm



Objectives of the programme:

- Construct an oil palm high-density reference map and a multi-parent consensus linkage map
- Detect and analyse worthwhile genes of vegetative characters and production quality
- Define and recommend a MAB strategy for oil palm

- Plant oil palm methodological trials
- Integrate the results of the project into current oil palm breeding programmes

Current situation:

- All field observations and oil analyses required have been complet d and sent to Cirad for the fi esea of QTLs
- Planta al trial t

Some parents are suspected or known to present genetic tolerance factors to BSR or Wilt Disease

Choice criteria and statistical design

Evaluation of the hybrids:

- Estimate the genetic value of both parents
- Estimate the average value of the type of progeny
- Rank the progenies within the types of progeny

Criteria:

- Total oil production and precocity
- Height increment
- Disease tolerance
- Oil quality

Statistical designs

- Equilibrated lattice design
  - 4*4 (16 treatments)
  - 5*5 (25 treatments)
- Fisher blocks

Trial results:

All our results are corrected:

- FFB (t / ha) = FFB (kg) per tree * 135 / 1000
- %OER = %O/B * 0.855
- %KER = %K/B * 0.5 * 0.855
- %TER = %OER + %KER

Bunch characteristics at Aek Kwasan

LM2T self partner	%O/B	%OER	%KER	%TER
DA10D self	24.14	22.41	1.98	24.39
DA10D*DA3D	28.29	24.22	2.11	26.33
DA5D*DA3D	28.31	24.26	1.84	26.10
DA115D self	29.91	25.62	1.96	27.58
LM404D self	32.09	27.47	1.44	28.91
LM404D*DA10D	29.61	25.37	1.62	27.00

Yield at adult stage at Aek Kwasan (t/ha)

LM2T self partner	FFB	CPO	Total Oil
DA10D self	26.9	6.03	6.56
DA10D*DA3D	26.2	6.39	6.94
DA5D*DA3D	28.5	7.00	7.48
DA115D self	26.1	6.75	7.26
LM404D self	25.0	6.81	7.17
LM404D*DA10D	26.3	6.56	7.00

Height Increment

LM2T self partner	Cm/year
DA10D self	48.2
DA5D*DA3D	46.4
DA115D self	44.1
LM404D self	52.1
LM404D*DA10D	52.6

Aek Loba Timur Project

Variability in 1995 common progenies

	OER (%)	FFB Kg/tree	CPO T/ha	Total Oil T/ha
Mean	25.64	226.7	7.836	8.454
C.I. (%)	0.28	4.18	0.110	0.112

Best three crosses in 1995 planting (5 - 7 yr)

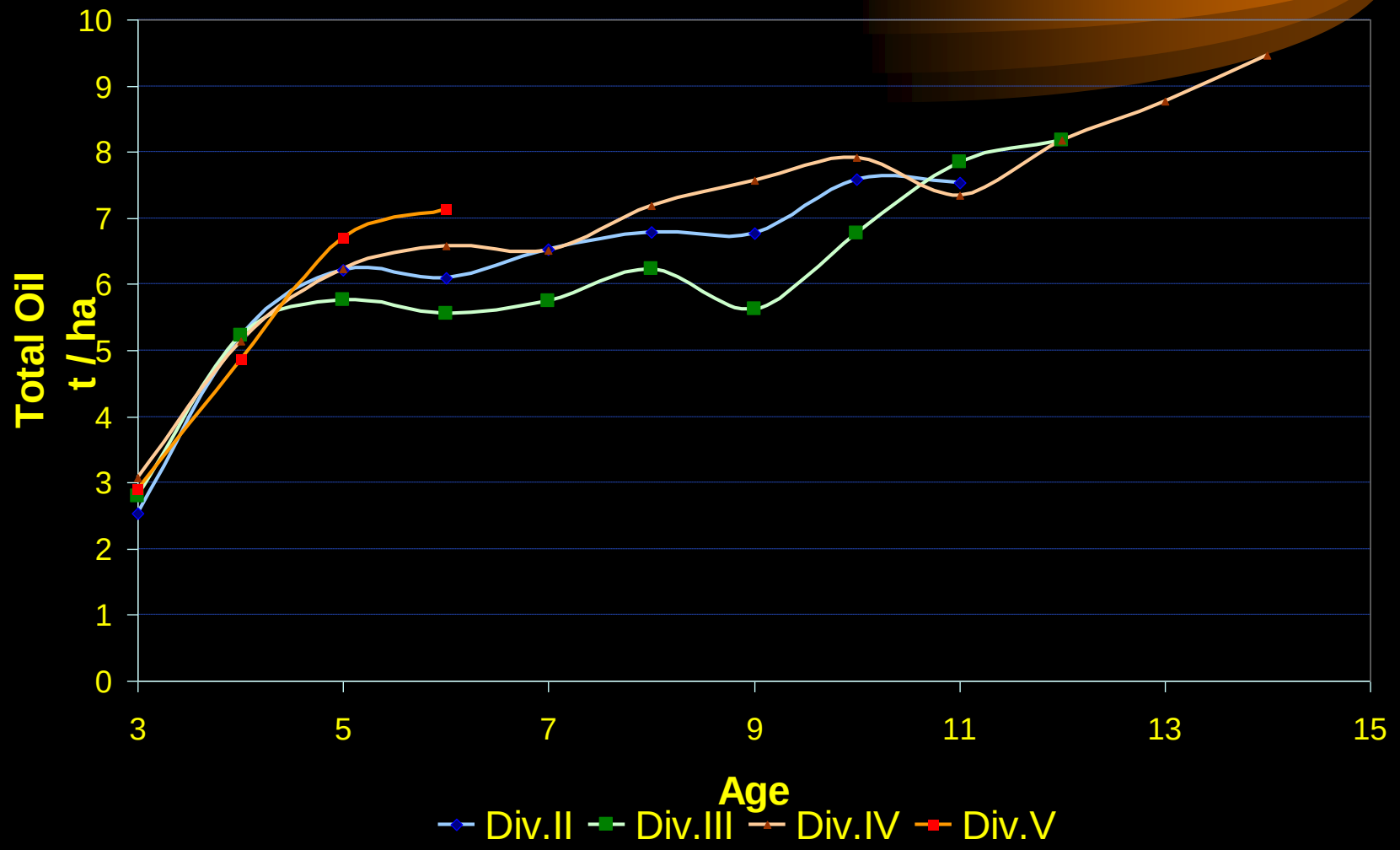
	OER	FFB	CPO
(DA5D*DA3D)*LM	27.4	31.6	8.6
(DA128D*LM269D)*YA	28.2	31.7	8.9
(DA3D*DA115D)*LM	29.5	30.8	9.1
(DA10D*DA115D)*LM	26.9	32.3	8.8
DE*LM Clones	28.3	31.8	8.9

1997 planting (3 - 5 yr)

	OER	FFB	CPO
GP06 to 10	27.7	23.3	6.4
LM2T*DA10D	23.0	22.4	5.1
LM2T*DA115D	24.9	22.5	5.6
GP11 to 17	26.0	19.3	5.0
LM2T*DA10D	23.7	17.4	4.1

Commercial scale

Deli * La Mé planting material at Aek Loba



Conclusion

- The best progenies produces from 8.6 to 9.1 tons oil / ha
- Some genitors confirm excellent bunch quality (up to 27%OER)
- probable complex interactions between the genotype, the pests, the physiology and the behaviour of the oil palm

- Commercial yield of 7 to 9 tons total oil / ha / year

The Company's 37,000 ha of oil palms are the best tool to cross-check the quality of the work undertaken and a large exciting field of investigation for both team-mates engaged on the sustainability of oil palm along the way

Thanks for your attention