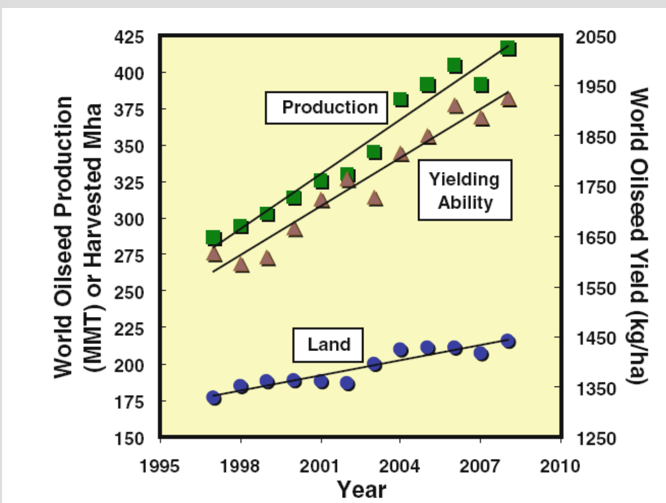
SAWIT KINABALU

IRMAC (Malaysia) Sdn. Bhd.
International Resource Management Consultancy

Breeding or Nutrition? What is the limitation for high oil palm yields?

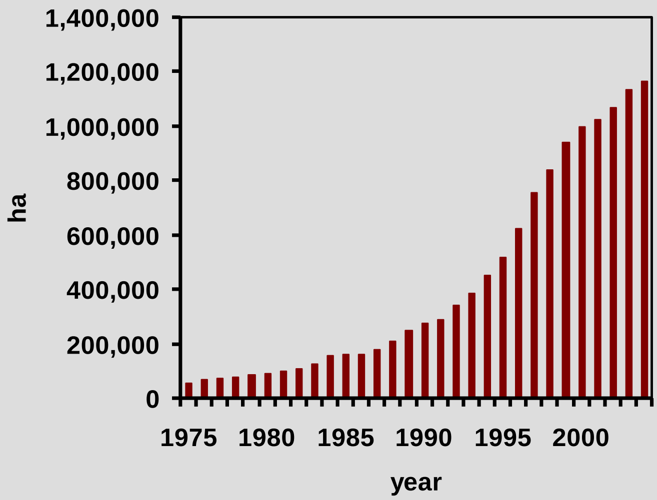
Anja Gassner, Mohd Faisal Mohd Noor, Hoong Hak Wan



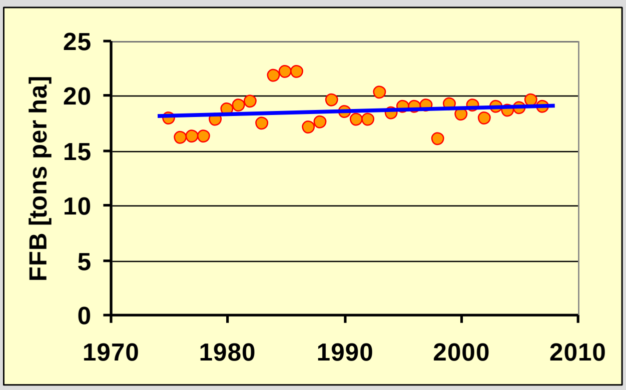
A 40% increase in the average global oilseed yield is needed to meet demands (Wilson, 2004).

Oil crop	Oil production [million tonnes]	% of total production	Average oil yield [tonnes/ha/year]	Planted area [million ha]	% of total area
Soyabean	33.58	31.69	0.36	92.10	42.24
Sunflower	9.66	9.12	0.42	22.90	10.50
Rapeseed	16.21	15.30	0.59	27.30	12.52
Oil palm	33.73	31.84	3.68	9.17	4.21
Total[§]	105.94			218.02	

[§] Only for seven major oil crops (soyabean, oil palm, sunflowerseed, rapeseed, cottonseed, groundnuts, and coconut).
Source: Oil World



Sabah: expansion of area planted with oil palm from 1975 to 2004



- **National production increased over the years, in general increases are largely due to an expansion in the area under harvest and not to an improvement in yield performance**
- **Sabah's CPO yield 4.11 t ha^{-1} above the national average of 3.73 t ha^{-1}**

The Yield Gap

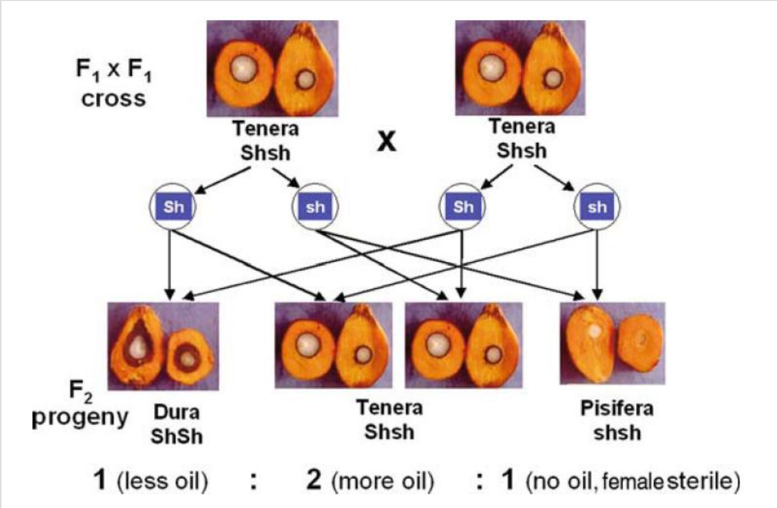
- **The potential yields of the best material planted in 1980–1988 were 9–10 t (Jalani, 1998). This suggests that as a minimum**

- **the national yield now should be 4.5 t/ha, with the estate sector reaching 6 t/ha.**

Has the technological change that continues to sweep through most of the other oil crops has somehow missed the oil palm industry?

Stringfellow (2000)

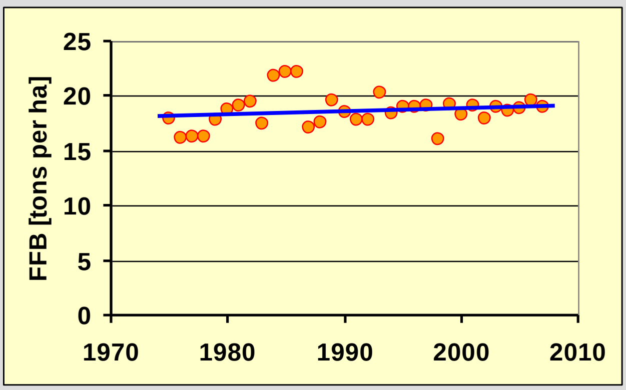
- Commercial materials, which started with the Dura (D) palm variety, had a low oil extraction ratio (OER) in the range of 12–16%.
- This was replaced by the Tenera (T), a hybrid of the Dura and Pisifera (D6P) varieties, as the planting material of choice, because of higher yield. The much improved OER of over 25% contributed to doubling of the yield.

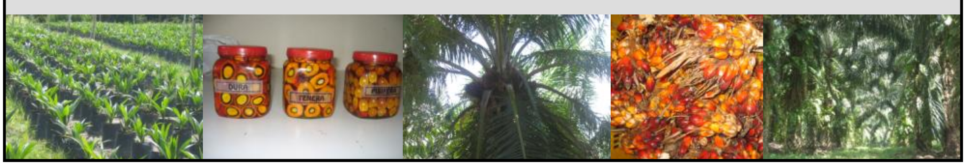


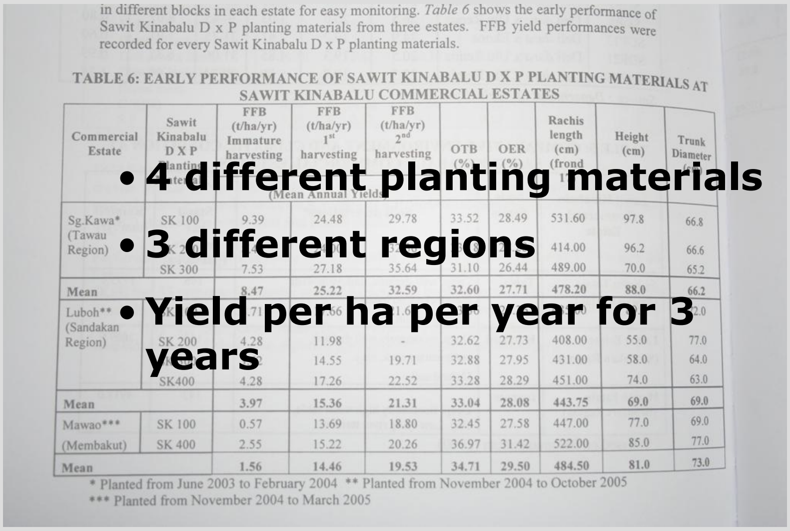
- Some of the latest planting materials based on the improved Tenera are capable of producing 100% more palm oil compared to the standard Tenera.

Contribution of Publications at PIPOC

- 2005: Breeding 25%, Nutrition 8%
- 2009: Breeding 26%, Nutrition 11%







in different blocks in each estate for easy monitoring. *Table 6* shows the early performance of Sawit Kinabalu D x P planting materials from three estates. FFB yield performances were recorded for every Sawit Kinabalu D x P planting materials.

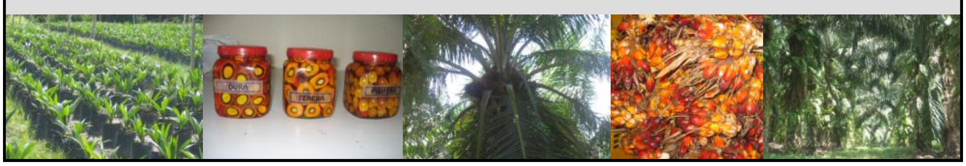
TABLE 6: EARLY PERFORMANCE OF SAWIT KINABALU D X P PLANTING MATERIALS AT SAWIT KINABALU COMMERCIAL ESTATES

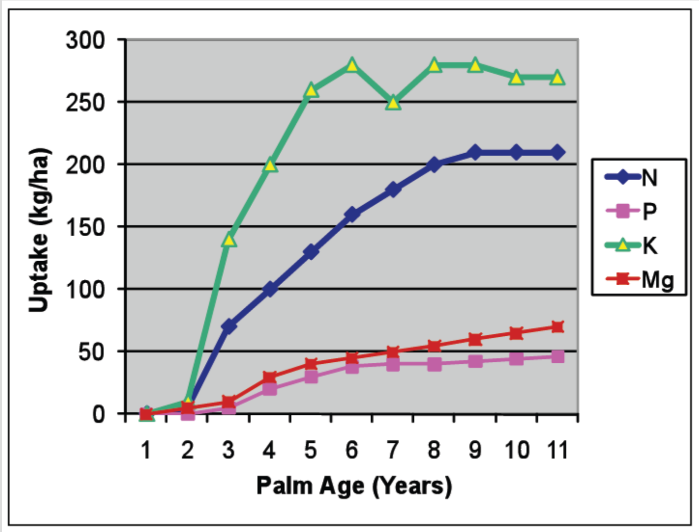
Commercial Estate	Sawit Kinabalu D X P Planting Material	FFB (t/ha/yr) Immature harvesting	FFB (t/ha/yr) 1st harvesting	FFB (t/ha/yr) 2nd harvesting	OTB (%)	OER (%)	Rachis length (cm) (frond 17)	Height (cm)	Trunk Diameter (cm)
		(Mean Annual Yields)							
Sg.Kawa* (Tawau Region)	SK 100	9.39	24.48	29.78	33.52	28.49	531.60	97.8	66.8
	SK 200	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	414.00	96.2	66.6
	SK 300	7.53	27.18	35.64	31.10	26.44	489.00	70.0	65.2
Mean		**8.47**	**25.22**	**32.59**	**32.60**	**27.71**	**478.20**	**88.0**	**66.2**
Luboh** (Sandakan Region)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	SK 200	4.28	11.98	-	32.62	27.73	408.00	55.0	77.0
	[illegible]	[illegible]	14.55	19.71	32.88	27.95	431.00	58.0	64.0
	SK400	4.28	17.26	22.52	33.28	28.29	451.00	74.0	63.0
Mean		**3.97**	**15.36**	**21.31**	**33.04**	**28.08**	**443.75**	**69.0**	**69.0**
Mawao*** (Membakut)	SK 100	0.57	13.69	18.80	32.45	27.58	447.00	77.0	69.0
	SK 400	2.55	15.22	20.26	36.97	31.42	522.00	85.0	77.0
Mean		**1.56**	**14.46**	**19.53**	**34.71**	**29.50**	**484.50**	**81.0**	**73.0**

* Planted from June 2003 to February 2004 ** Planted from November 2004 to October 2005
*** Planted from November 2004 to March 2005

- **4 different planting materials**
- **3 different regions**
- **Yield per ha per year for 3 years**

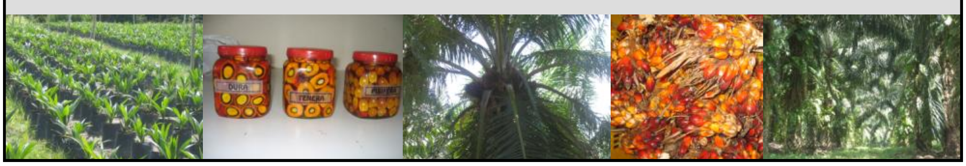
Dependent Variable: FFB					
Source	III Sum of Squ	df	Mean Square	F	Sig.
Corrected Model	2397	21	114	23	0.004
Intercept	4691	1	4691	951	0.000
Material	11	3	3.6	0.7	**0.585**
Age	1484	2	742	150	**0.000**
Region	423	2	211	43	**0.002**
clone * age	3.9	4	1.0	0.2	0.926
clone * Region	6.9	2	3.4	0.7	0.551
age * Region	40	4	9.9	2.0	0.258
clone * age * Region	11	4	2.8	0.6	0.704
Error	20	4	4.9		
Total	8920	26			
Corrected Total	2416	25			
a	**R Squared = .992 (Adjusted R Squared = .949)**				





Standard fertiliser application, developed based on trials in West-Malaysia

Fertiliser	Year (kg palm ^{1} yr^{1}) 1st yr.	2nd yr.	3rd yr	4th yr.	5th yr.
Ammonium Sulfate	1.0	1.5	2.0	3.0	4.0
CIRP	1.0	1.5	2.0	2.5	2.5
MOP	0.5	1.0	1.5	3.0	3.5
Kieserite	0.5	1.0	1.5	1.5	2.0



Sabah

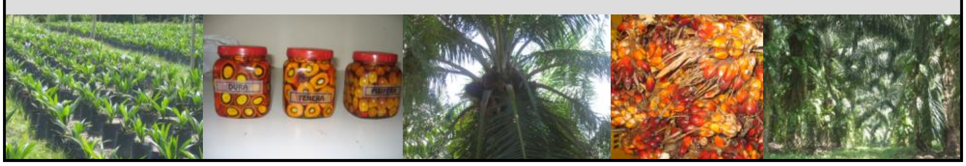
- **Different Soil Types**
- **Higher Rainfall rates**
- **Less pronounced season**

Source: Fairhurst & Härdter, 2003

White Stripe Disease

Nutrient Imbalance

> N:K Ratio

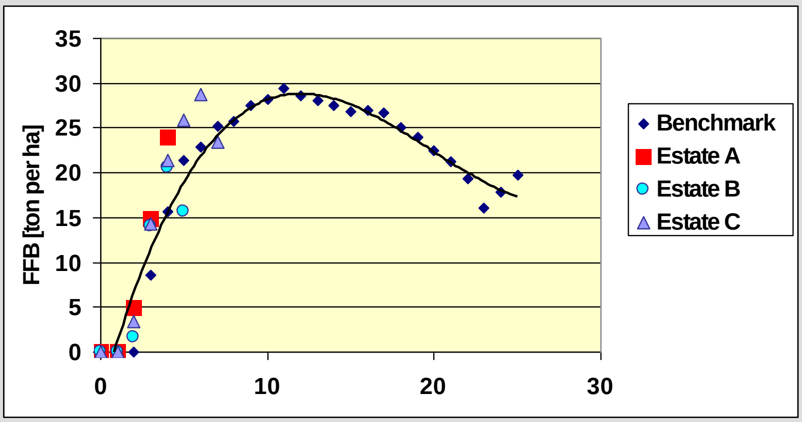


New Fertiliser Strategy

- **Higher K and N yield application**
- **Increase for K proportional higher**

↓

Lower N:K ratio



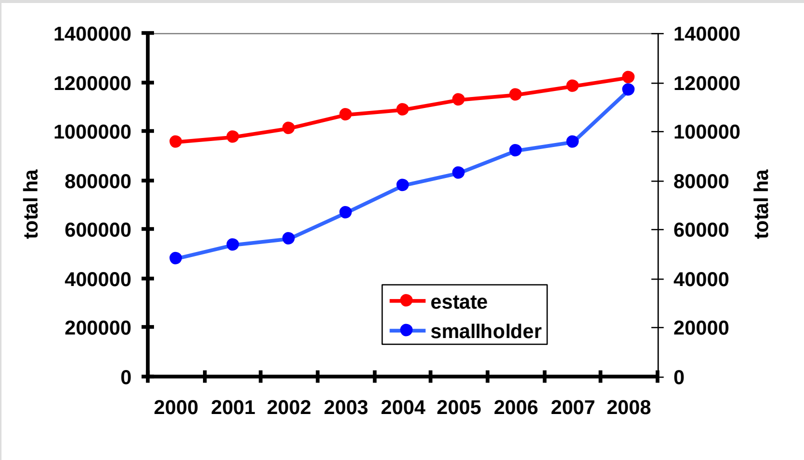
Fertiliser Prices

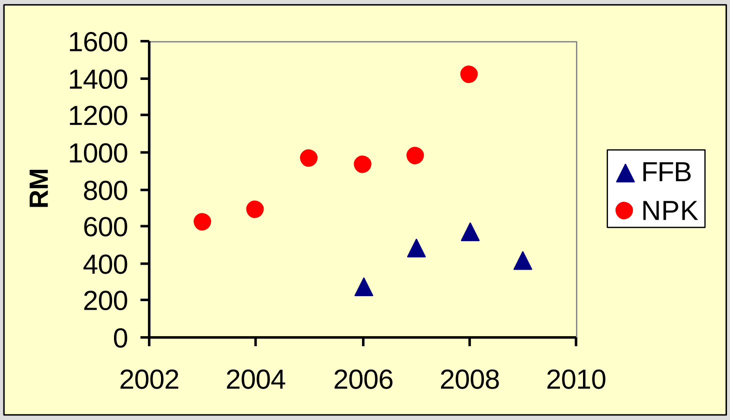
- **Prior to biofuel boom:**

  fertiliser costs accounted for 50-70% of field upkeep costs, 30-35% of variable costs and about 25% of the total cost of production (*Goh and Härdter, 2003*)

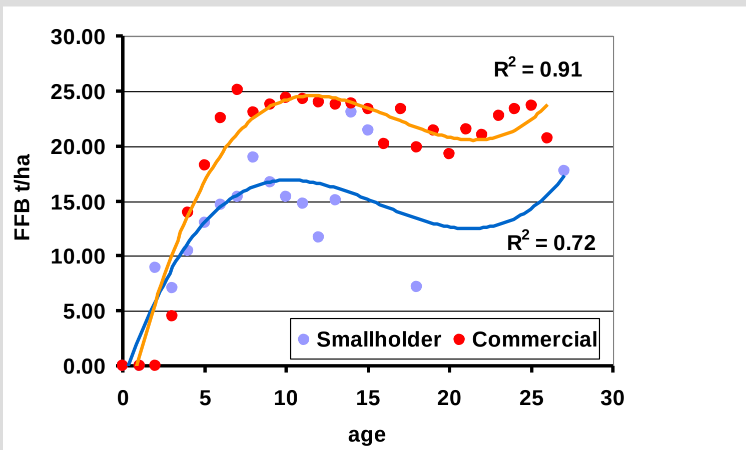
- **At present:**

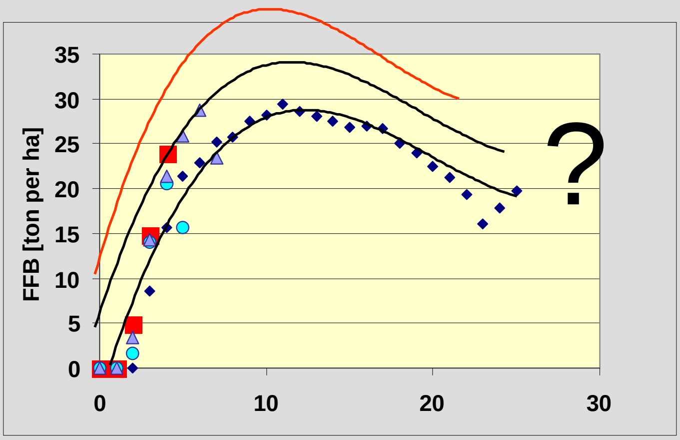
  50-60% of the total cost of production (*Haron et al., 2009*)





Gap between FFB and Fertiliser Price is widening!





Conclusion

- Long-term fertiliser trials in all representative Oil Palm Regions needed
- Focus on Micronutrients
- Preventing Environmental losses
- Make Fertiliser more affordable?