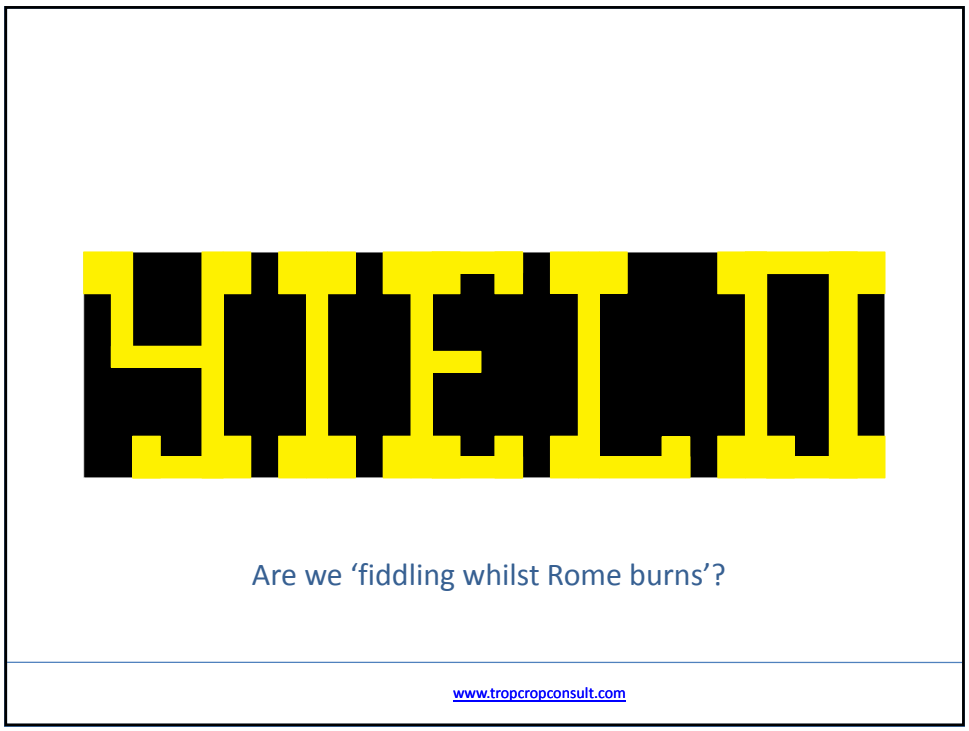
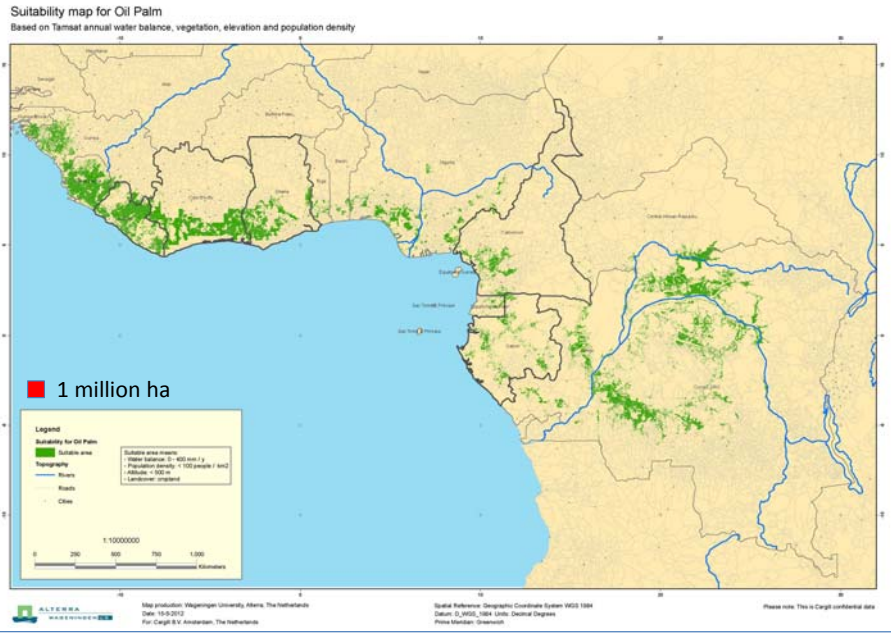

YIELD
Are we ‘fiddling whilst Rome burns’?
www.tropcropconsult.com


Yield improvement – the keystone of sustainability?
Thomas Fairhurst
Topical Crop Consultants Limited
Tropical Crop Consultants Limited, Wye, UK
November 12
Slide 2

Major challenges to feed the world with sustainable palm oil

- A requirement for a further 12 million ha of oil palm by 2050 even if yields average 5.2 t/ha by 2050 and soyabean maintains it's market share*.
- Limited availability of land in SE Asia but what about
  - Africa?
  - C and S America

*Corley, 2009



Strategies to increase crop production – relevance to oil palm

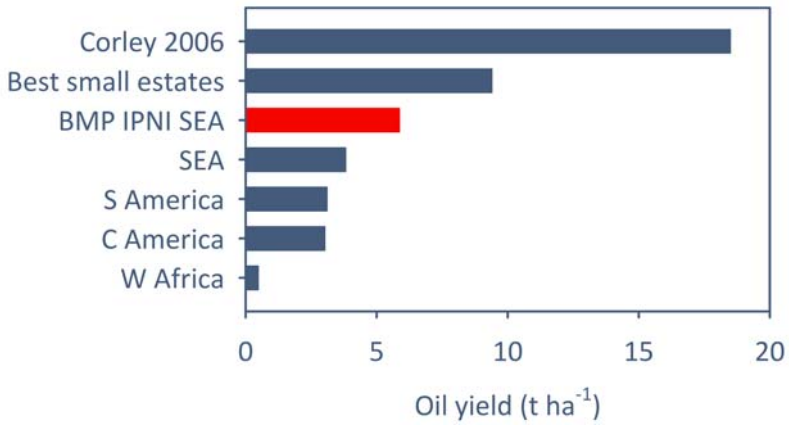
#	Strategy	Comments	Scope for oil palm
1	Area increase	Shortage of suitable land	Limited?
2	Yield increase	Huge scope for improvement	High
3	Number of crops per year	Not applicable	None
4	Displace lower yielding crops	Indirect effect	High
5	Reduce post harvest losses	Requirement to improve oil yield	High
6	Reduce use as feed for animals	Provides animal feeds as by–product	High

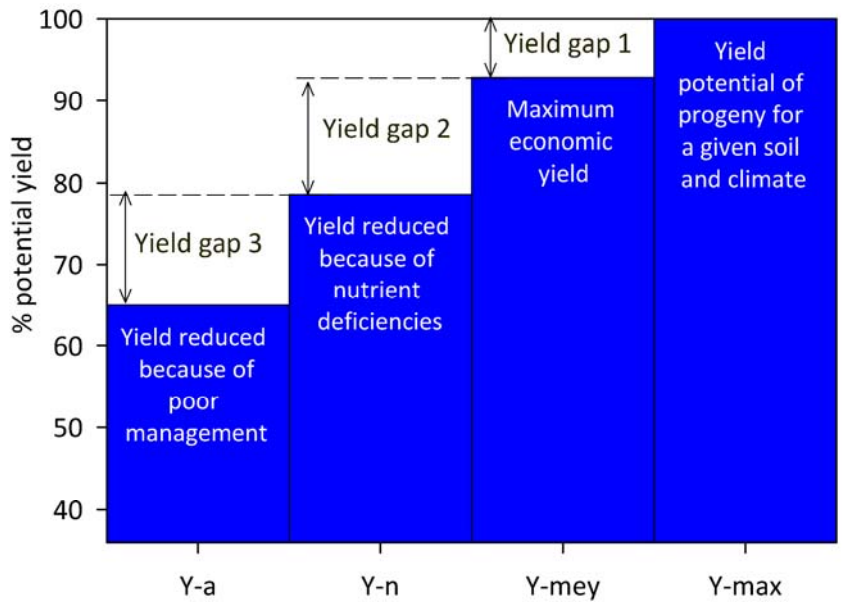
Evans, 1998

Yield and RSPO criteria

- Yield is mentioned once in the *RSPO Principles and Criteria* under *Principle 4* (*4.2 - Practices maintain soil fertility at, or where possible improve soil fertility to, a level that ensures optimal and sustained yield.*
- Yield – should be a primary goal for sustainable palm oil production and RSPO certification?
- Palm oil yields in RSPO certified plantations in Indonesia and Malaysia are about 1 t ha^{-1} greater than national averages.

What is the attainable yield on suitable land?





Benefits of yield improvement

- Profitability increased!
- Land spared for wilderness or other crops when coupled with proper land use planning
- Reduced carbon payback time
- Increased yield of CH_4 for electricity co–generation

Sustainable use of fertilizers

- Increasing yields doesn't necessarily require more fertilizer — emphasis should be on *efficient* fertilizer use!
- Emissions associated with increased fertilizer use on existing land smaller than emissions from clearing new land.
- Importance of measuring agronomic efficiency (i.e., how much extra oil per kg of additional fertilizer) — a possible criteria for RSPO?

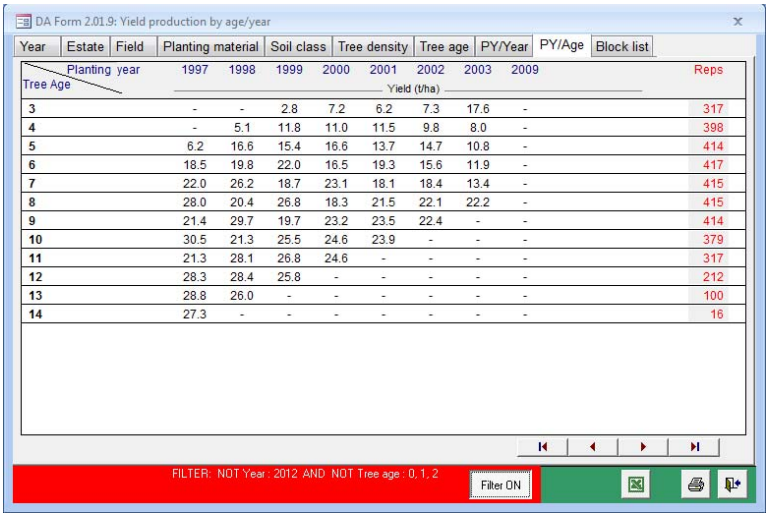
Crop protection and use of agrochemicals

- Herbicides are essential for maintaining proper ground cover and achieving high yields
- Importance of measuring agrochemical use (kg active ingredient per kg oil produced).
- A possible criteria for RSPO?

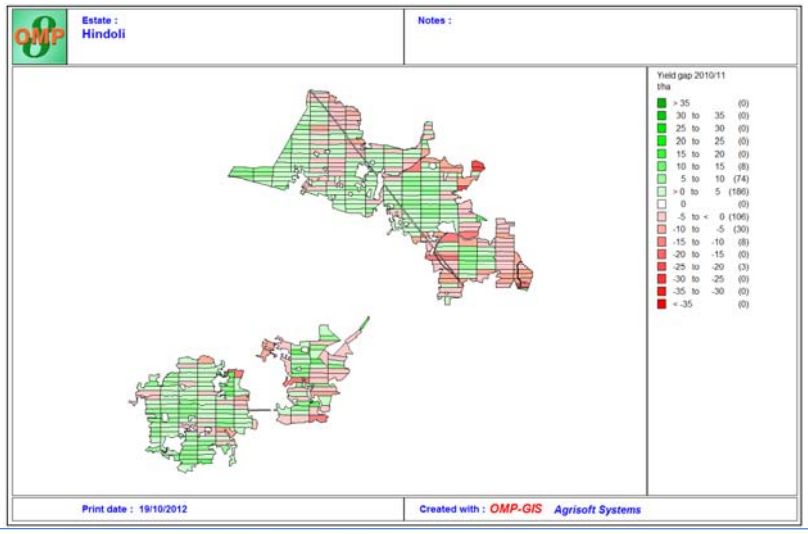
The importance of record keeping

- Records of yield, leaf and soil analysis, fertilizer and agrochemical use should be compiled in a database
- An essential tool for site specific management.
- Provides the means to assess:
  - Site utilization efficiency
  - Input use efficiency
- Cargill uses a customized database programme to maintain records of all agronomic parameters

Analysis of yield trends over time



Analysis of yield gaps



Individual block records

Growth Marker BMP06 BMP: BMP06 Estate SP Field E28 Block AB2230

Soil: Ultisol Topography Flat YOP: 1997 YAP: 14 DFH: 01/07/199 MFH: 24

Previous crop Scrub/beluka Land clearing Full Mech Density 138 P. material: Costarica Area 25.4 ha

	Yield data							Fertilizer inputs (kg/palm)								Leaf analysis (% dry matter)											
								N		P2O		K2O		Mg		B		N		P		K		Mg		B	PCS	PH	SPH
Yr	YA	Pot	Act	Ga	BW	BN	A	R	A	R	A	R	A	R	A	R	L	D	L	L	Rc	D	L	D	L	D	cm2	m	p/ha
11/1	14	31	28	-2.8	18	11	1.8	1.8	0.9	0.9	1.0	0.6	-	-	-	-	2.6	-	0.16	1.1	1.5	-	0.23	-	16		48	6	140
10/1	13	31	31	0.4	20	12	1.8	1.8	0.9	0.9	1.2	1.2	0.2	0.1	-		2.6	-	0.16	1.2	2.3	-	0.25	-	19	-	47	5	140
09/1	12	31	30	-1.0	20	11	0.9	0.9	-	-	1.8	0.9	-	-	-	-	2.6	-	0.16	1.2	2.2	3	0.25	-	17	-	48	5	140
08/0	11	31	24	-7.4	18	9	0.6	0.6	-	-	0.9	0.9	-	-	-	-	2.6	-	0.16	1.1	1.7	3	0.29	-	16	-	46	5	139

Manager's comments

Use of 'BMP blocks', where all manageable agronomic constraints are removed to provide a benchmark of attainable yield.

Estate yield assessment

OMP Hindoli

Report 1.04 printed: 19-Oct-12

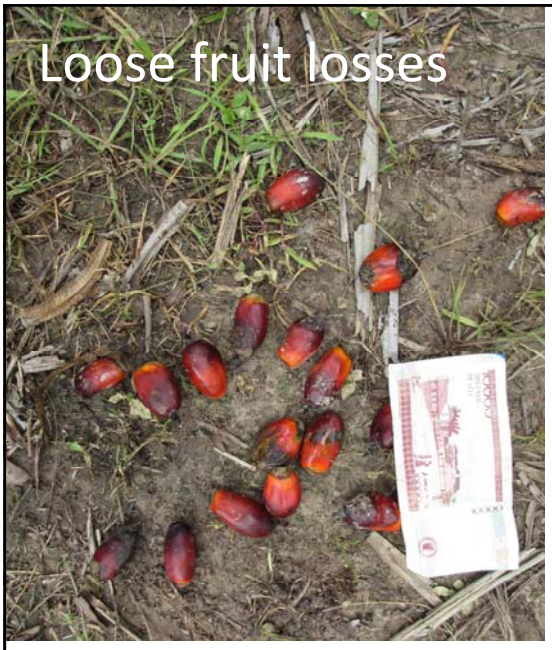
Monthly crop report by estate

May 2012

	Area (ha)				Production (t)							Yield (t/ha)						
Estate	Budget	Mature	%	Total	This month Actual	This month Budget	Year to date Actual	Year to date Budget	12 MRT Actual	2011/12 Budget	2011/12 Potential	This month Act.	This month Bud.	Year to date Act.	Year to date Bud.	12 MRT Act.	2011/12 Bud.	2011/12 Pot
SP	2,985.8	3,030.0	32	3,085.7	4,458	7,068	69,238	80,772	69,238	80,772	94,342	1.5	2.4	22.9	27.1	22.9	27.1	30.7
ST	2,866.0	2,866.0	30	2,866.0	4,704	7,496	76,368	85,668	76,368	85,668	88,661	1.6	2.6	26.6	29.9	26.6	29.9	30.9
TDSG	3,659.4	3,659.4	38	3,659.4	5,974	8,423	93,377	96,251	93,377	96,251	113,278	1.6	2.3	25.5	26.3	25.5	26.3	31.0
Hindoli summary	9,511.2	9,555.4	99	9,611.1	15,136	22,987	238,983	262,691	238,983	262,691	296,280	1.6	2.4	25.0	27.6	25.0	27.6	30.9

In the financial year 2011-2012 Hindoli achieved 81% of site yield potential

Loose fruit losses



Parameter	Value	Units
Density	143	palm/ha
Loose fruit loss	4	loose fruits/palm/round
Rounds	36	rounds/year
Loose fruit lost	20,592	LF/ha
Weight of loose fruit	10	g
LF loss	206	kg/ha/year
Area	10,000	ha
LF loss	2,059	t/year
Oil content	40%	oil in LF
Oil loss	824	t/year
CPO	900	$/t
CPO loss	741,312	$/year

Huge loss of revenue if some loose fruit are left in the field.
In a 10,000 ha estate, 4 uncollected loose fruit per palm per harvest means a loss of at least US$ 0.74 million!

www.tropcropconsult.com

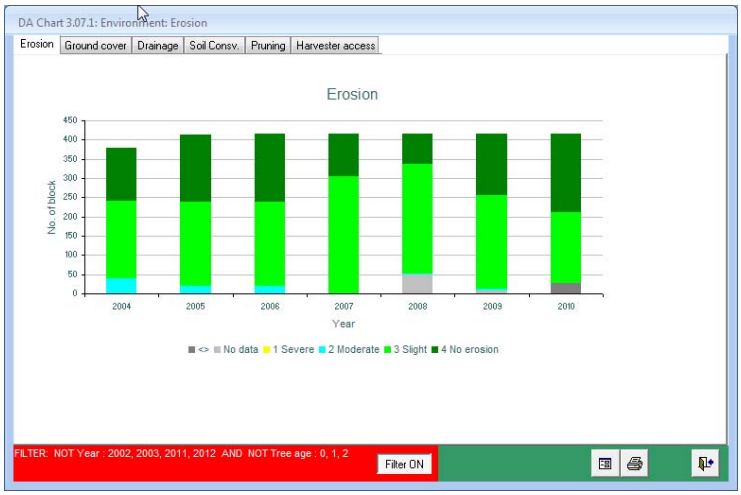
Analysis of pesticide active ingredient use

OMP Hindoli — Report 2.04.1 printed: 19-Oct-12

Active ingredient by hindoli — Year 2011

Active Ingredient		October: Sprayed area ha	October: Active ingredients Applied kg/block or l/block	October: Active ingredients Rate kg/ha or l/ha	October: Pesticide toxicity index AI / LD50 / ha	October: Pesticide toxicity index AI / LD50 / t FFB	Year to date: Sprayed area ha	Year to date: Active ingredients Applied kg/block or l/block	Year to date: Active ingredients Rate kg/ha or l/ha	Year to date: Pesticide toxicity index AI / LD50 / ha	Year to date: Pesticide toxicity index AI / LD50 / t FFB
Herbicide											
alkyl polyglycol ether	App.	-	-	-	-	-	-	-	-	-	-
	Rec.	-	-	-	-	-	-	-	-	-	-
	Diff.	-	-	-	-	-	-	-	-	-	-
fluroxypyr-meptyl	App.	67.7	0.8	0.01	6.21	0.02	1,061.8	17.8	0.02	8.37	0.08
	Rec.	-	-	-	-	-	-	-	-	-	-
	Diff.	67.7	0.8	0.01	6.21	0.02	1,061.8	17.8	0.02	8.37	0.08
Glufosinate-ammonium	App.	212.3	9.6	0.05	26.14	0.20	1,442.6	89.3	0.06	35.78	0.48
	Rec.	-	-	-	-	-	-	-	-	-	-
	Diff.	212.3	9.6	0.05	26.14	0.20	1,442.6	89.3	0.06	35.78	0.48
Glyphosate-isopropylammonium	App.	2,170.4	140.1	0.06	7.14	0.56	7,672.6	1,136.3	0.15	16.38	1.12
	Rec.	-	-	-	-	-	-	-	-	-	-
	Diff.	2,170.4	140.1	0.06	7.14	0.56	7,672.6	1,136.3	0.15	16.38	1.12
isopropil amina glifosat	App.	-	-	-	-	-	-	-	-	-	-
	Rec.	-	-	-	-	-	-	-	-	-	-
	Diff.	-	-	-	-	-	-	-	-	-	-
Metsulfuron-methyl	App.	1,148.0	2.1	-	0.36	0.01	7,694.4	21.5	-	0.56	0.04
	Rec.	-	-	-	-	-	-	-	-	-	-
	Diff.	1,148.0	2.1	-	0.36	0.01	7,694.4	21.5	-	0.56	0.04
Triclopyr-triethylammonium	App.	42.1	1.0	0.02	4.56	0.01	906.2	29.3	0.03	6.46	0.05
	Rec.	-	-	-	-	-	-	-	-	-	-
	Diff.	42.1	1.0	0.02	4.56	0.01	906.2	29.3	0.03	6.46	0.05
Total											
	App.	2,424.8	153.6	0.06	9.11	0.79	7,934.3	1,294.2	0.16	24.75	1.75
	Rec.	-	-	-	-	-	-	-	-	-	-
	Diff.	2,424.8	153.6	0.06	9.11	0.79	7,934.3	1,294.2	0.16	24.75	1.75

Analysis of trends for soil erosion

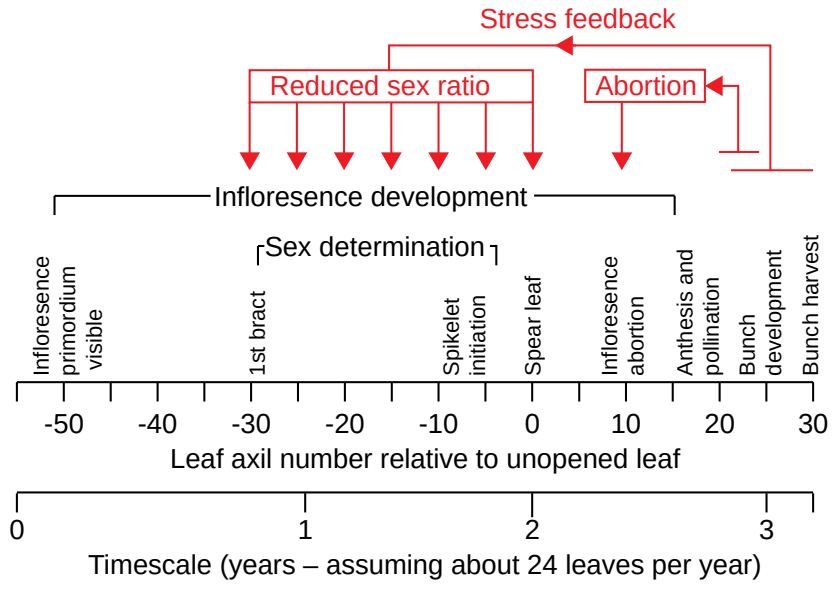


An index for site utilization?

- A measure of site utilization: aggregated actual yield as a percentage of site attainable yield?
- A means to assess yield?

Problems with yield intensification

- Time lag between implementation of improved agronomic practices and their impact on yield
- Yield intensification needs long term commitment and patience from investors.
- Need for well trained and motivated staff at all levels to implement best agriculture practices



Jones, 1997

Cargill invests in oil palm industry education in Indonesia


BERANDA | TENTANG KAMI | HUBUNGI KAMI

beningpost

untuk indonesia yang lebih baik

POLITIK EKONOMI SAINTEK KESEHATAN GAYA HIDUP OLAH RAGA DARI REDAKS

BERANDA » EKONOMI

18/07/2012 22:47:40 WIB

Cargill dan IPB Dirikan Kebun Pendidikan Kelapa Sawit Pertama di Indonesia

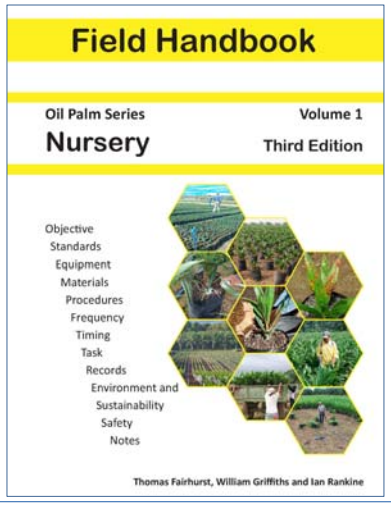
MS. Mubarok - BeningPost

Penghasil dan pemasar internasional bahan pangan pertanian, Cargill, hari ini, Rabu (18/07) mengumumkan kerjasama dengan salah satu institute pertanian terkemuka di Indonesia, Institut Pertanian Bogor (IPB) untuk membangun kebun pendidikan kelapa sawit pertama di Indonesia. Kebun ini, yang merupakan bentuk skala kecil dari perkebunan kelapa sawit komersial, juga akan menjadi kerjasama pertama antara petani kelapa sawit komersial dengan sebuah institusi pendidikan. Berlokasi di Kecamatan Jonggol, Bogor, kebun pendidikan tersebut akan memberikan pelatihan berkualitas tinggi dan sesuai standar-standar industri mengenai teknik-teknik produksi dan manajemen perkebunan terbaru.

foto: beningpost.com/paramuda

- Major initiative to support education of young plantation executives.
- Collaboration with Institut Pertanian Bogor.
- Practical 'on–farm' training.

Importance of good extension materials



- How to perform each task
- Health and safety precautions
- Environmental and sustainability issues
- Means to assess whether standards have been achieved in the field.

Conclusions

- More explicit recognition of yield as a primary driver of sustainable palm oil production required?
- Include an index for 'Site Utilization Efficiency' in the Principles and Criteria for RSPO certification?
- In line with continuous improvement (ISO 9000)

References

1. Agrisoft Systems (2012) *OMP-MIS: site-specific management in oil palm.* Agrisoft Systems. Available at: http://www.agrisoft-systems.de/AS_OMP_MIS_01.htm (accessed 19 october 2012).
2. Corley, R.H.V. (2009) How much palm oil do we need. *Environmental Science & Policy*, 12, 134-139.
3. Donough, C., Witt, C. and Fairhurst, T. (2010) Yield intensification in oil palm using BMP as a management tool. In: *Proceedings of the International Oil Palm Conference held in Jogjakarta from 1-3 June, 2010*. IOPRI, Jogyakarta, Indonesia.
4. Evans, L.T. (1998) Feeding the Ten Billion: Plants and Population Growth. Cambridge University Press, Cambridge, UK.
5. Fairhurst, T., Griffiths, W. and Rankine, I. (2013) Field Handbooks: Oil Palm Series Volumes 1-3, 3nd. edn. Potash & Phosphate Institute (PPI), Potash & Phosphate Institute of Canada (PPIC) and 4T Consultants (4T), Singapore.
6. Jones, L.H. (1997) The effects of leaf pruning and other stresses on sex determination in the oil palm and their representation by a computer simulation. *Journal of Theoretical Biology*, 187, 241-260.
7. Mubarok, M. (2012) *Cargill dan IPB Dirikan Kebun Pendidikan Kelapa Sawit Pertama di Indonesia.* Available at: http://beningpost.com/read/3354/cargill-dan-ipb-dirikan-kebun-pendidikan-kelapa-sawit-pertama-di-indonesia (accessed 19 october 2012).