

Alleviating seasonal water deficit for a sustained oil palm production

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International Society of Oil Palm Agronomists (ISOPA) Colloquium

Jointly organised by IOPRI and MPOB

Marihat, 29 Sept. 2016

Outline

INTRODUCTION

1. [WD \(water deficit\)](#)
2. Effects of WD on oil palm
 - [Nutrient fluctuation](#)
 - [Yield drop](#)

RESEARCH RESULTS...

Field trials	Recommendations
I. Drought	<ol style="list-style-type: none">1. Rain harvest (rorak, <i>Ganoderma</i> sanitation hole, water outlet)2. Balanced fertilization3. Use of drought-tolerant DxP materials?
II. Irrigation	Irrigation / fertigation
III. Pocket irrigation	Development of active gel with high WHC
IV. Mill-waste trials	<ol style="list-style-type: none">1. Enlarged in-field POME distribution2. Land application of mill solid-waste (EFB)
V. Runoff/ leaching/ stemflow	<ol style="list-style-type: none">1. Cover crop2. Frond placement

Water deficit calculation

Month	#Rainy days	Rainfall (mm)	Water Deposit	ET	Water Balance	Soil Moisture	Water Excess	Water Defisit
A	B	C	D	E	F =C+D-E	G _{max 200}	H=F-G	I
1	4	37	100	150	-13	0	0	-13
2	8	100	0	150	-50	0	0	-50

AWHC (avl. water holding cap.)= 200 mm

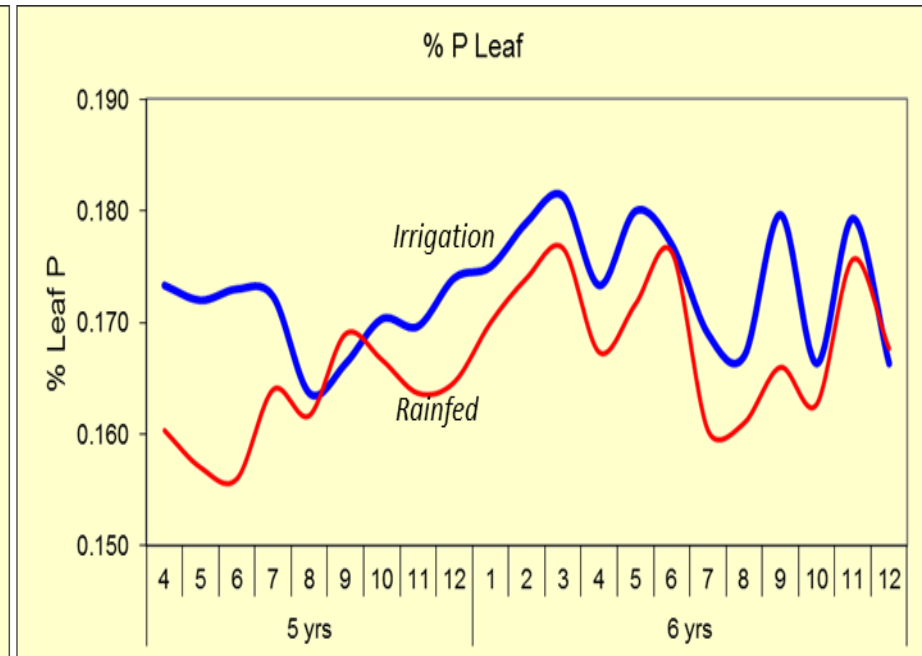
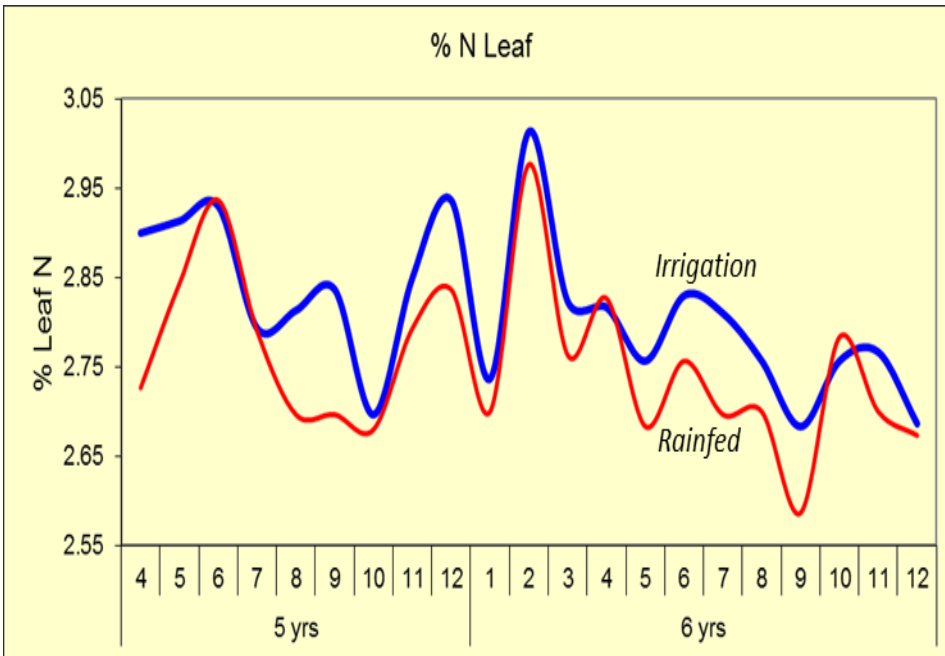
ET (Evapotranspiration)

ET=150 mm if RD<=10

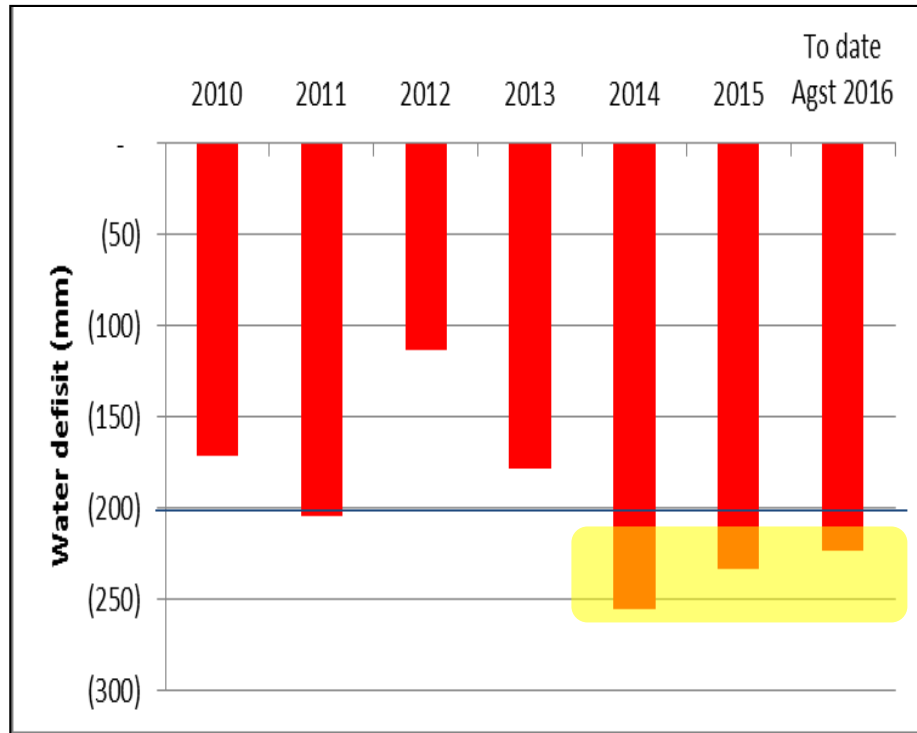
ET=120 mm if RD>10

Scale = mm

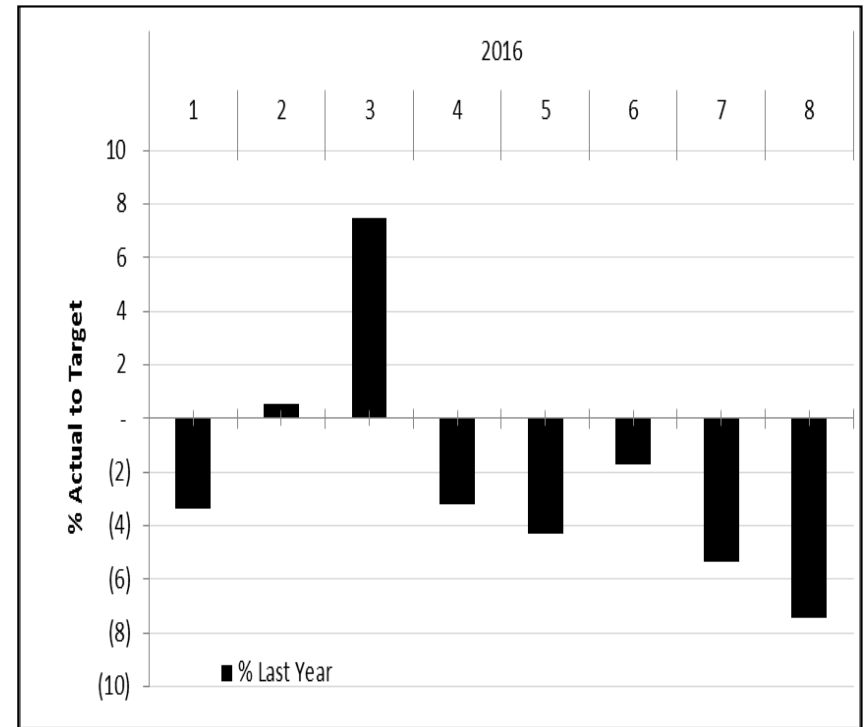
The effect of **water deficit** on palm nutrient status



Water deficit, 2010-2016



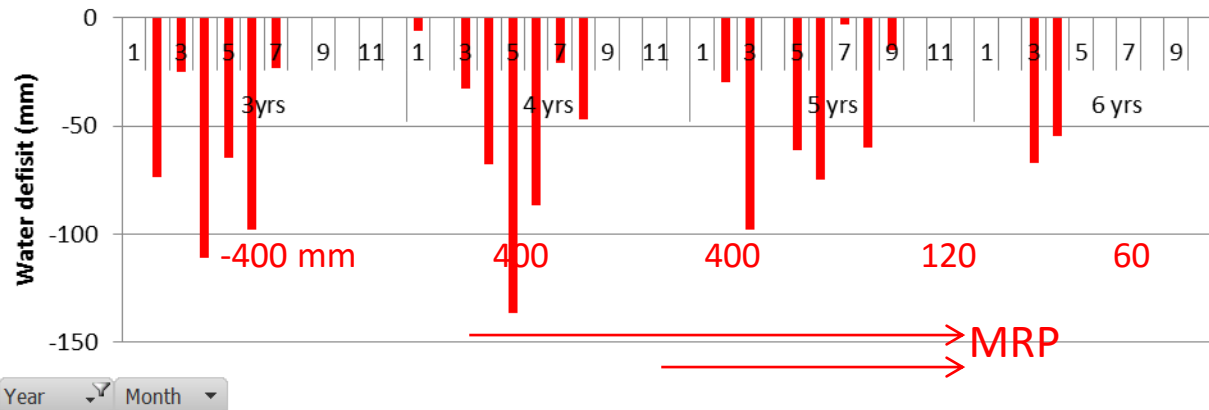
Oil palm yield (%Actual / LY), Jan-Aug. 2016



Yield drop (increased %MRP palms)

	5 yrs			6 yrs		
Treatment	NOB/palm	FFB/palm	MRP	NOB/palm	FFB/palm	MRP
Irrigation	23	221	4%	17	234	13%
Rainfed	20	193	9%	15	207	30%

Water Defisit 3-6 yrs old

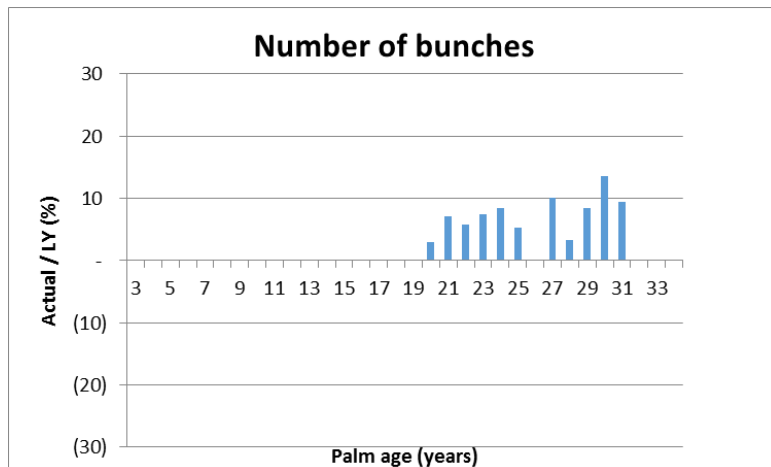


Published Studies (Caliman, 1998)

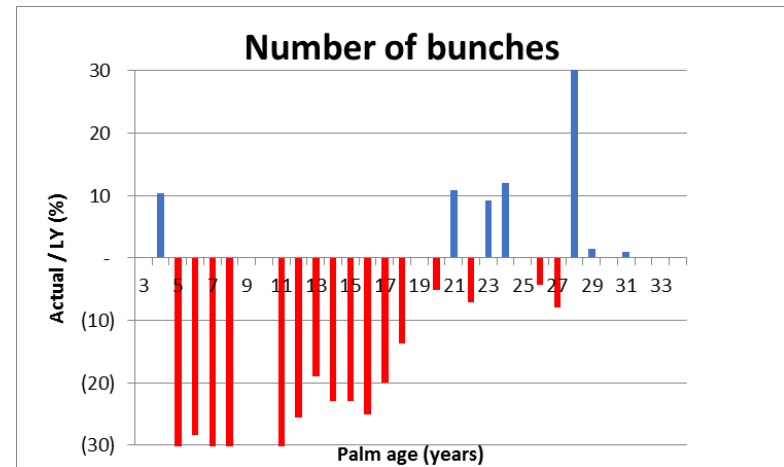
- Old palms less affected by drought/ *el nino* than young mature palms
- Three periods of sensitivity of the palms

Period	Months before harvest	Yield drop
1	5 and 10	15-20%
2	18-22	5-10%
3	30-33	3-10%

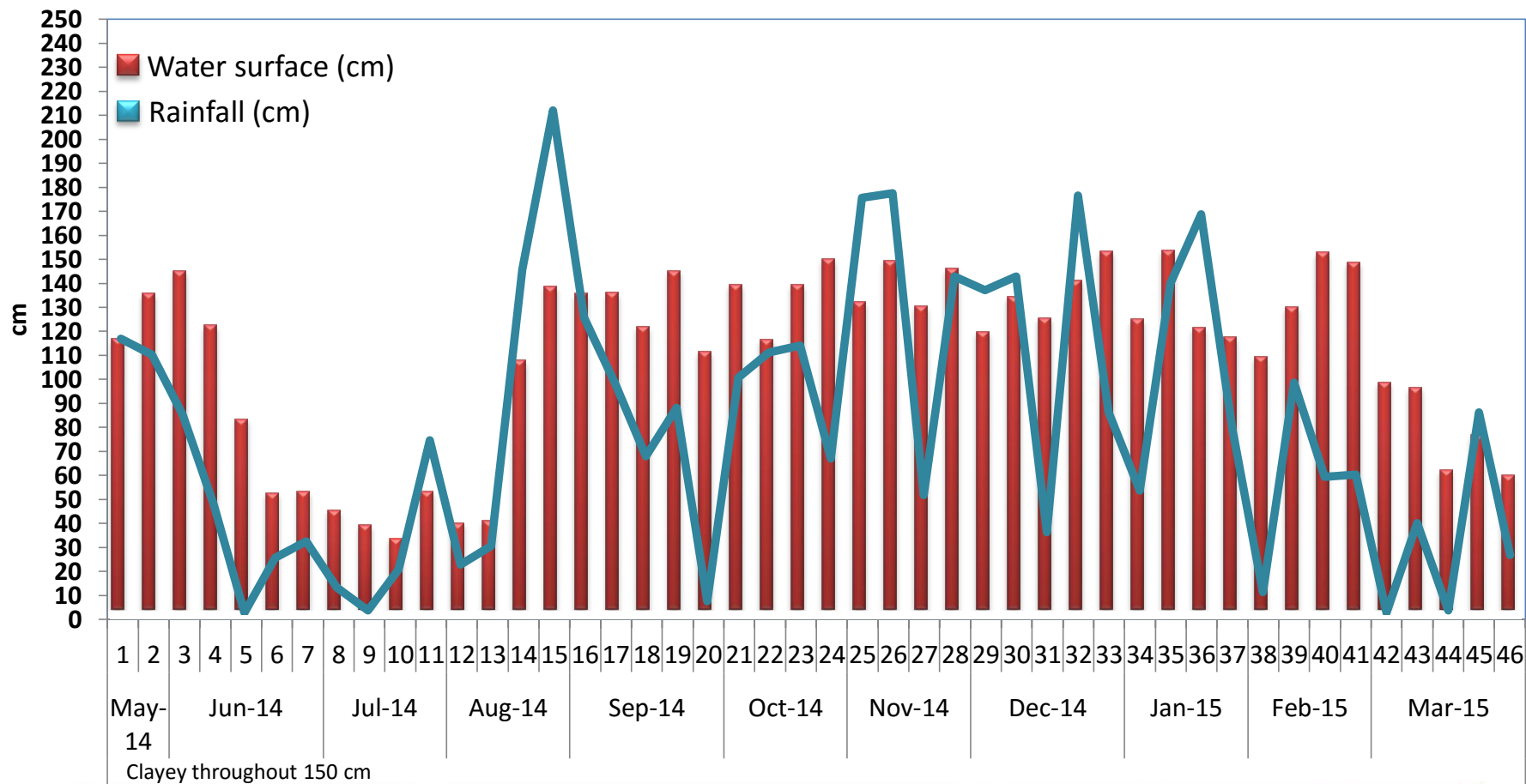
Estate	Year - 0	Year - 1	Year - 2
A	6-13%	6%	
B	2-8%	2-8%	2-8%
C	2%	1%	
D	9-10%	9%	



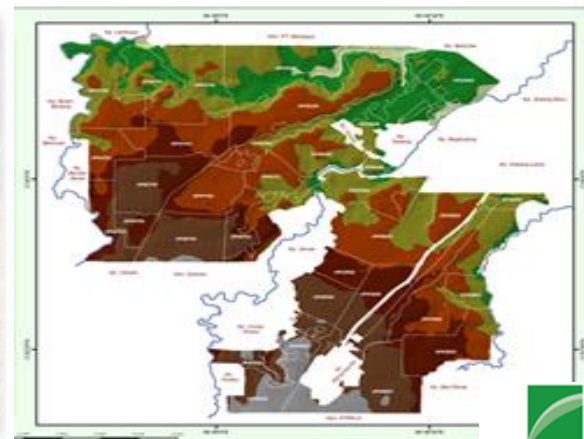
Rainfall > 3,500 mm/ a



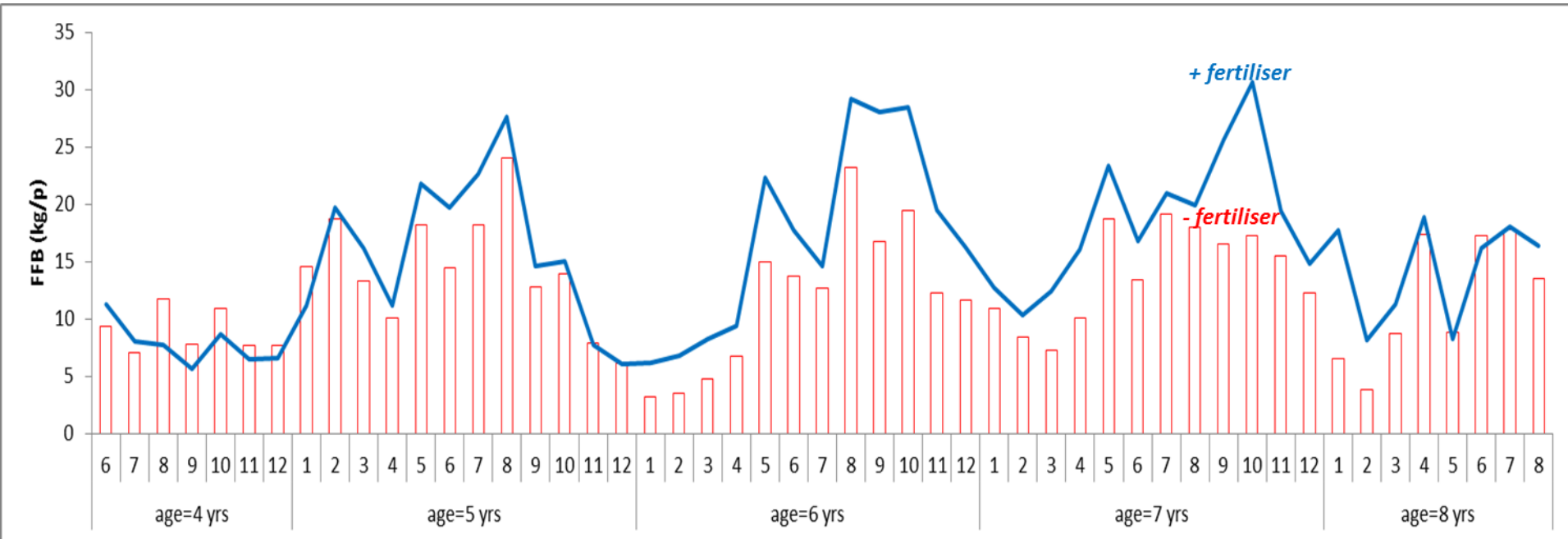
< 2,000 mm/ a



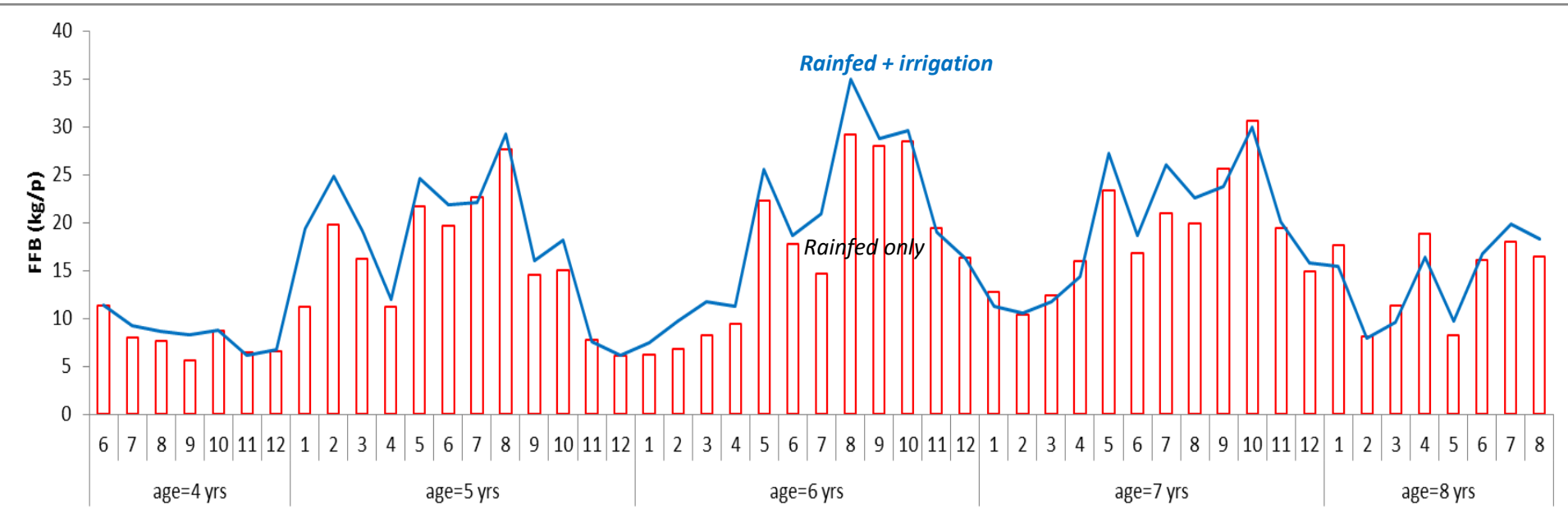
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The effect of *fertilisers* on FFB yield



The effect of **additional water (irrigation)** on FFB yield



Pocket Irrigation

(gel with WHC > 200x dry wt.)



POME Treatment (cm/rey)	Fertilisers	% on dry matter leaf					% on dry matter rachis			
		N	P	K	Mg	Ca	P	K	Mg	Ca
10	Nil	2.71	0.173	0.89	0.20	0.67	0.145	1.95	0.09	0.32
20	Nil	2.71	0.168	0.85	0.22	0.74	0.171	2.03	0.10	0.36
100	Nil	2.72	0.174	0.80	0.22	0.73	0.206	1.92	0.12	0.41
Nil	NP	2.71	0.160	0.90	0.18	0.68	0.115	1.81	0.09	0.34
Nil	Nil	2.71	0.163	0.88	0.19	0.72	0.123	1.96	0.09	0.37
Mean		2.71	0.168	0.86	0.20	0.71	0.152	1.93	0.10	0.36
LSD		0.04	0.004	0.09	0.06	0.10	0.060	0.37	0.02	0.04
CV(%)		0.85	1.31	5.30	15.92	7.17	20.27	9.79	11.99	6.13



Treatment		1997-2000		
		FFB (t/ha)	NOB/ Ha	ABW (kg)
N	1	28.14	1157	24.37
	2	28.43	1141	24.96
K	0	27.82	1132	24.62
	1	28.74	1166	24.71
Mg	0	28.30	1160	24.45
	1	28.27	1138	24.88
EFB	0	27.29	1125	24.34
	1	28.49	1180	24.17
	2	29.08	1142	25.50
LSD 5%(NKMg)		1.14	57	0.65
LSD 5% (EFB)		1.40	69	0.80
CV %		6.84	8.35	4.46

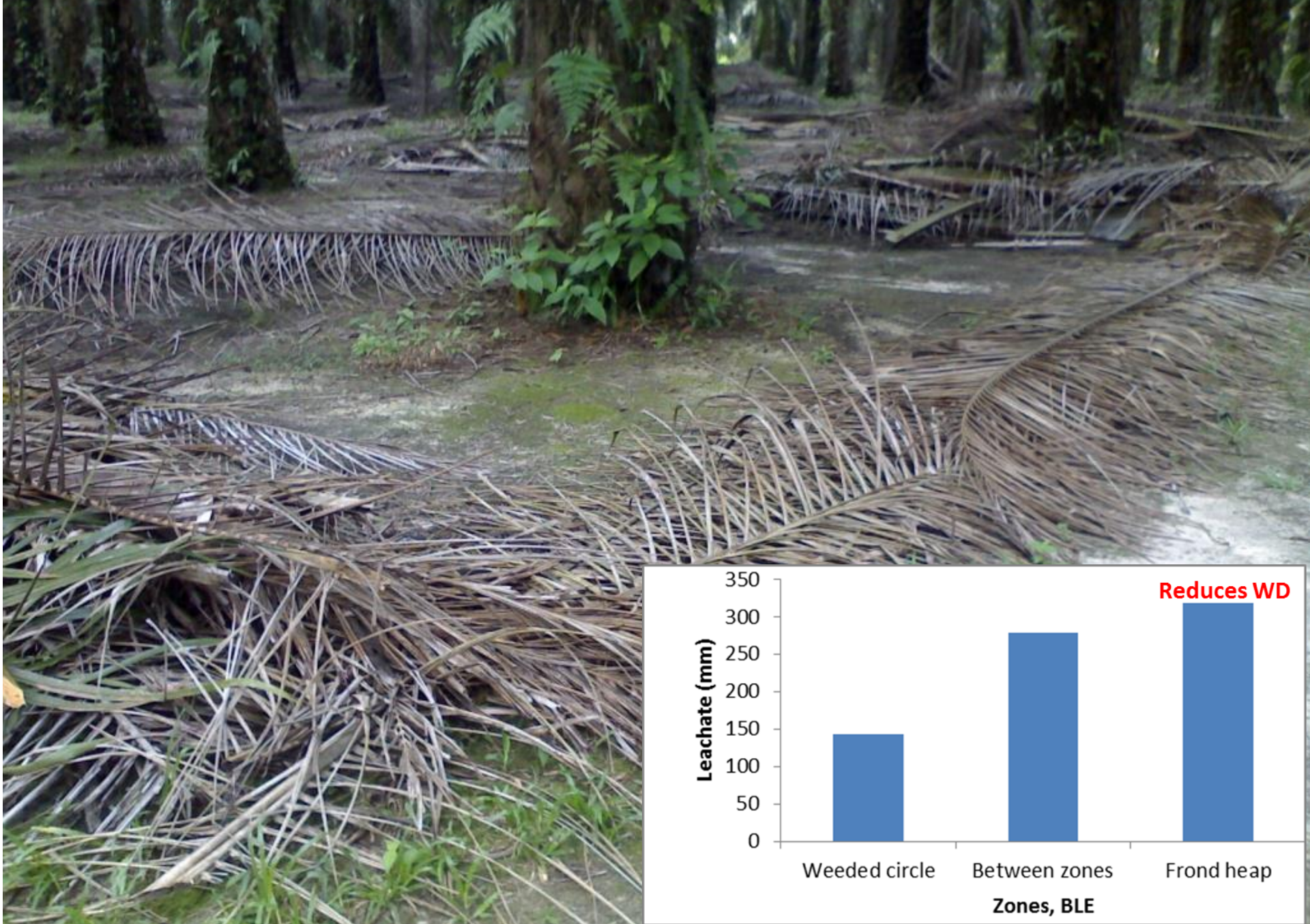


Mulching effect



Site with 3,500 mm annual rainfall (+cover crop):
<10% of storm water becomes run-off
60% becomes leachate water → **reduces WD**
13% becomes stemflow







Tentative Program

Day 1: Wednesday, 28 September 2016

07.00 - 12.00	Registration (Santika Hotel)
13.00 - 17.30	Trip to Lake Toba
19.30 - 21.00	Dinner

Day 2: Thursday, 29 September 2016

07.00 - 08.00	Breakfast
08.00 - 09.30	Trip to Marhat
09.30 - 12.30	Field clinic How to Increase Oil Palm Fruitset? <ul style="list-style-type: none"> - Analysis of oil palm fruit set - Counting the population of <i>E. kamerunicus</i> - Hatch & carry mobile
12.30 - 14.00	Lunch
14.00 - 14.10	Opening remarks (IOPRI)
14.10 - 16.40	ISOPA Qolloquium: <ul style="list-style-type: none"> Paper I : BMPs of oil palm with monsoonal rainfall and high water deficit (IOPRI) Paper II : How to prevent drought effects in oil palm plantation? (BLRS) Paper III : BMPs of oil palm in Sandy Soil (Dr. Suriyanto - Indonesia) Paper IV : How to optimize oil palm production on marginal land in Malaysia (MPOB)
16.40 - 16.50	Closing remarks (Dr. Norman Kamarudin - President of ISOPA)
16.50	Trip to Medan