

# BMP and Fertilizer Use Efficiency

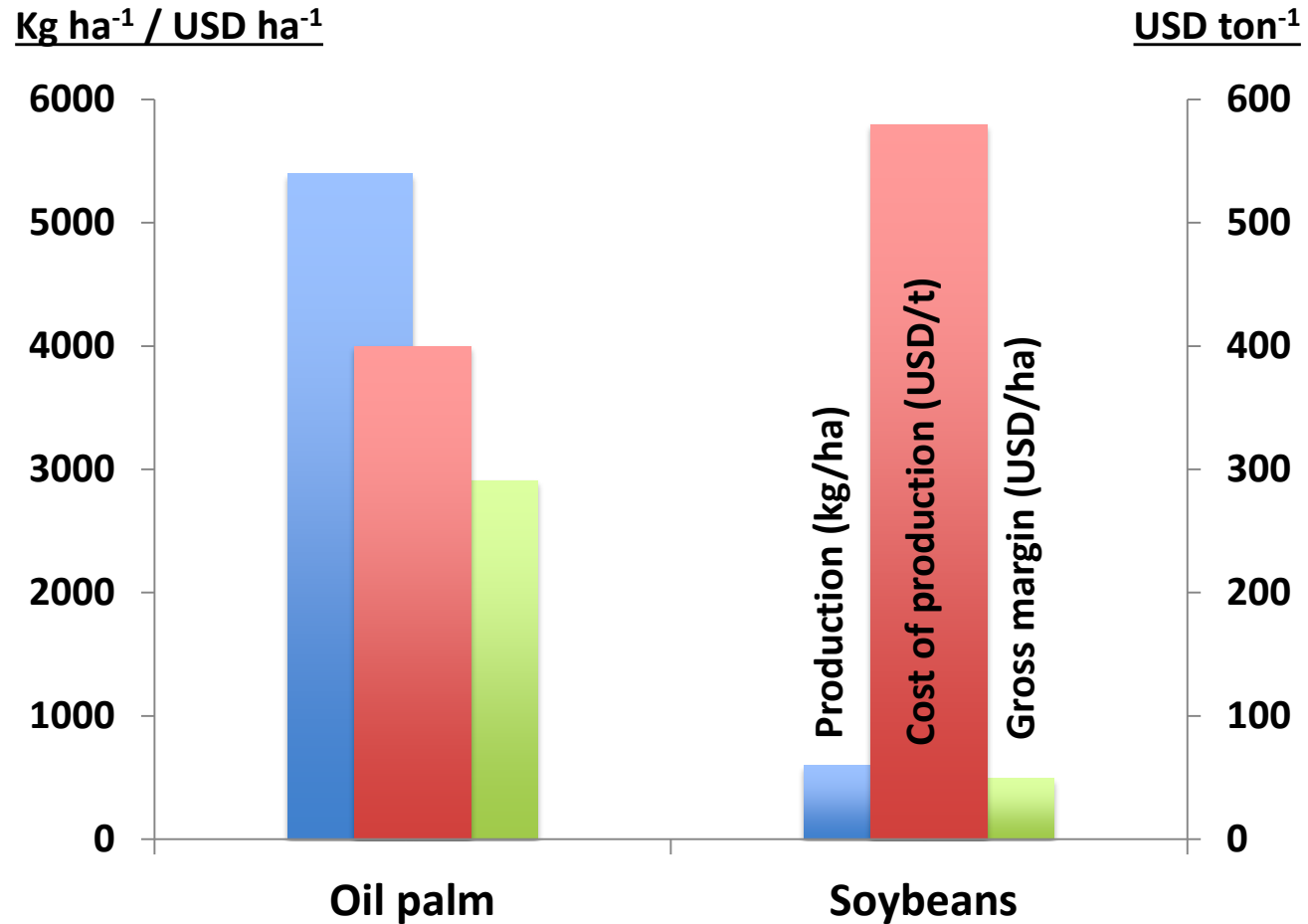
*Chris Donough*  
*IPNI Southeast Asia*



Managing Oil Palms in the Sabah Interior Region  
Seminar & Soil Tour, Keningau, 12-14 August 2014

# Profitable, Eco-efficient Oil Palm

## BMP and Fertilizer Use Efficiency



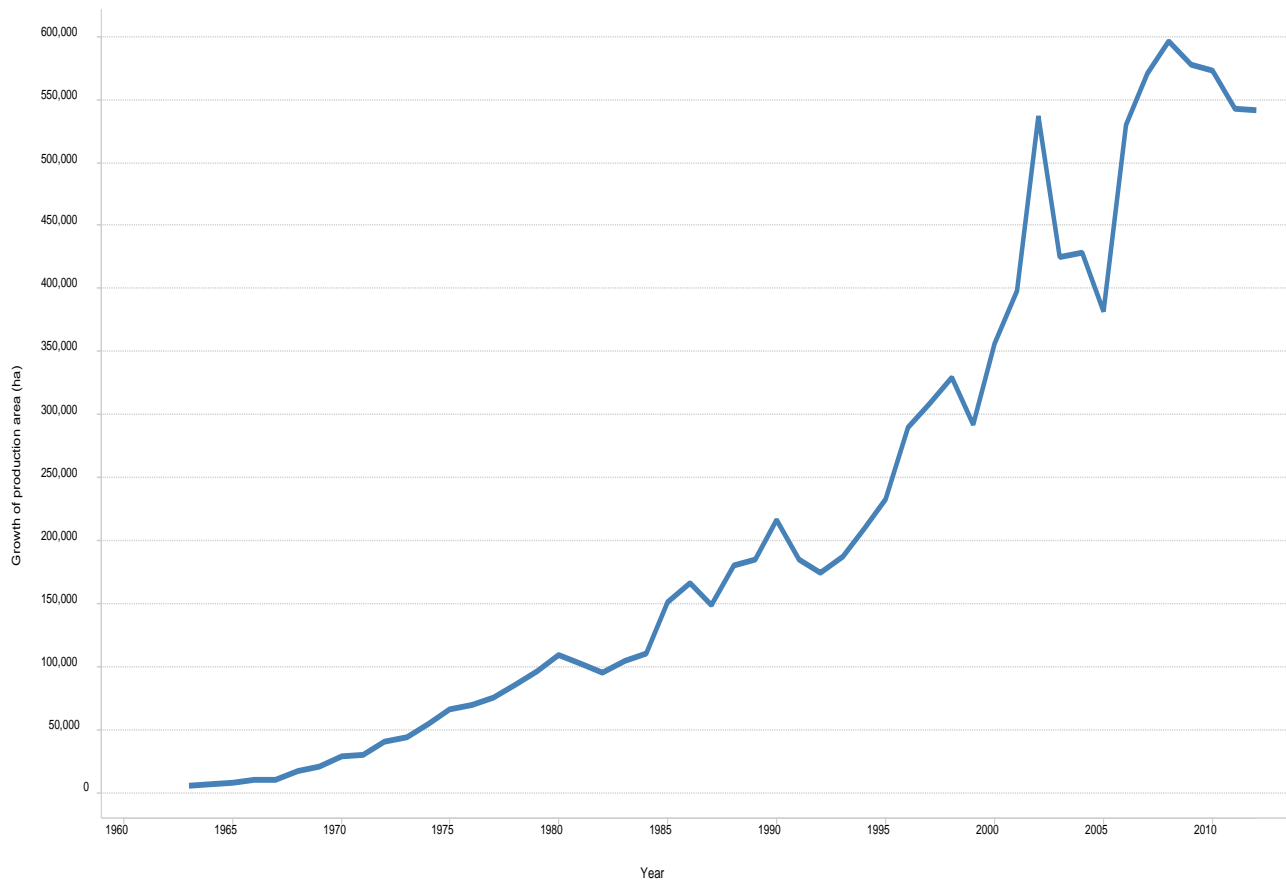
*Zimmer et al (2009)*

# Rapid expansion in planted area – driven by SE Asia

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Efficiency

Annual growth of OP production area (ha) 1961-2012

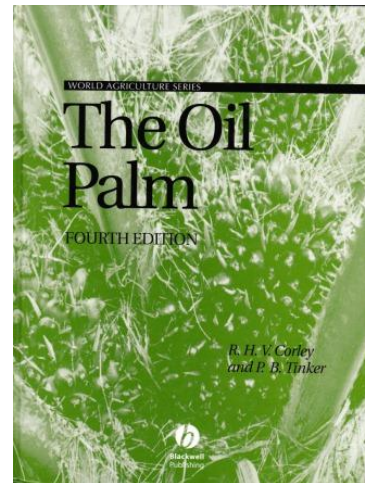
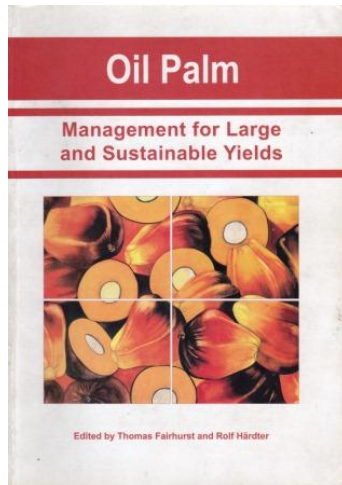
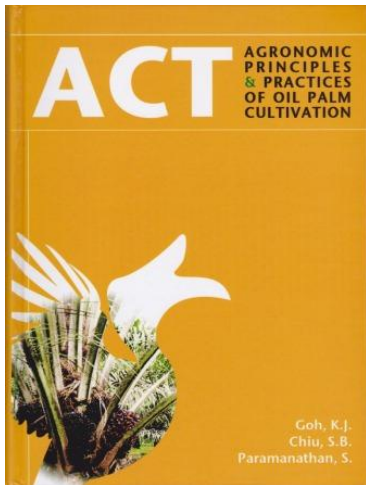
Data from FAO, 3 yr. moving average



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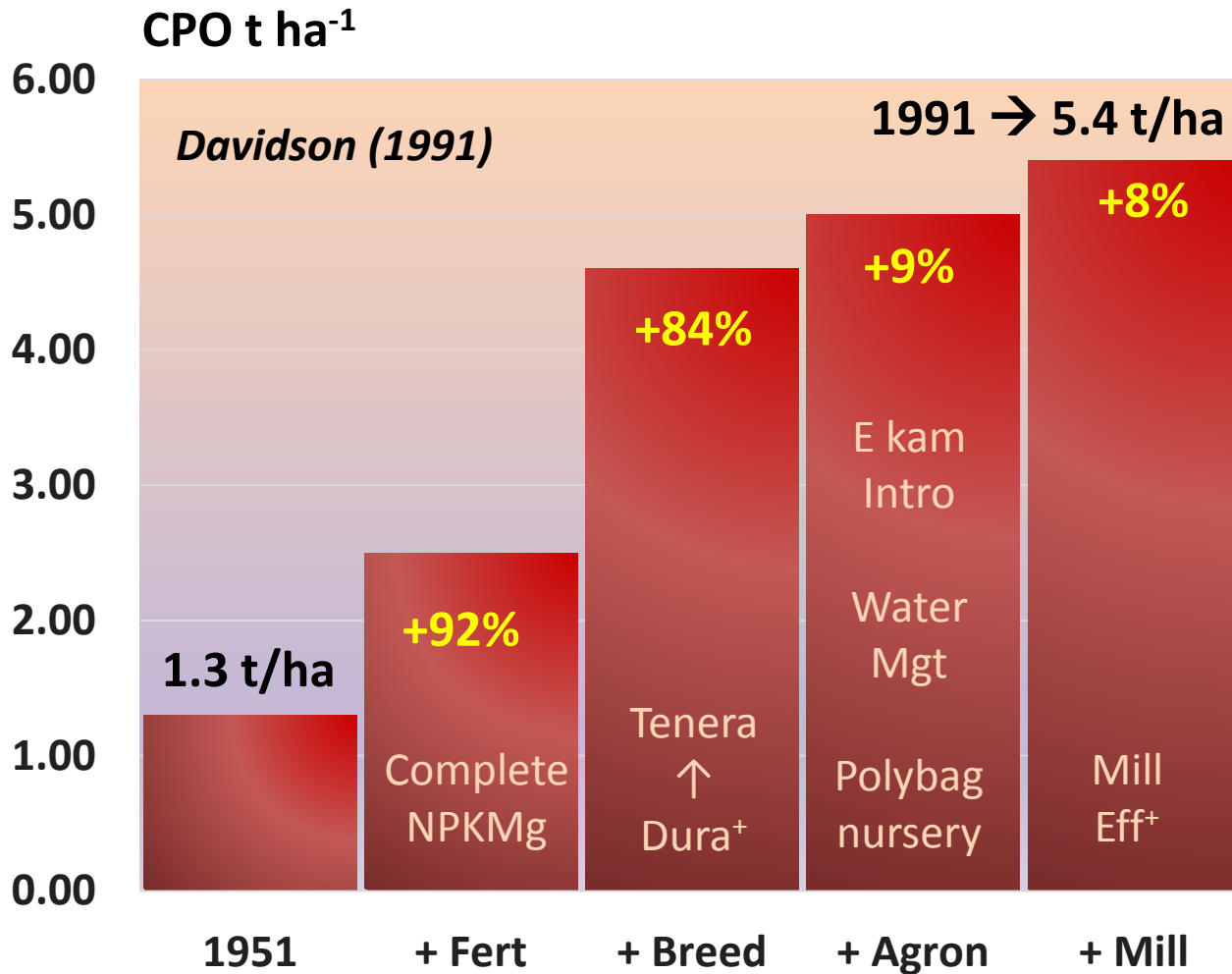
# Oil palm BMPs

- 1 century of commercial cultivation
- Decades of field experimentation → *summarized in good books*
- Visit <http://www.ipni.net/publications> to browse or download catalogue



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# Yield increase at commercial scale with better practices



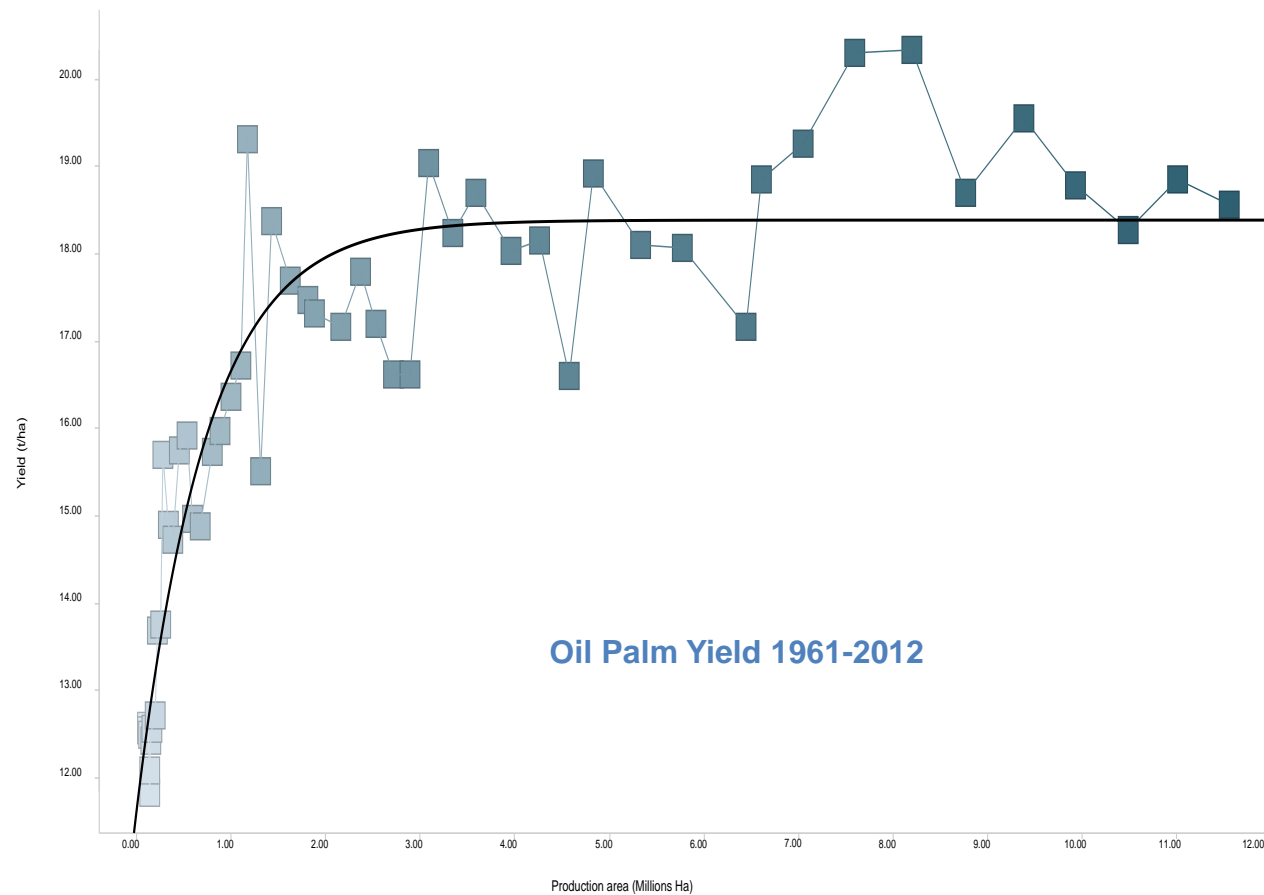
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# Stagnant yield – since 1990s

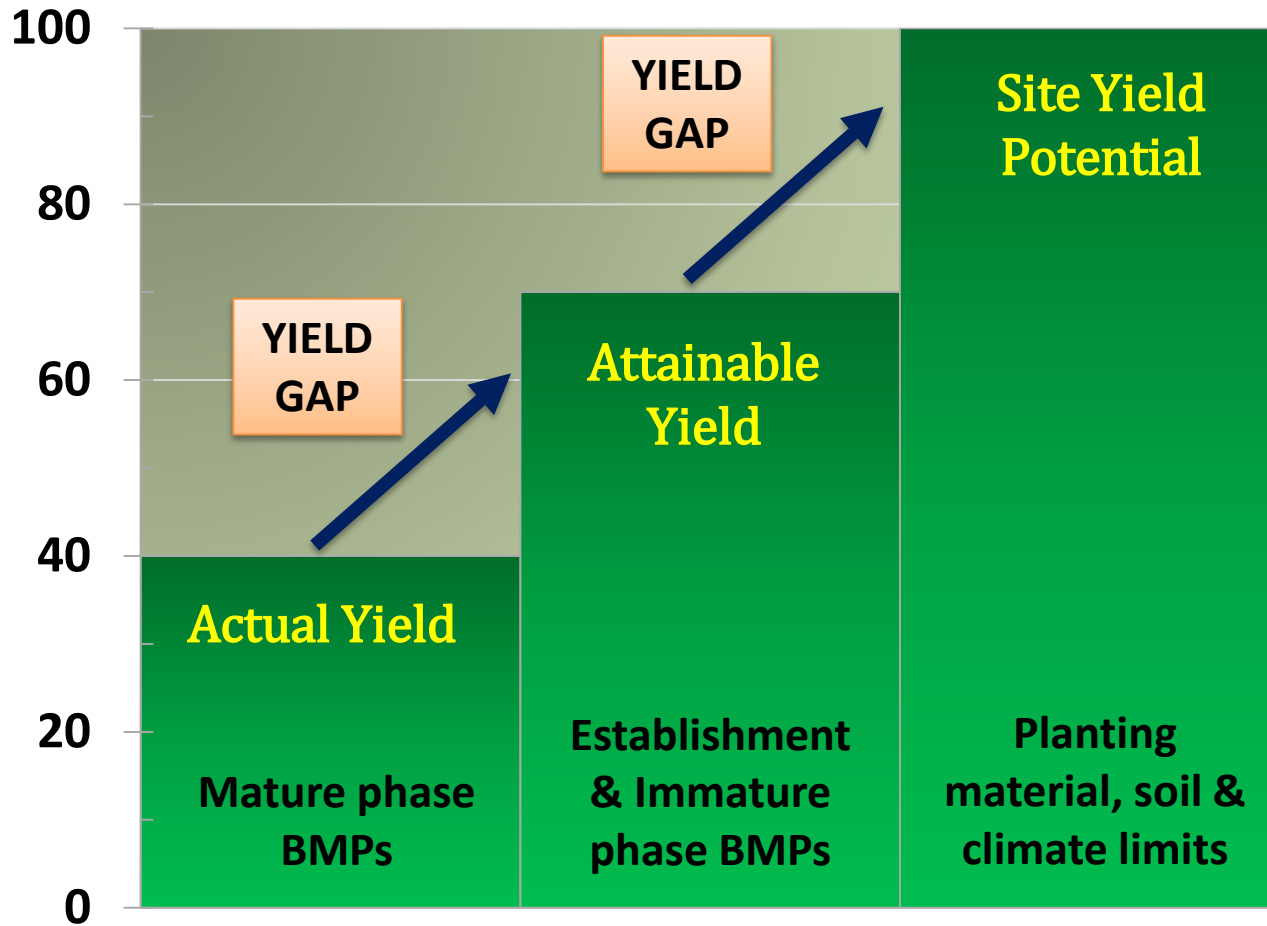
## BMP and Fertilizer Use Efficiency

Yield (t/ha) vs. Production area (Millions Ha)

No apparent yield gain since 1990



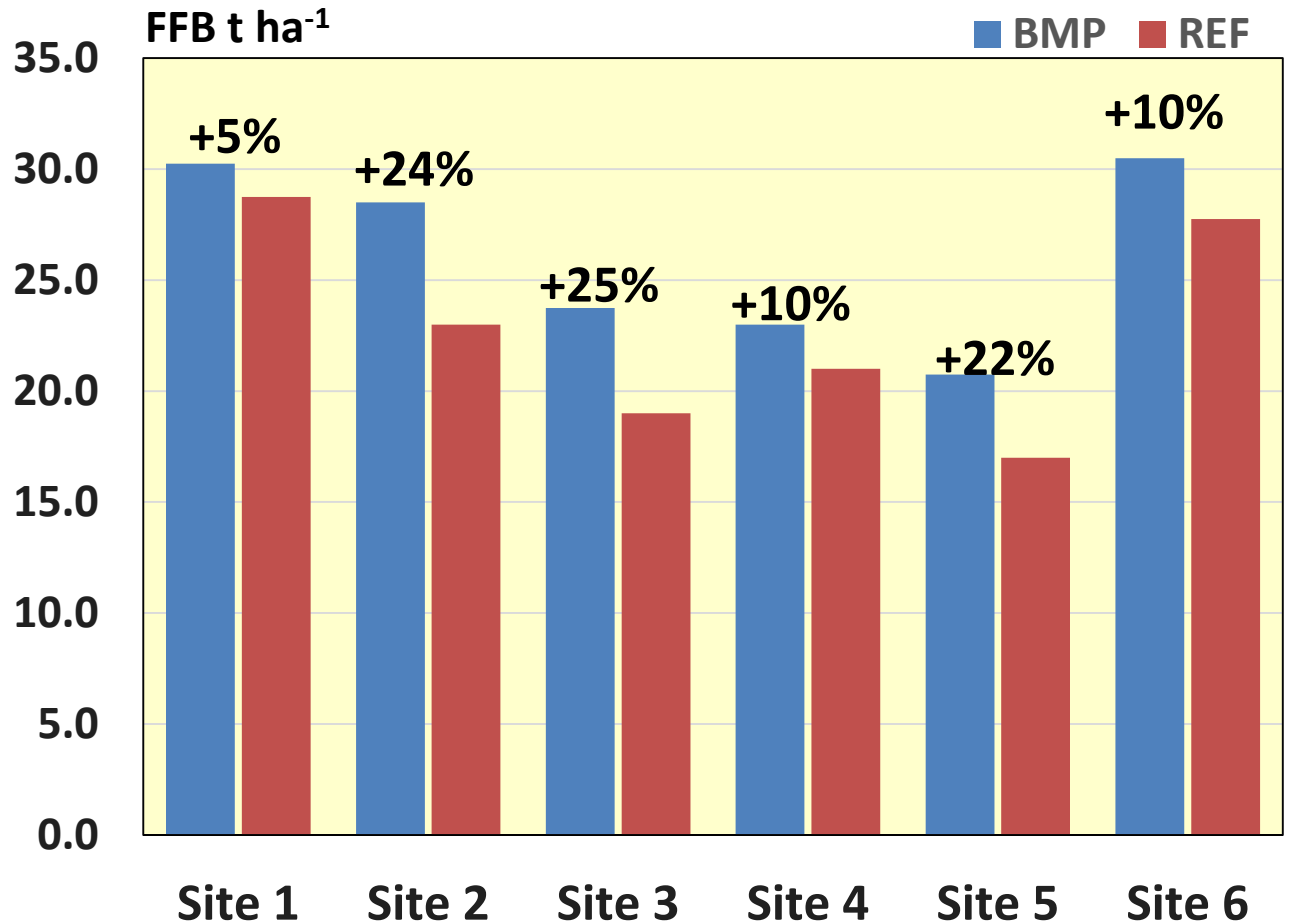
# Sub-optimal BMPs → Yield Gaps



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# Better BMP implementation

→ Better Yield: Indonesia



*Donough et al (2011)*

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# Oil palm needs fertilizers

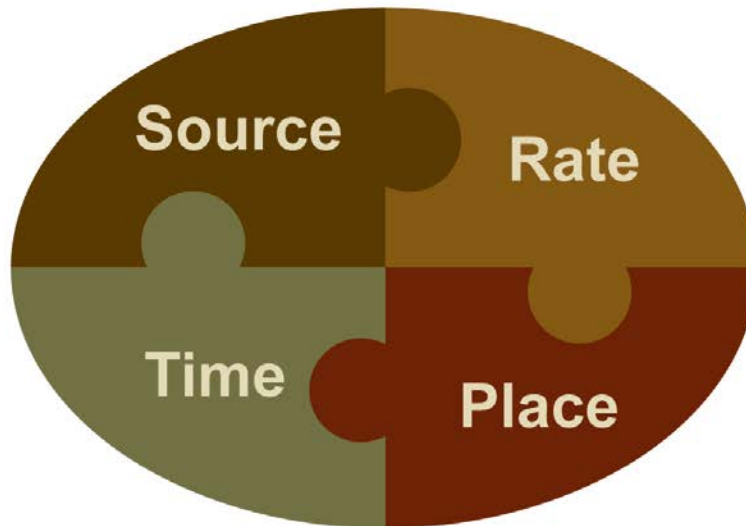
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- High fruit bunch (FFB) yield → *removes nutrients from fields*
- *Nutrients needed for palm growth*
- Low soil fertility → *insufficient to meet crop demand*
- Recycling of nutrients (post-mill)
  - *insufficient for all cropped areas*
  - *insufficient for all crop needs*

## BMP and Fertilizer Use Efficiency

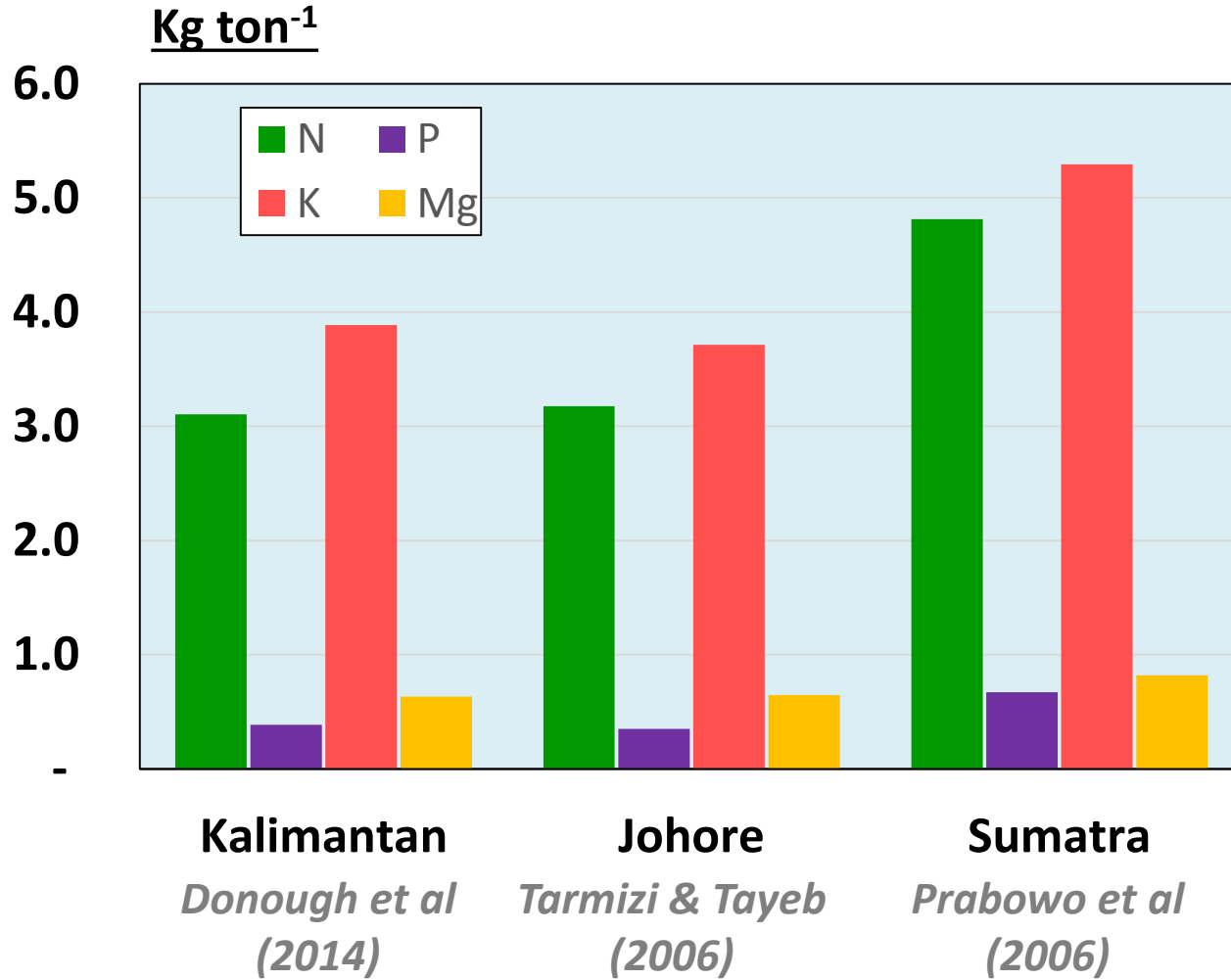
# Nutrient BMPs based on 4R principles

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# Nutrient content in *tenera* FFB



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# Field trials:

## Yield response to fertilizers

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- Malaya: Commercial cultivation since 1911
- Many field trials since post-WW2, many results presented
- Example:

<u>Soil type</u>	<u>FFB Yield (t ha<sup>-1</sup>) <i>Tarmizi et al (1992)</i></u>		
	<u>Control</u>	<u>Maximum</u>	<u>Response</u>
Inceptisol	18 – 34	24 – 36	1 – 9 %
Ultisol	9 – 28	26 – 37	5 – 24 %
Oxisol	12 – 26	28 – 35	2 – 23 %

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# Field trials:

## Yield response to fertilizers

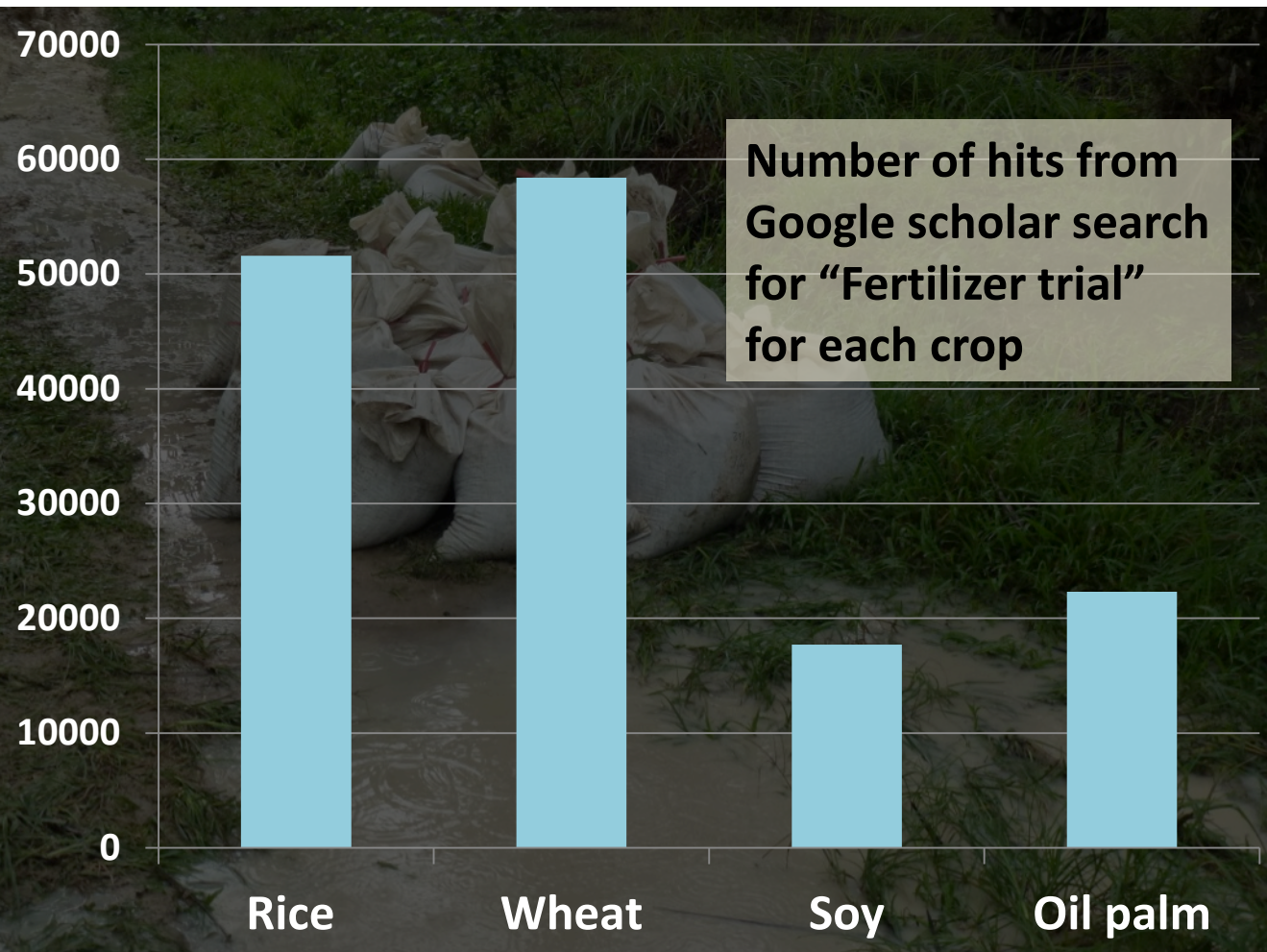
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- Sabah: Commercial cultivation started 1958
- Less field trials, fewer results reported
- Jabatan Pertanian Sabah – Betty Kwan
- Sawit Kinabalu – Boris & Hoong
- FELDA – Foong et al

# BMP and Fertilizer Use Efficiency

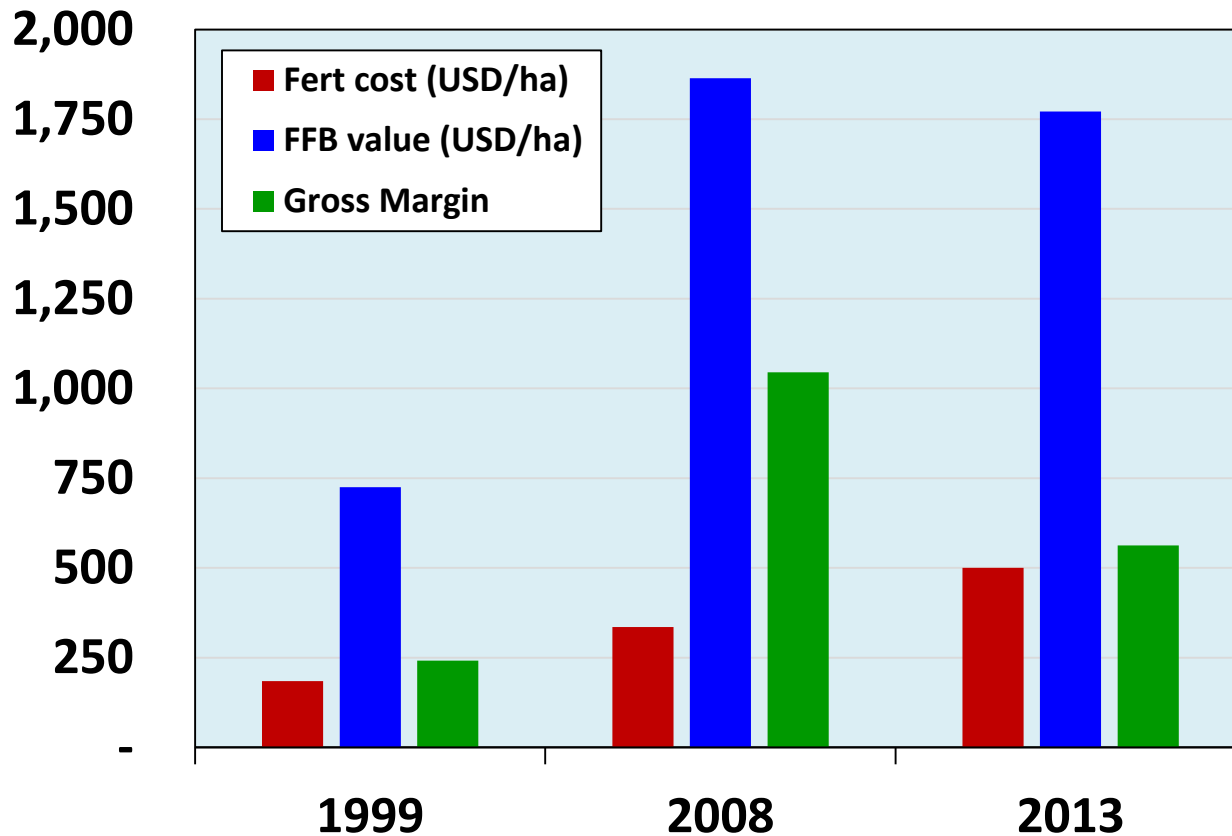
# Weakness in info base

## BMP and Fertilizer Use Efficiency



# Fertilizing margin narrowing

## BMP and Fertilizer Use Efficiency



*Adapted from Mutert (2001)*

# Labour & logistics

## BMP and Fertilizer Use Efficiency



### **Skilled labour in short supply**

- *over 200 million tons of fruit is collected each year by hand*
- *almost all fertilizer applied by hand*



# “New Business Model”

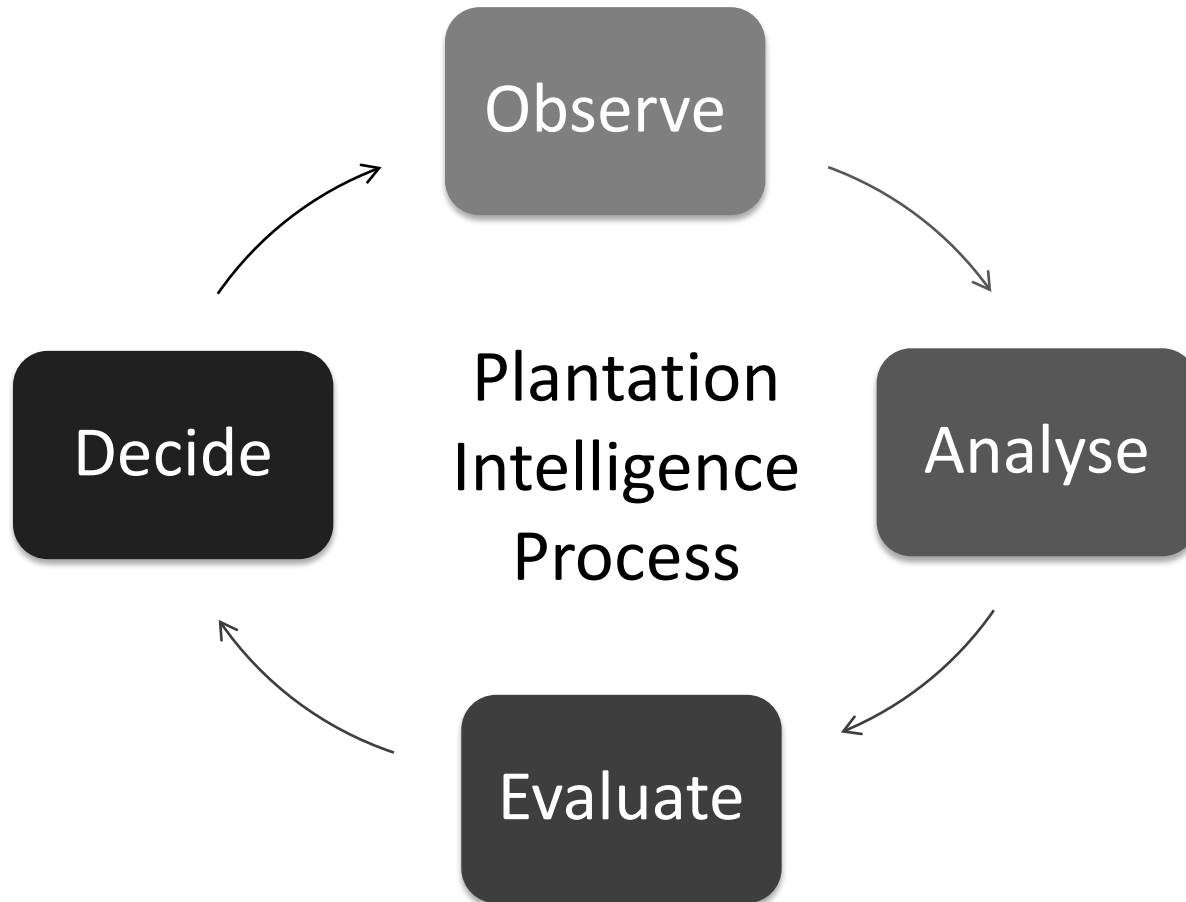
- Learn from commercial data

- Not just trials



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# Plantation Intelligence



*Cook et al (2014)*

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# Fertilizer Use Efficiency (FUE)

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- Kg Yield per Kg Fertilizer applied
- In commercial practice, 'cost' is a key issue
- Use FUE as performance indicator?

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# FUE → a new KPI

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***Apparent FUE*** → Actual Yield (kg)  
per kg fertilizer applied in last 3  
years

***Break-even FUE*** → based on FFB  
price & cost of fertilizer applied

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# Yield Taking & Yield Making BMPs in Mature Oil Palm

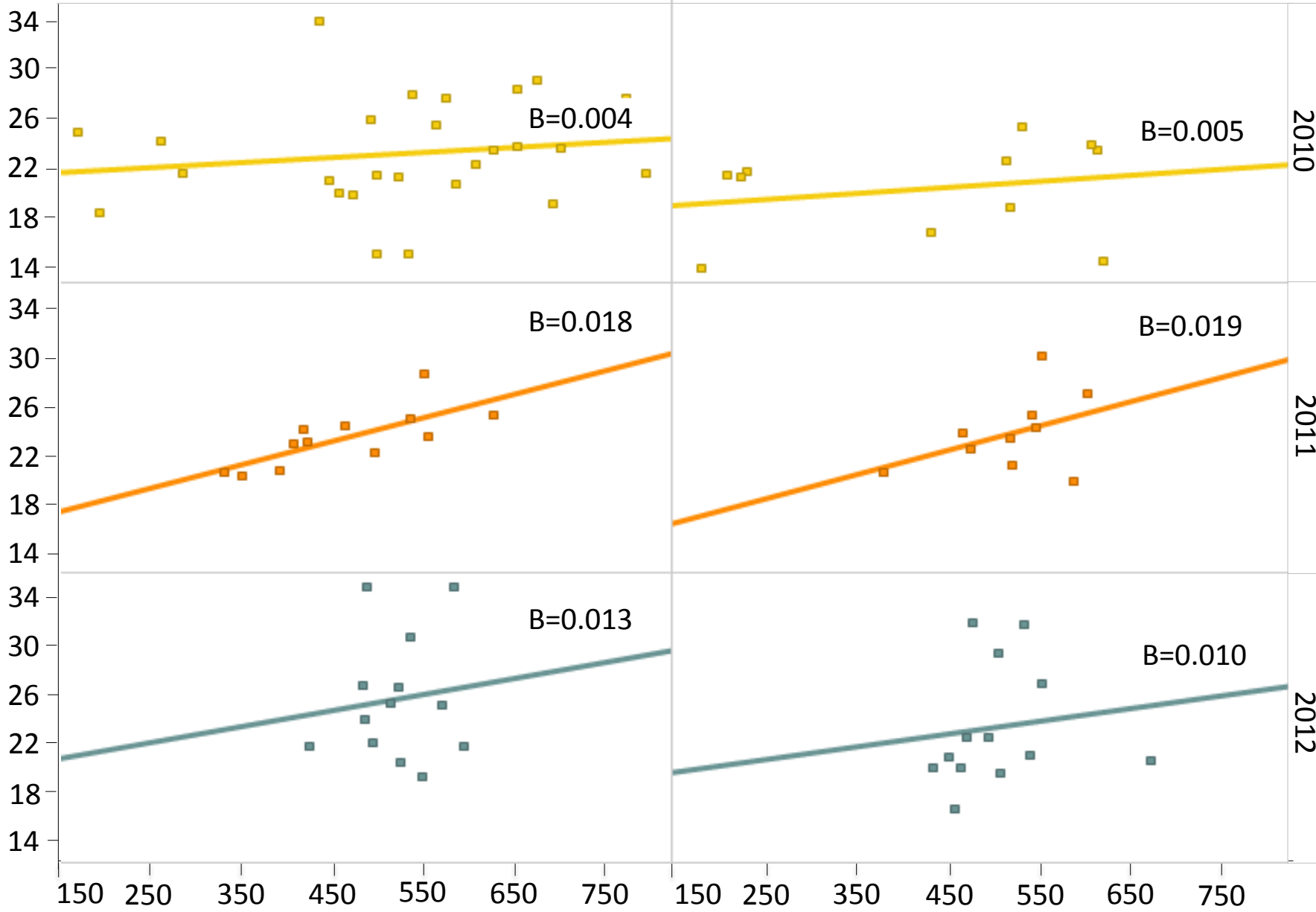
## BMP and Fertilizer Use Efficiency

	Crop recovery	Canopy management	Nutrient management
Yield making			
Yield taking			

**FFB Yield (t ha<sup>-1</sup>)**

**SOIL A**

**SOIL B**



2010

2011

2012

**NPKMg added over this year and previous 2 yrs (kg/ha, weighted 25:50:25)**

# Options from analysis

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- **Focus fertilizers** → responsive soils
- **Reduce yield expectation** in poorer areas
- **Manage labour** → maximize benefits from fertilizer

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# Thanks to Seminar Organizers & Thank You All for Listening



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