# Commercial Farming in Tropical Agriculture

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*International Plant Nutrition Institute*

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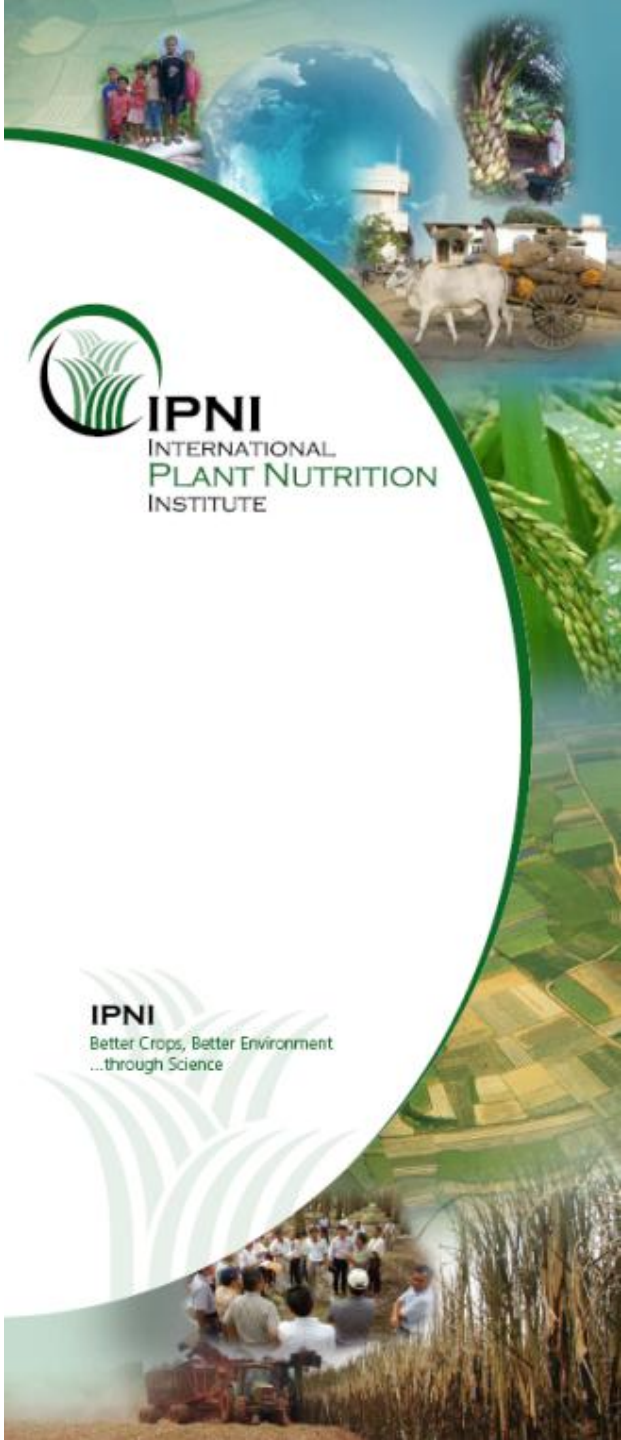


# Commercial farming

- Large-scale production of crops for sale into world markets
  - e.g. wheat, maize, tea, coffee, sugarcane, rubber, banana, oil palm
- Capital intensive

- Crop may be produced on-site or shipped to a processing facility belonging to the farm owners

# Commercial farming

Differs from subsistence farming … main objective is higher profits through:

- economies of scale,
- specialization,
- capital-intensive farming techniques,
- labor-saving technologies,
- maximizing of yield

## Commercial farming drivers:

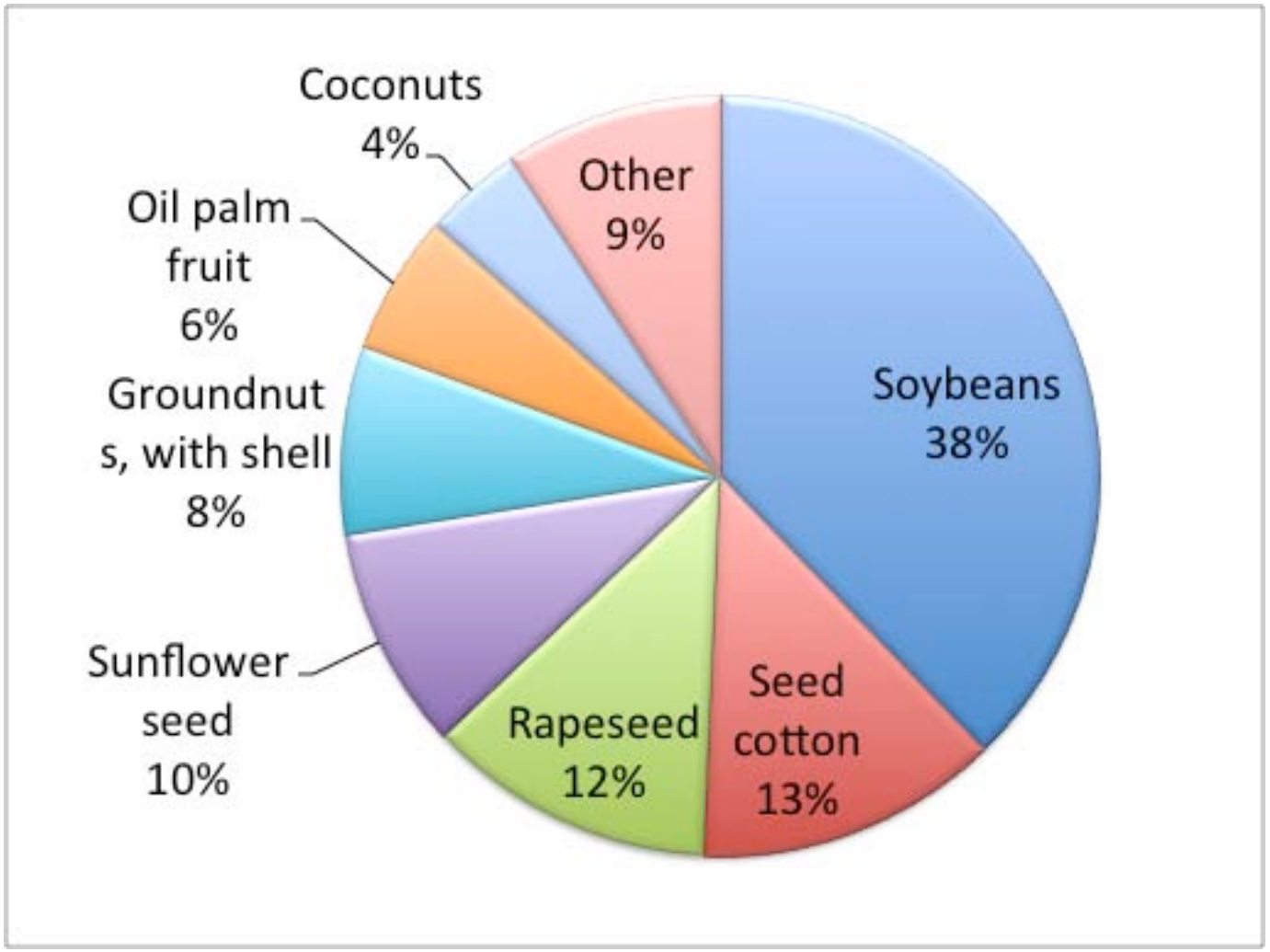
1. Transportation – access to transportation systems to move products to market
2. Climate and soil – determines the type of crop that can be grown
3. Materials –access to raw materials, (e.g. seed, fertilizer, technology)
4. Labor – needs affordable labor supply
5. Market forces – supply and demand impact prices

# Commercial farming

Three types of commercial farming:

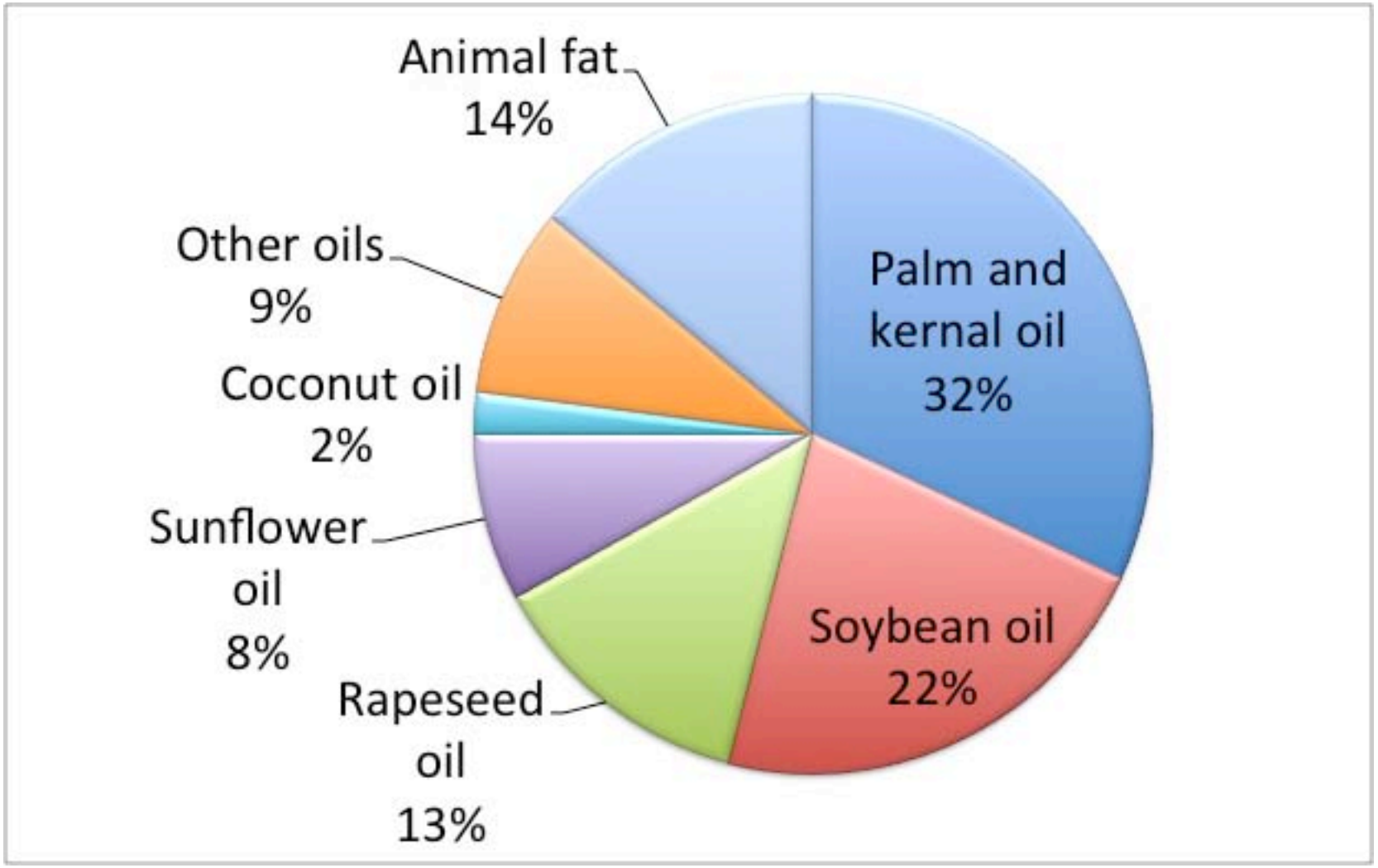
1. Intensive: large amounts of capital or labor applied to smaller land area
2. Extensive: small amounts of capital or labor applied to large areas
3. Plantation agriculture: large farms usually in tropical or sub-tropical countries.

# Oil crops harvested area: 273 M ha, 2011



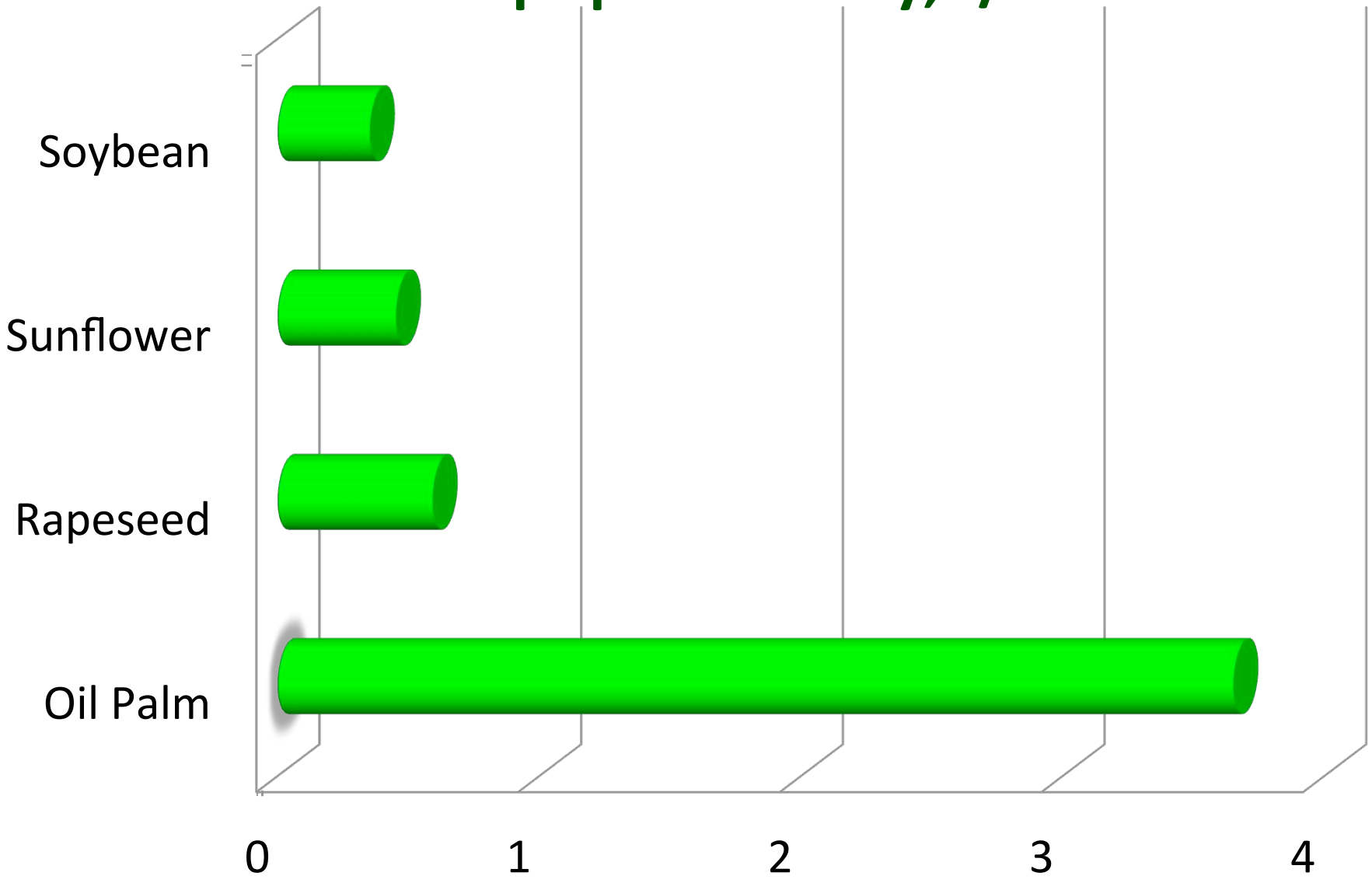

Source: http://faostat.fao.org

# World oils and fats production, 185 Mt



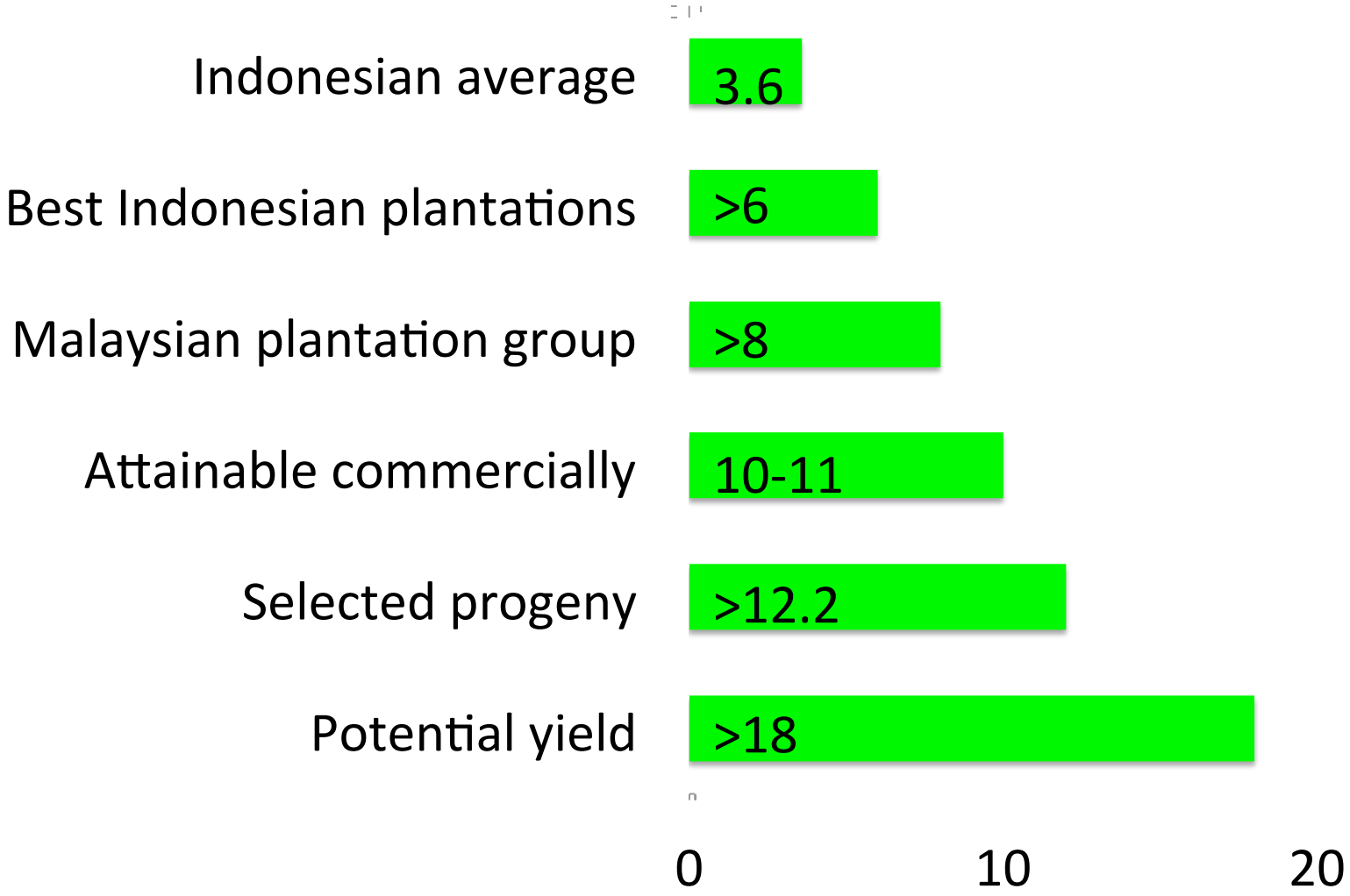

Source: Oil World, 2012

# Oil crops productivity, t/ha



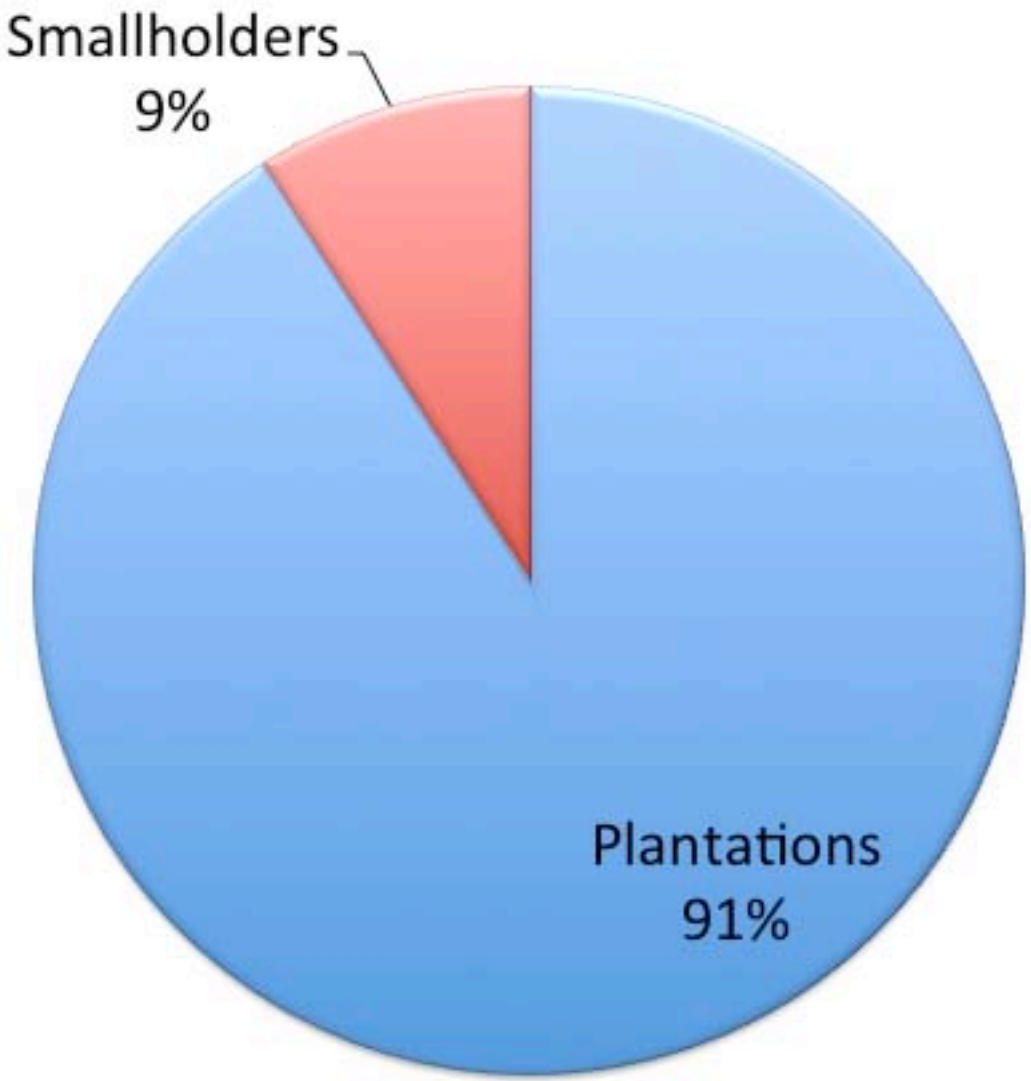

Source: Oil World Annual 2006

# Crude Palm Oil Yield, t/ha/yr




Source: Donough et al., 2010

# Palm Oil Production




**Smallholder area**

Malaysia, 41 %

Indonesia, 44 %

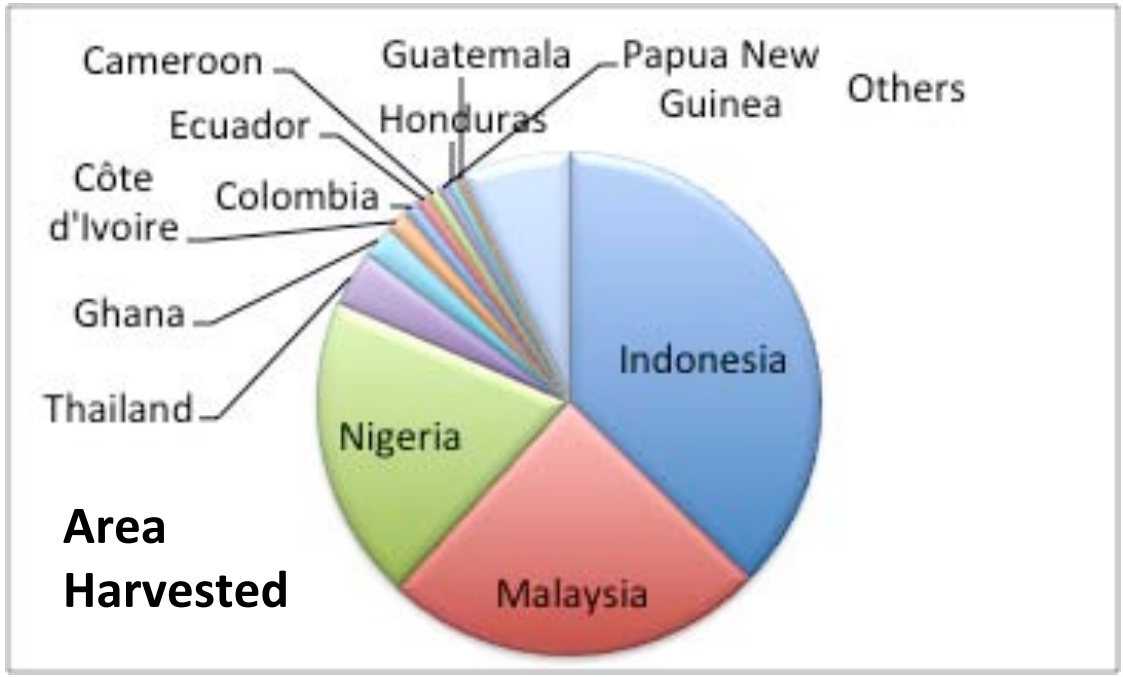
Thailand, 76 %

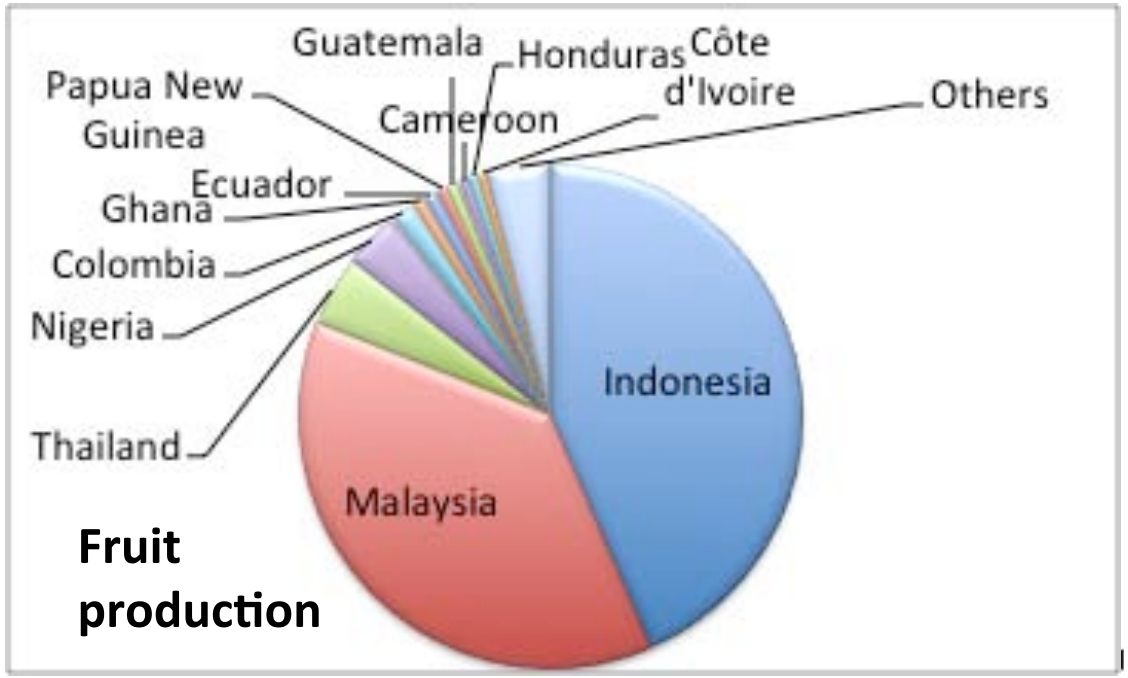
PNG, 42 %

Source: FAO 2007, cited in Koh & Wilcove 2008, Wild Asia 2012

# 2011 Top Oil Palm Producing Countries

- 16.3 M ha harvested in 42 countries
  - 233.8 M t fruit
  - 48.6 M t oil
- 12 countries account for 93% of area harvested and 96% of fruit production



# Average fresh fruit bunch (FFB) yield of top oil palm producing countries, t/ha

| Country | Yield | Country | Yield |
|---|---|---|---|
| Indonesia | 16.7 | Ecuador | 15.4 |
| Malaysia | 21.9 | Papua New Guinea | 14.5 |
| Thailand | 18.0 | Guatemala | 28.0 |
| Nigeria | 2.7 | Cameroon | 12.7 |
| Colombia | 22.9 | Honduras | 14.1 |
| Ghana | 5.6 | Côte d'Ivoire | 6.7 |

# Stages of oil palm production: seedlings and nursery


# Stages of oil palm production: removal of mature trees and replanting

# Stages of oil palm production: harvesting

# Annual nutrient demand (kg/ha) of oil palm at various stages (adapted from Oberthur et al. 2012)

| Age | N | $P_2O_5$ | $K_2O$ |
|---|---|---|---|
| 0-3 | 40 | 14 | 66 |
| 3-9 | 191 - 267 | 74 – 96 | 344 - 465 |
| 10 | 114 | 32 | 180 |
| 9-12 | 116 | 28 | 200 |
| 15 | 162 -192 | 48 - 60 | 300 - 335 |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# Fertilizing oil palm

# Oil palm fertilizer application rates (selected examples of mature palms, kg/ha/yr)

| Soil | N | $P_2O_5$ | $K_2O$ | MgO |
|---|---|---|---|---|
| Paleuquult | 230 | 90 | 310 | 35 |
| Tropofibrist | 160 | 70 | 700 | 10 |
| Distropept | 200 | 130 | 500 | 60 |

- N rates from 1.5 to 8 kg / palm / year of AS or its equivalent
- P rates from 0.5 to 2 kg / palm / year of TSP or its equivalent
- K rates from 1 to 5 kg / palm / year of KCl or its equivalent

Fertilizer recovery efficiencies: N: 19–36%, P: 7–29%, K: 29–70%, Mg: 10–60% (Prabowo et al., 2002)

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# Oil palm best management practices (BMPs)

## Case Study, 2006 – 2012 Indonesia

# BMP Case Study Sites

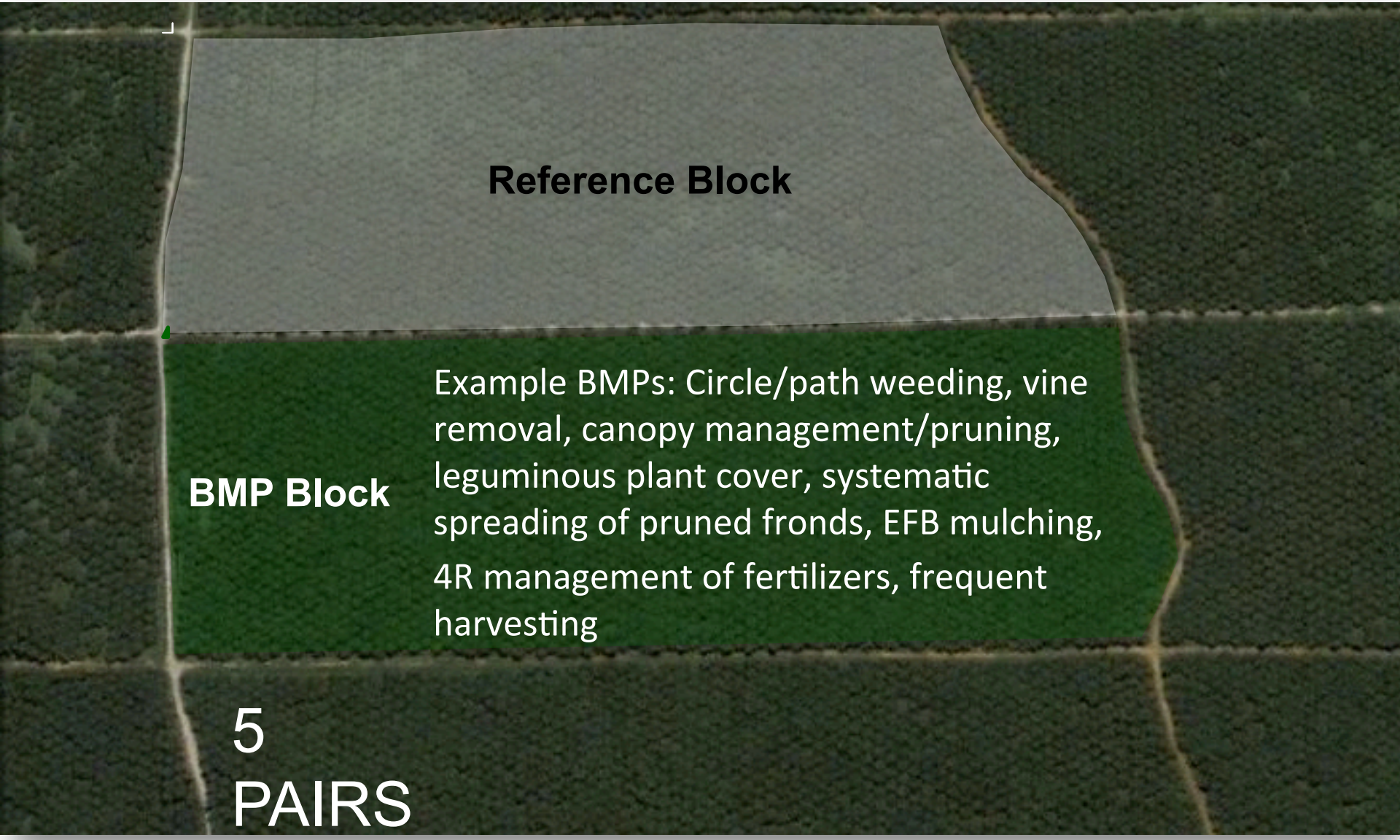
IPNI SEAP BMP Sites

Annual precipitation (mm)

- 800 - 1,500
- 1,500 - 2,000
- 2,000 - 2,500
- 2,500 - 3,000
- 3,000 - 3,500
- 3,500 - 4,000
- 4,000 - 5,200

0 500 km

# Operational Design: Commercial Production



# Nutrient Input into the System, kg/ha over 4 yrs

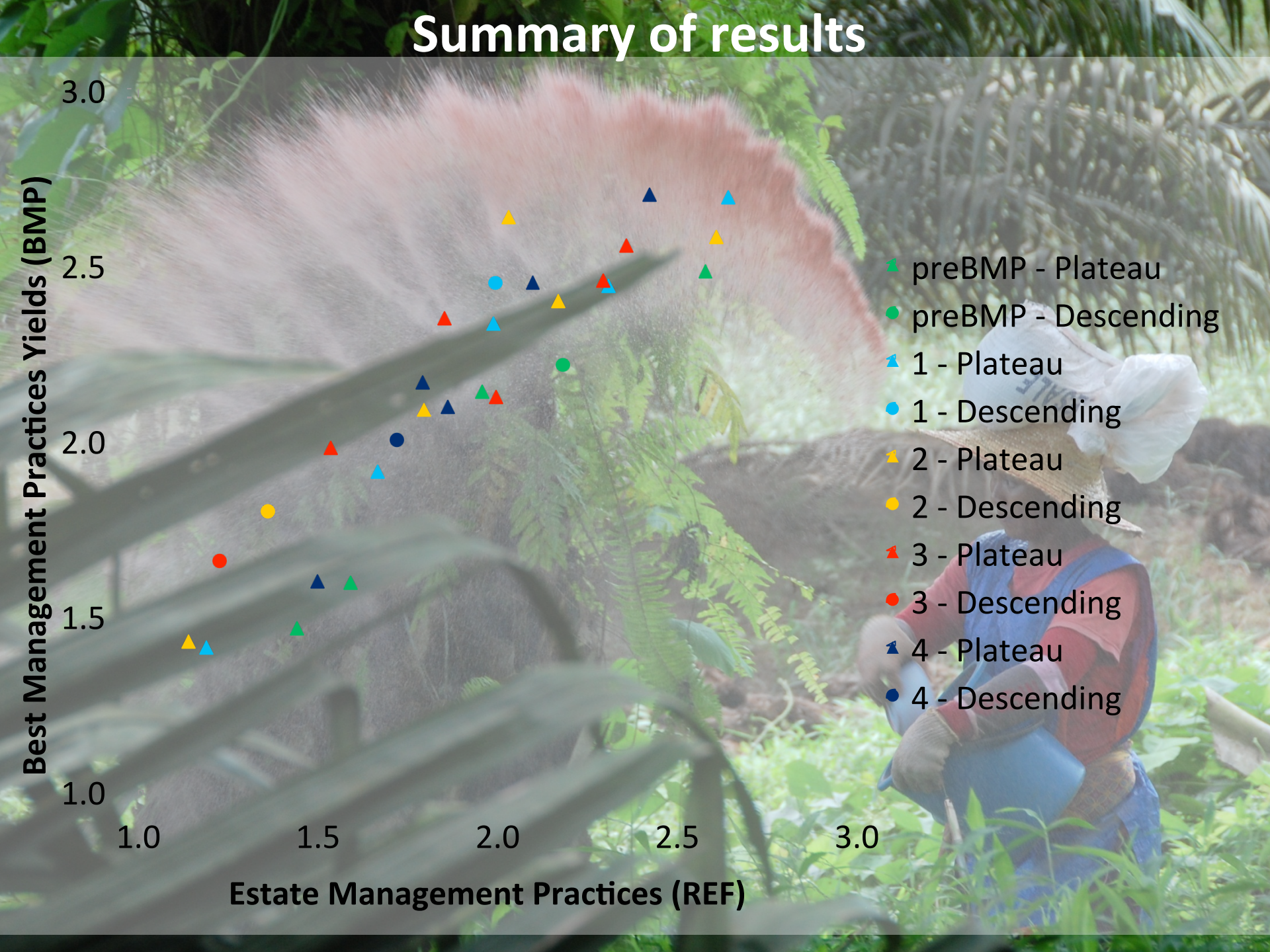
Inorganic nutrient inputs similar in REF and BMP, Nutrient Balance concept:

- N 400-600 kg/ha over 4 years
- P 80-150 kg/ha over 4 years
- K 600-1200 kg/ha over 4 years
- Mg 60-100 kg/ha over 4 years

BMP received EFB 40t/ha

- N 60-400 kg/ha
- P 10-50 kg/ha
- K 200-1150 kg/ha
- Mg 15-90 kg/ha

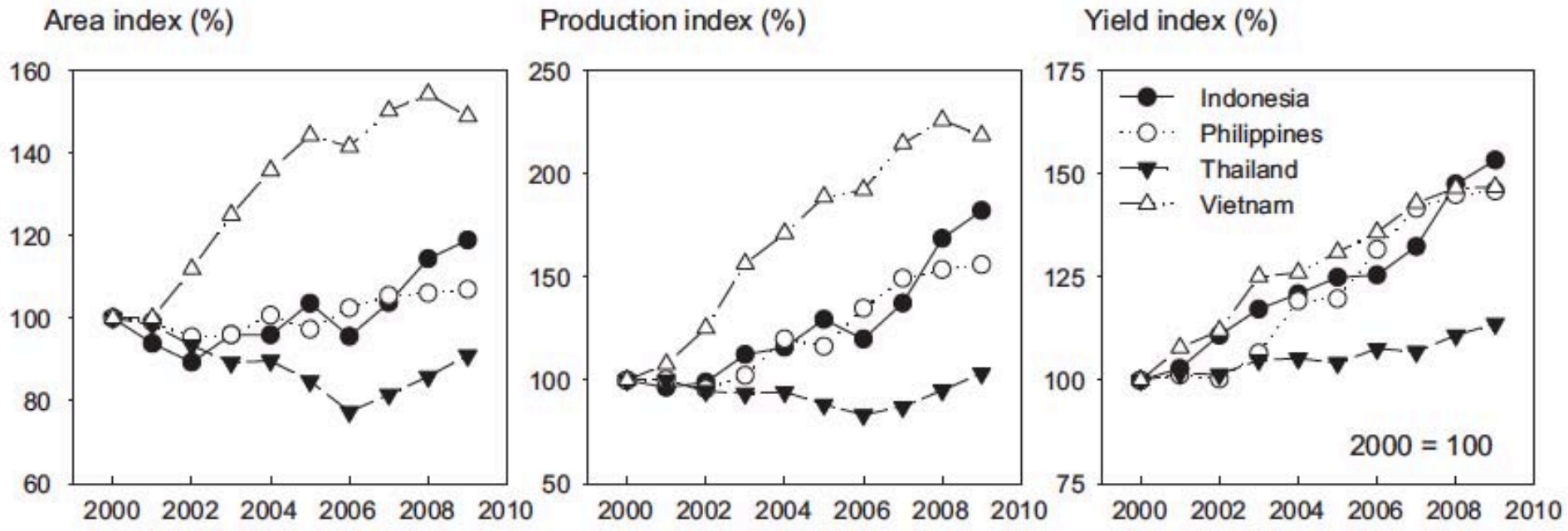
# Summary of results



# Opportunities for extensive commercial farming in the tropics

- After rice, maize in the next most important cereal crop in SE Asia
  - staple in much of Indonesia, the Philippines, and Vietnam

# Growth in maize area, production, and yield in Southeast Asia relative to base year 2000



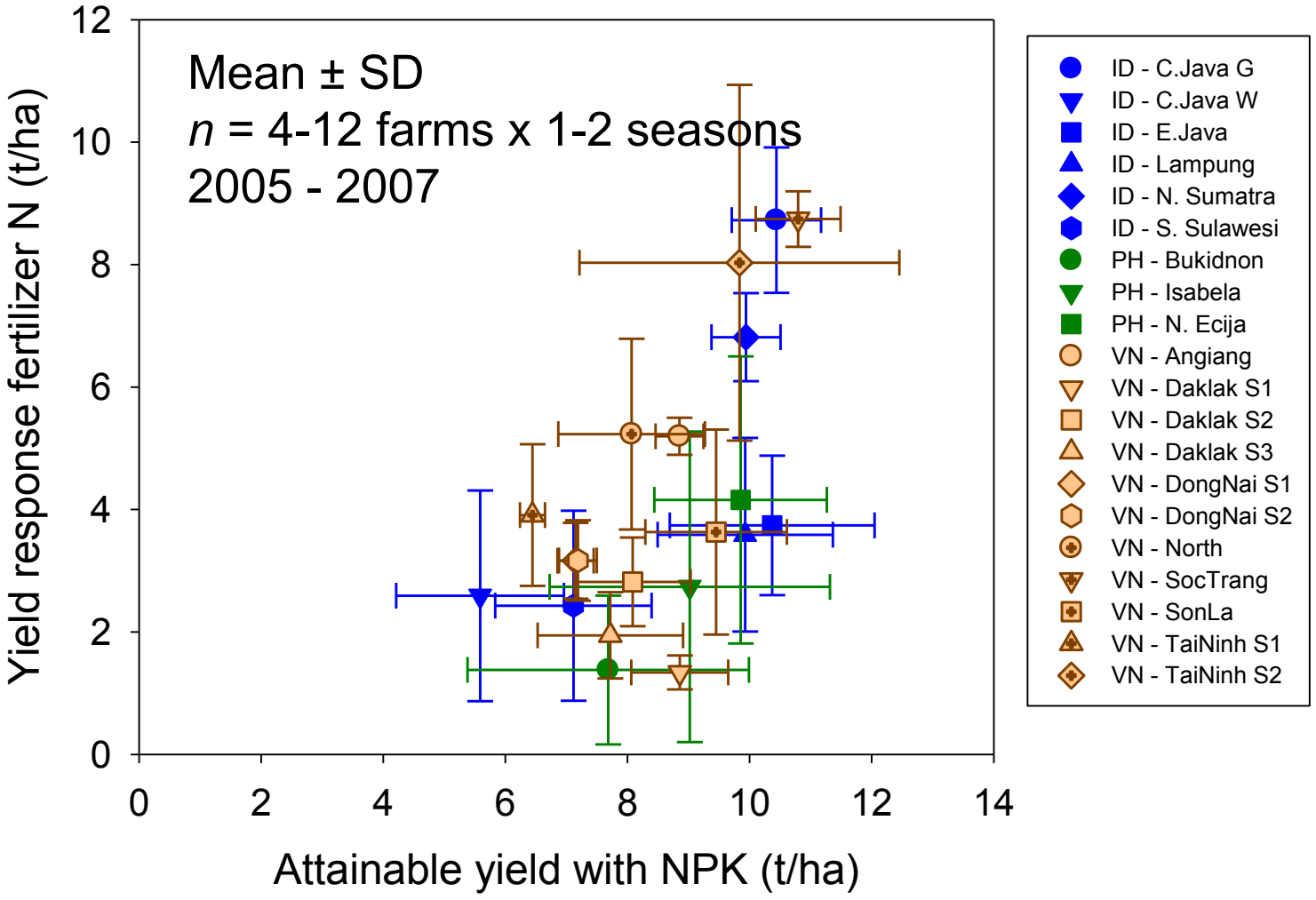

Source: Pasuguin et al., 2012

- Production has grown by at least 50% in the last decade due to improved yields
  - demand in Asia will reach 310 Mt by 2020, from its current 270 Mt … outstrip recent production increases

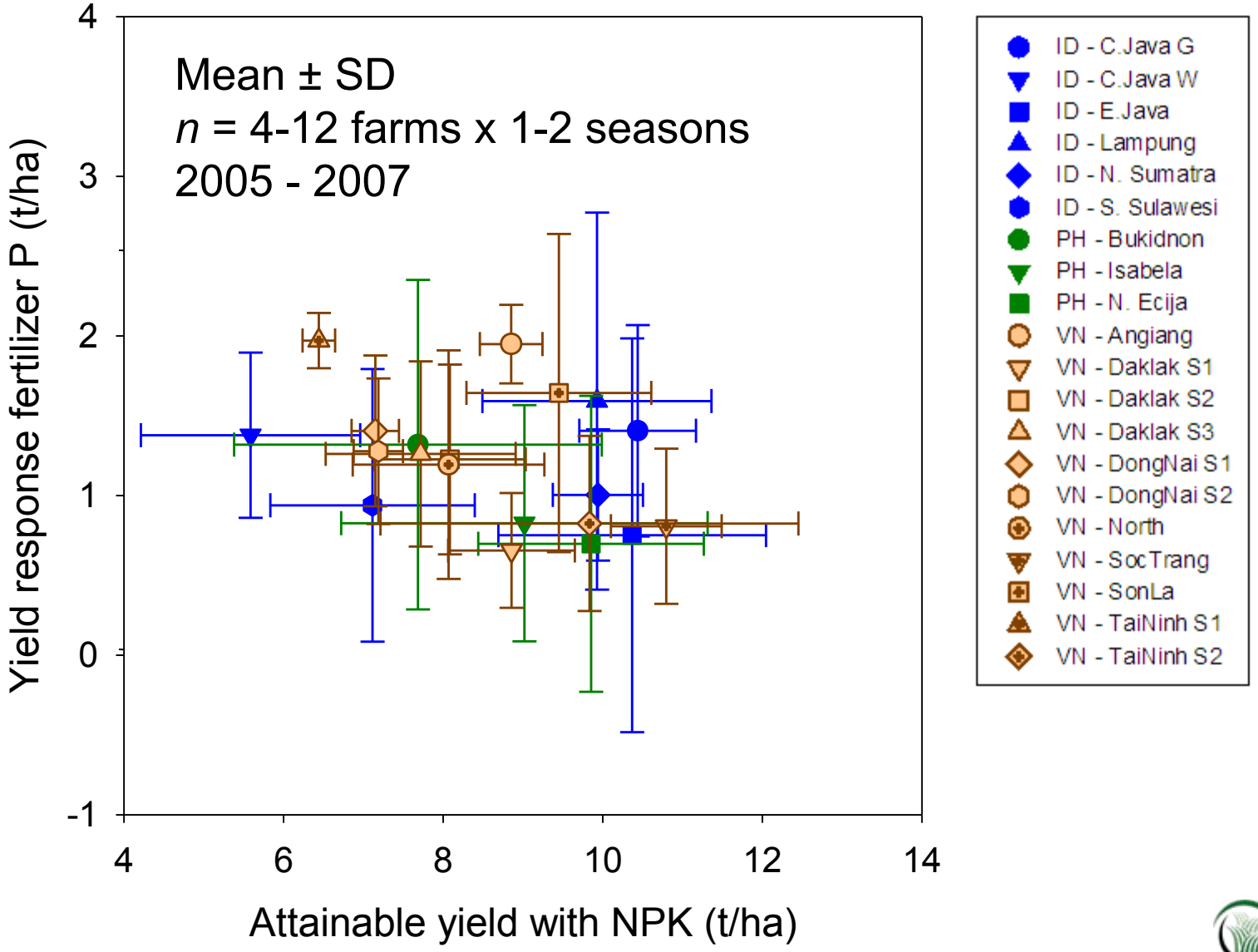
# Opportunities for extensive commercial farming in the tropics


- Maize production is below potential because of suboptimal fertilizer management, especially N, but P and K are also lacking … unbalanced nutrient use

# Tropical maize yield response to fertilizer N in SE Asia (Witt et al., 2009)

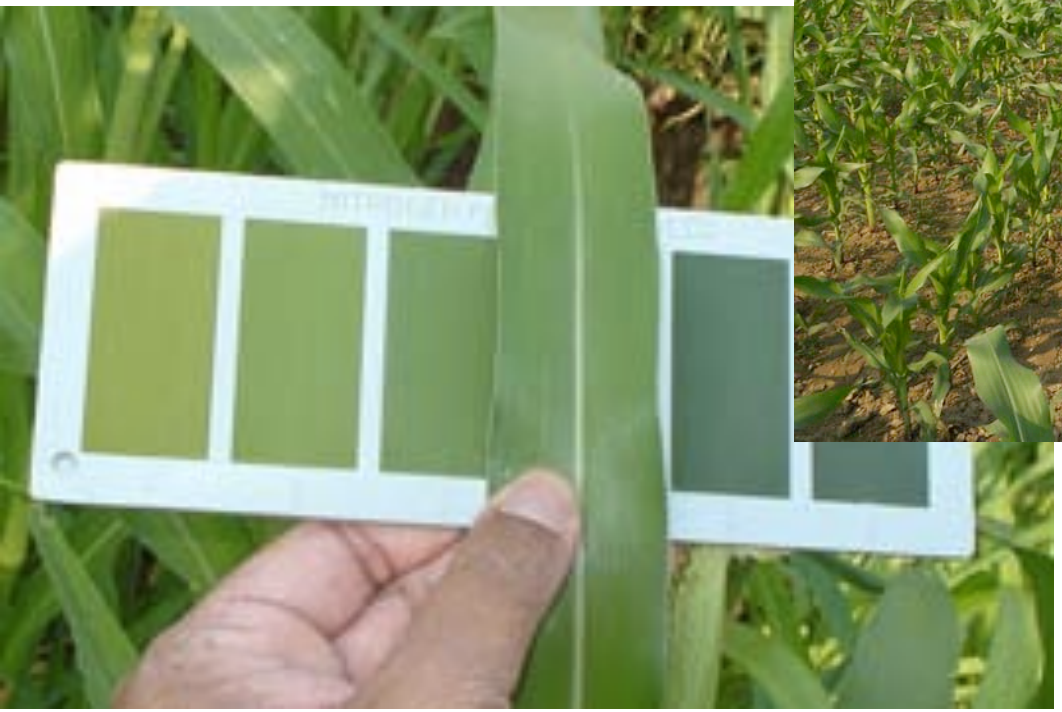


# Tropical maize yield response to fertilizer P in SE Asia (Witt et al., 2009)



# Site-specific nutrient management (SSNM) … strategies for improved nutrient management

- Leaf color charts
- Omission plots
- Decision support tools



# Nutrient Expert

Recommendation:

- tailored to location-specific conditions
- consistent with 4R approach

**Name and/or location:** Here; Site A **Field size:** 1 ha

**Current yield:** 110 cavan (FW) 5.3 t/ha (15.5% MC)

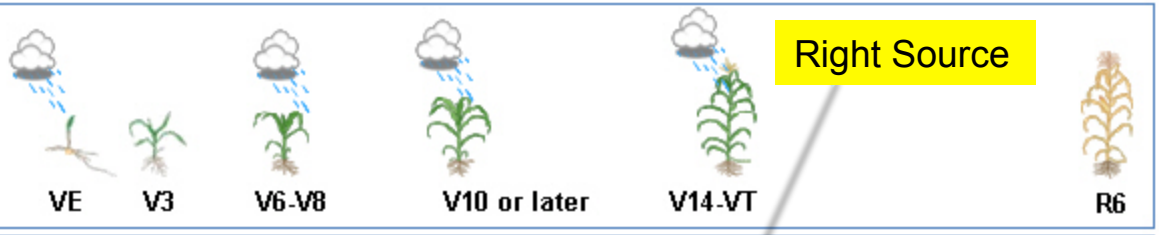
**Growing environment:** Favorable rainfed

## Recommended alternative practice for hybrid maize

**Yield goal:** 165 cavan (FW) 8.0 t/ha (15.5% MC)

**Planting density:** 69,444 plants/ha

**Distance between rows:** 60 cm **Distance between plants:** 24 cm




Right Source

| Growth stage | Days after planting | Soil moisture | Fertilizer sources | Weight of full bag (kg) | Amount (bags) |
|---|---|---|---|---|---|
| Basal | 0 | sufficient | 14-14-14 | 50 | 6.5 |
| | | | Urea | 50 | 0 |
| | | | MOP | 50 | 0.5 |
| V6 | 25 | sufficient | Urea | 50 | 2.5 |
| V10 | 35 | sufficient | Urea | 50 | 2 |

Right Time

**Other sources of nutrients:**

Crop residue (maize): high

Organic fertilizer: 0 t

Fertilizer rates are adjusted to field size

Right Rate

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