BEST MANAGEMENT PRACTICES (BMP) FOR CULTIVATION OF OIL PALM ON TROPICAL PEAT

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& PLWG Members

Definition of Tropical Peat Soils

Tropical peat soils (**Histosols**) are defined as **organic soils** that are characterized by woody fibers and saturated with water for more than 30 cumulative days during normal years (USDA Soil Survey Staff, 2010).

The depth of tropical peat is ≥ **50 cm** and contain **≥ 65% organic matter.**

STATUS OF OIL PALM CULTIVATION ON TROPICAL PEAT

- Estimated **21.00 mil ha** of tropical peatlands in **Indonesia** and **2.43 mil ha** in **Malaysia.**

- MPOB (2009) reported 666,038 ha peatland in Malaysia (Sarawak- 437,174, PM-207,458 , Sabah-21,406) had been cultivated with oil palm, **mostly on logged-over peat forests.**

- In Indonesia (Agus *et al*, 2010) estimated there are (1.71 million ha) of peat forests have been developed for oil palm cultivation, mainly in Sumatra (1.40 million ha) and Kalimantan (0.31 million ha).


AN EXAMPLE OF LOGGED-OVER PEAT FOREST


LOGGING BY LOCAL PEOPLE

Cash crop cultivation by slash and burn method

Degraded peatland over-grown with lallang

An Acacia plantation on peat

EXAMPLE OF A GOOD OIL PALM PLANTATION ON PEAT
(Water level at 50-70 cm from peat surface)

Yield Performance on Peat

- The **actual FFB yields** achieved by prime age oil palm on developed peatland ranged from about **30 to less than 15 mt/ha/annum.**

- **It is therefore important to develop guidelines on Best Management Practices** (BMP) for improving cultivation of oil palm on tropical peat.

What are best management practices on peat ?

- Give **best economic yield** with **minimum GHG emissions.**
- **To be effective, good implementation, monitoring, reporting and documentation** are essential.
- **BMP guidelines** applicable for **existing** large plantations and small-holders (defined as **< 25 ha** in Indonesia).

Preparation of the BMP Manual

- In response to the 2009 RSPO GA decision, the Peatland Working Group (PLWG) was set up in April 2010.
- It held six meetings, 2 public forums in Sibu and Pekan Baru and several field visits in Sarawak, P. Malaysia and Sumatra.
- The PLWG collated experiences from RSPO members and non-member plantation companies.
- Drafts were circulated for comments through a consultative process to a range of stakeholders.
- The BMP Manual had gone through 9 revisions to ensure balanced and practical views.

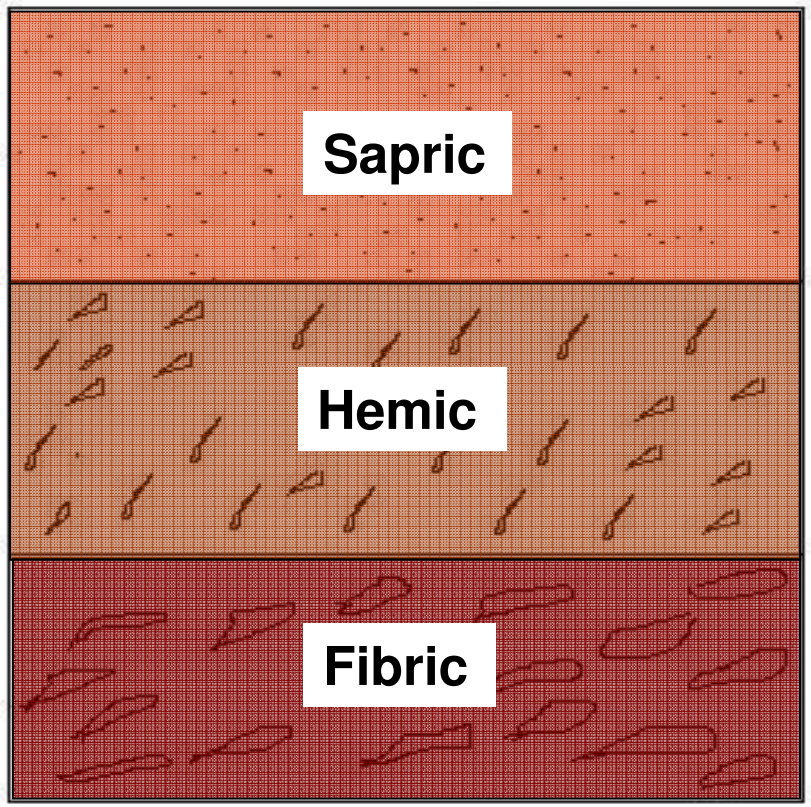
Layout of BMP Manual

- **8 chapters**
  - Introduction.
  - Definition, peat depth and characteristics of tropical peat.
  - BMP on oil palm cultivation (Water and Fertilizer management, etc).
  - BMP on operational issues (Enhancing yield, transport systems, training).
  - BMP on environmental & social issues (Fire prevention, GHG reduction).
  - BMP on R&D, Monitoring, Reporting & Documentation).
  - Smallholders on peatland.
  - Summary of key points.

- **8 annexes** (Glossary, Resolution adopted at the 2009 RSPO GA, Peat distribution in SE Asia, Potential impacts, Relevent RSPO P&C and Indonesia & Malaysia regulations pertaining to cultivation of oil palm on peatland and Fire Prevention & Control).

- **12 case studies** (Measurement of peat subsidence, Fire control, Water Management, Water Transport System, etc).

STAGES OF PEAT DECOMPOSITION

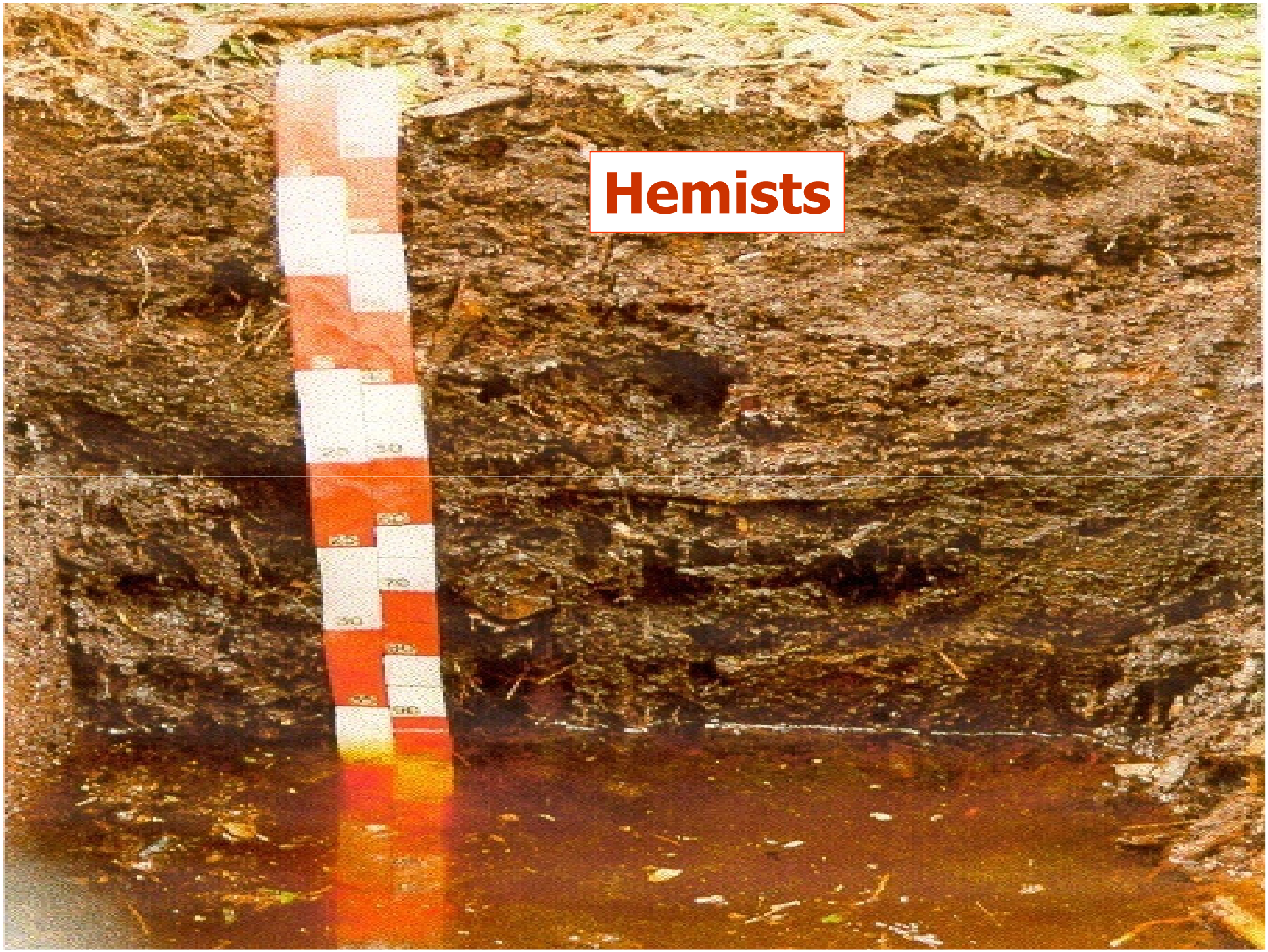


< 33 % woody fibre
Most fertile

33-66 % woody fibre
Intermediate fertility

> 66 % woody fibre
Least fertile


Saprists from mixed forest peat in Riau with yield potential of 25-30 mt FFB/ha/year.


Hemists


Fibrists
'98 12 19


FFB yield < 10 mt/ha/year on woody fibrists

Generalized chemical properties of surface peat (0-50cm)

Chemical properties	Lim, 2006 (Riau, Indonesia)	Melling *et al*, 2000 (Sarawak, Malaysia)
pH	3.6	3.7
Organic C (%)	41.1	45.4
Total N (%)	1.56	1.69
C/N ratio	26.3	26.9
Exch.Ca (cmol/kg)	6.68	0.76
Exch.Mg (cmol/kg)	9.55	1.01
Exch.K (cmol/kg)	0.61	0.19
CEC (cmol/kg)	70.8	41.4
Extr P (mg/kg)	120.0	21.4
Total Cu (mg/kg)	4.1	1.4
Total Zn (mg/kg)	28.0	17.1
Total B (mg/kg)	5.0	1.1
Total Al (mg/kg)	1.35	
Total Fe (mg/kg)	108.8	67.7

Physical properties of peat

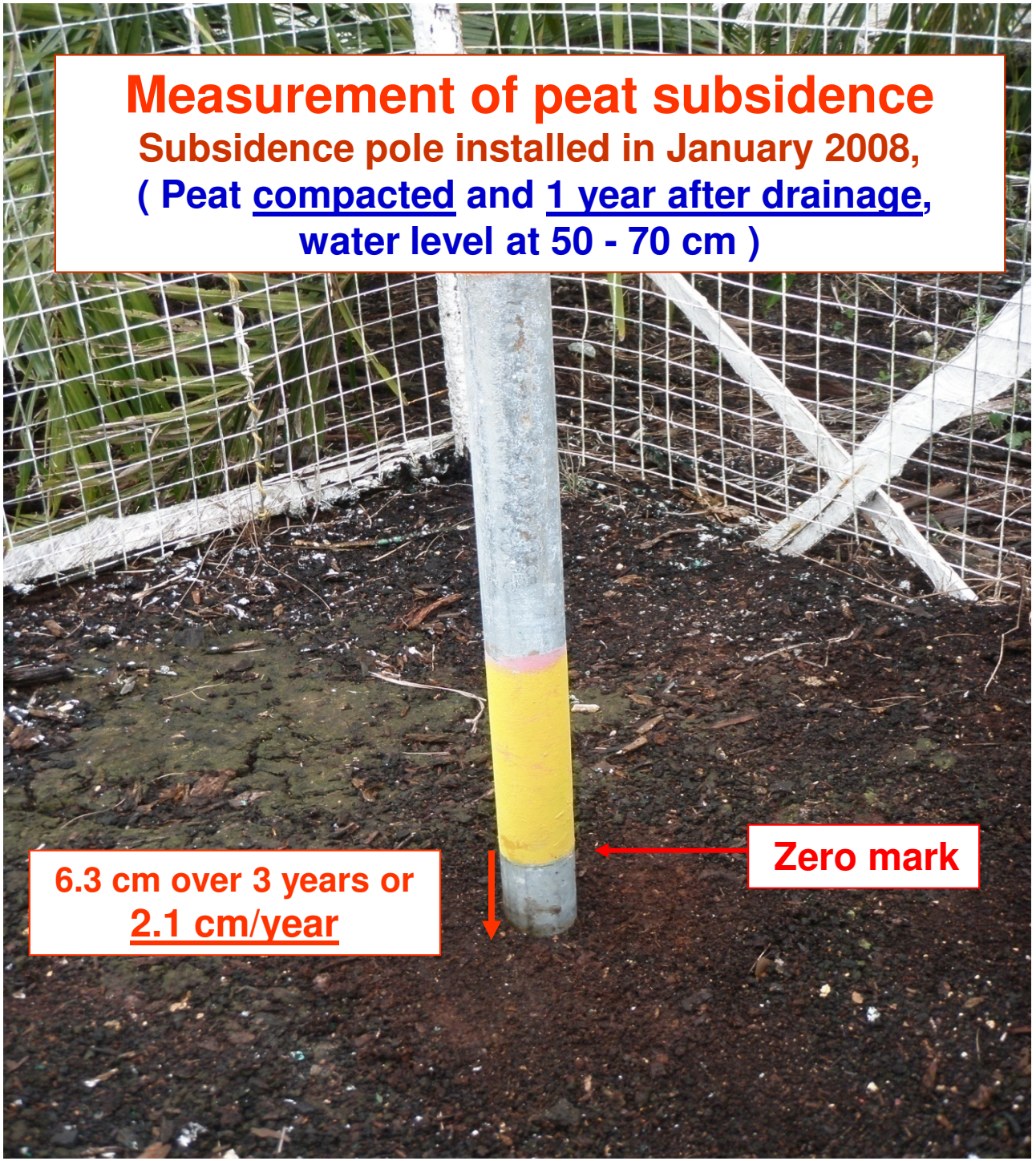
Low bulk density of ± 0.10 g/cm^3 and high total porosity (± 90 %) result in high nutrient leaching in peat.

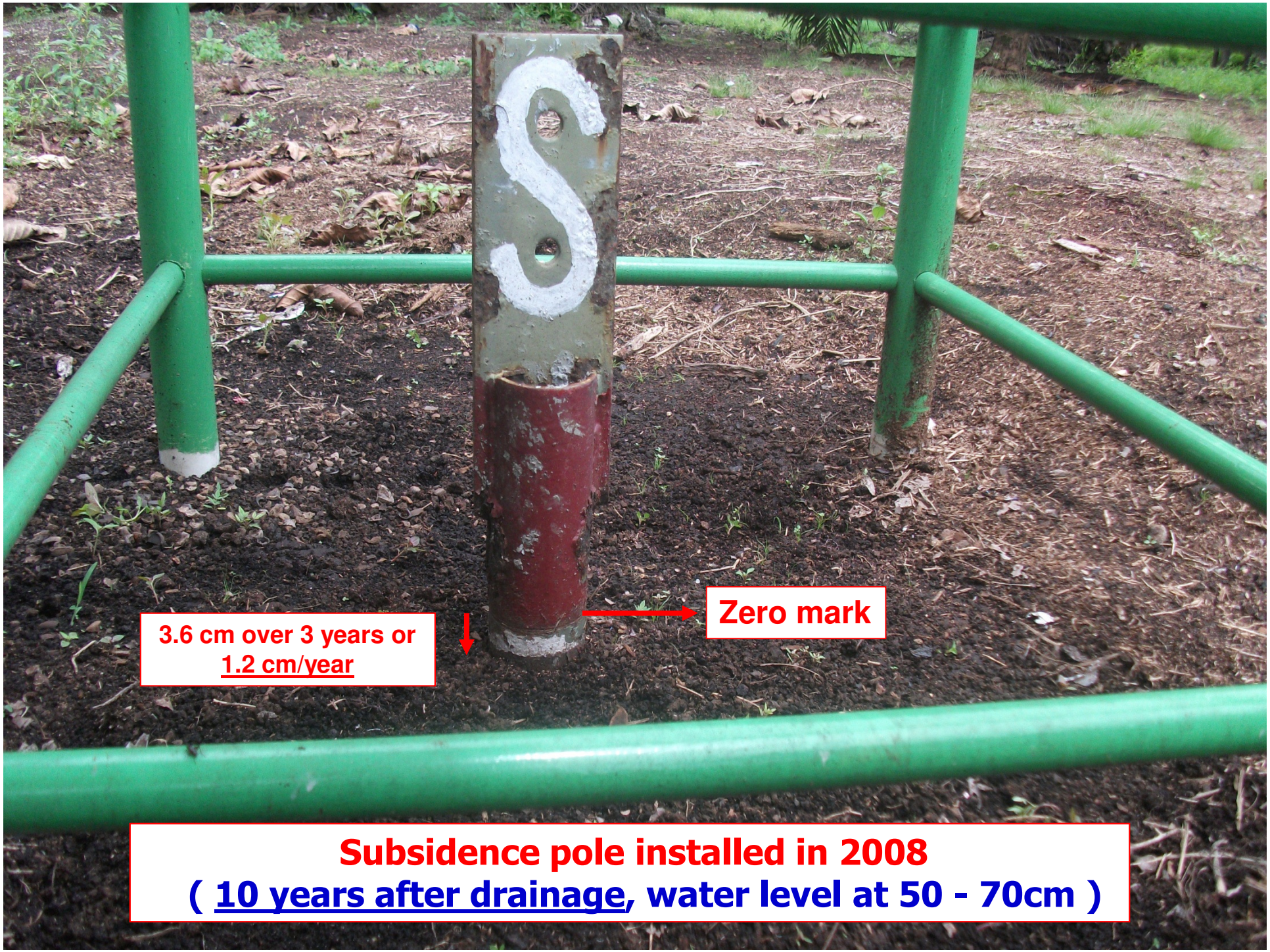
Upon drainage peat subsidence sets in.

Management of peat subsidence

- **Subsidence** is a natural process of settling, oxidation and shrinkage of the peat organic materials upon drainage.

- Palm leaning which adversely affect oil palm yield is caused mainly by peat subsidence.


Measurement of peat subsidence
Subsidence pole installed in January 2008,
(Peat compacted and 1 year after drainage,
water level at 50 - 70 cm)
6.3 cm over 3 years or
2.1 cm/year
Zero mark



Subsidence pole installed in 2008
(10 years after drainage, water level at 50 - 70cm)

How to minimize peat subsidence and GHG emissions ?

- **Avoid** over-drainage and maintain a ground cover of soft vegetation esp. ferns and moss on the interrows.

- Maintain water level at the rooting depth of oil palm ie. 50-70 cm from peat surface by an effective **water management system.**

- During replanting, soil compaction and deep planting is important to minimize palm leaning.

COMPACTION is important to reduce palm leaning and improve field access and reduce CO_2 emission.

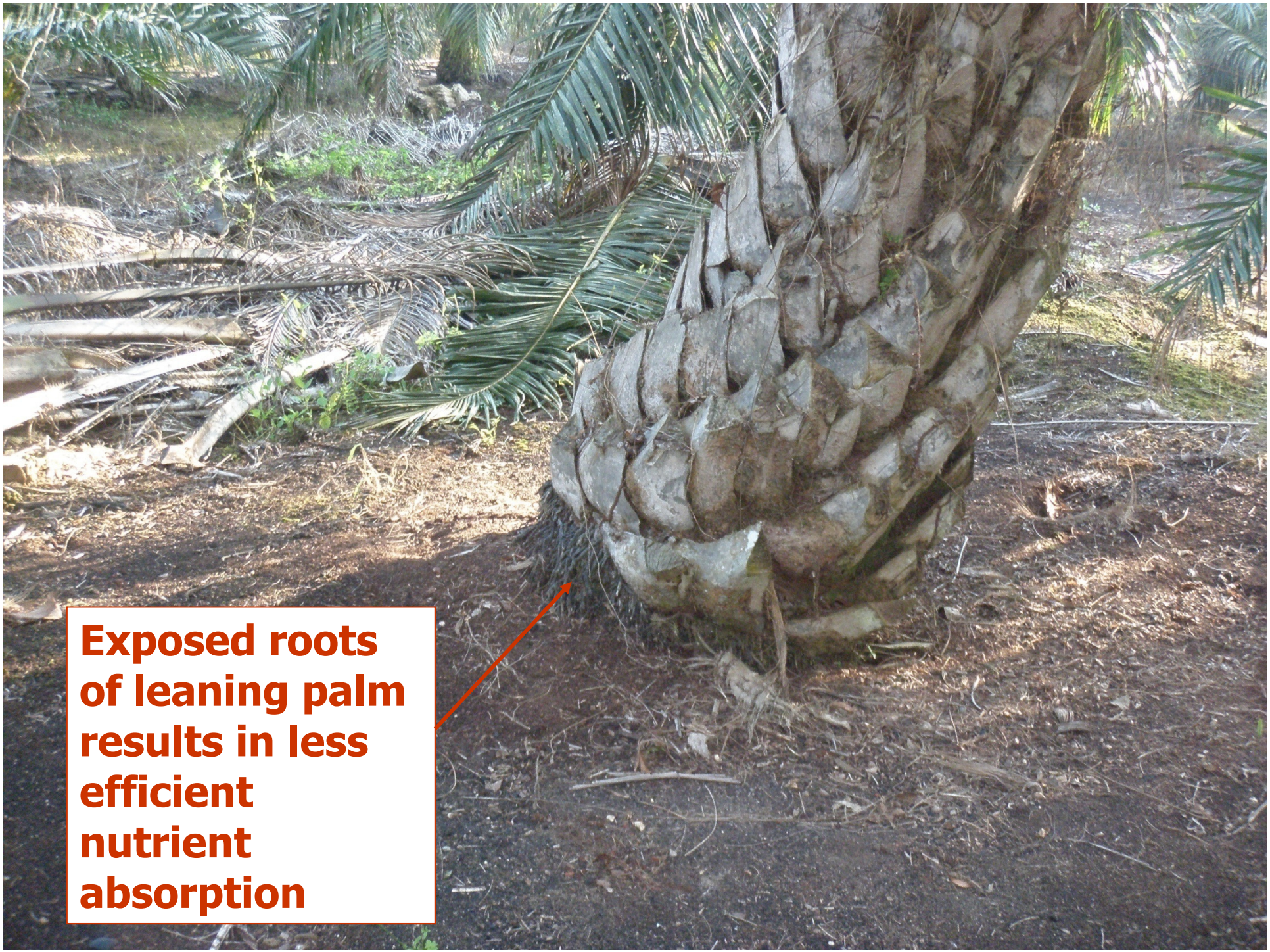
- For effective compaction, lower water table to ± 80 cm from the peat surface.


15 cm from solid peat surface
Hole-in-hole planting (Deep planting)

To minimize peat subsidence and GHG emission, maintain a natural vegetative cover (lower temperature) and keep water level at 50-70 cm from peat surface.


With soil compaction, deep planting, good water management
and maintaining adequate soft vegetation / moss
palm leaning is minimal.


Area with no compaction and with shallow planting, result in haphazard leaning of palms.


Exposed roots of leaning palm results in less efficient nutrient absorption


Soil mounding of exposed roots


New root formation 6 months after mounding
improves palm anchorage and nutrient absorption.


Fallen palm on peat


Rehabilitation of fallen palm
Prune some obstructing fronds
Mound exposed roots


2 years after
soil mounding

Good Water Management is the key to high peat productivity

WATER MANAGEMENT PRACTICES

- Site specific, influenced by topography and **local rainfall condition.**

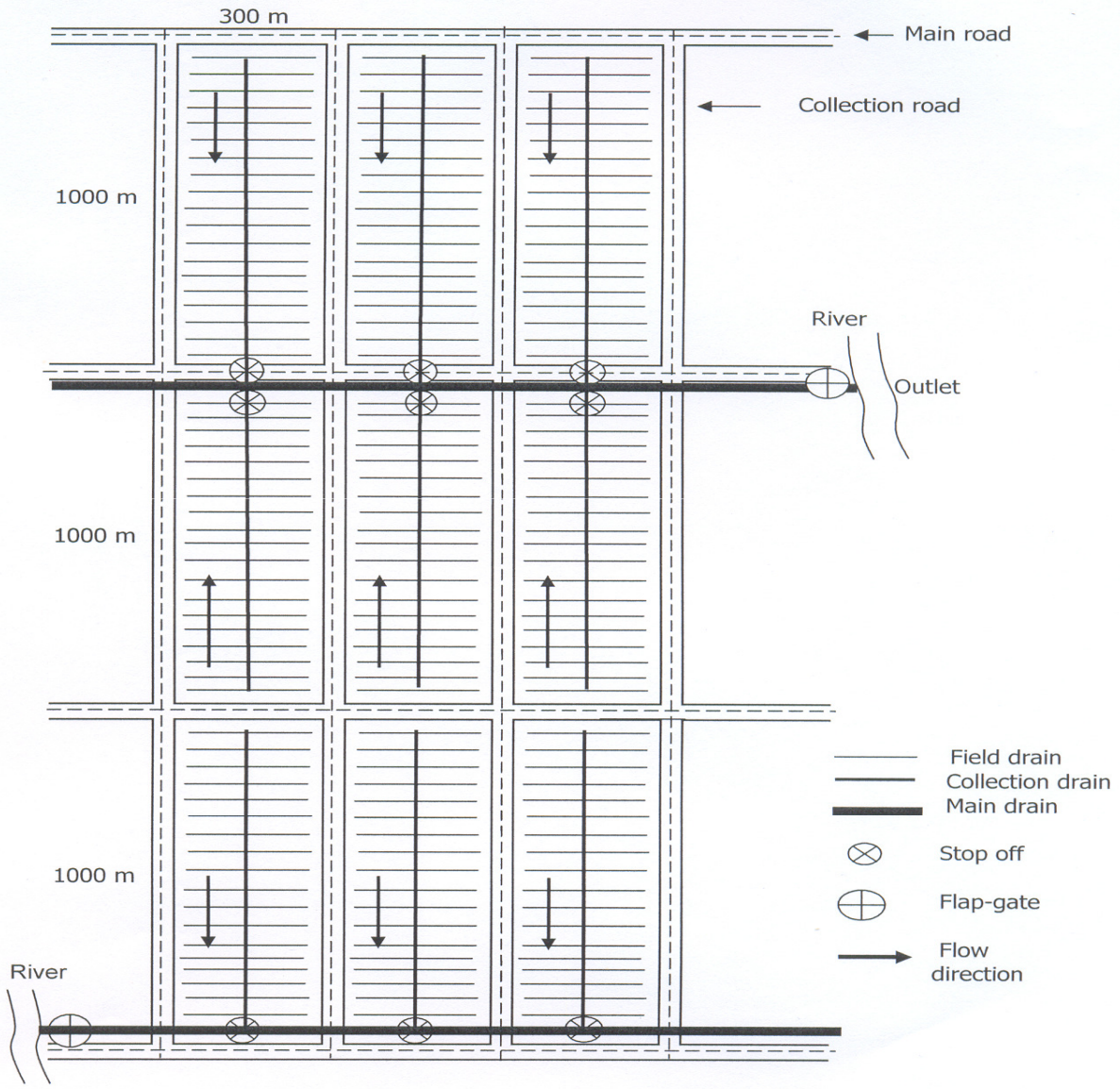
- **Good water management is the prerequisite for the implementation of other BMPs.**

- Maintain water at 50-70 cm from peat surface .

  Avoid flooding and over-drainage by

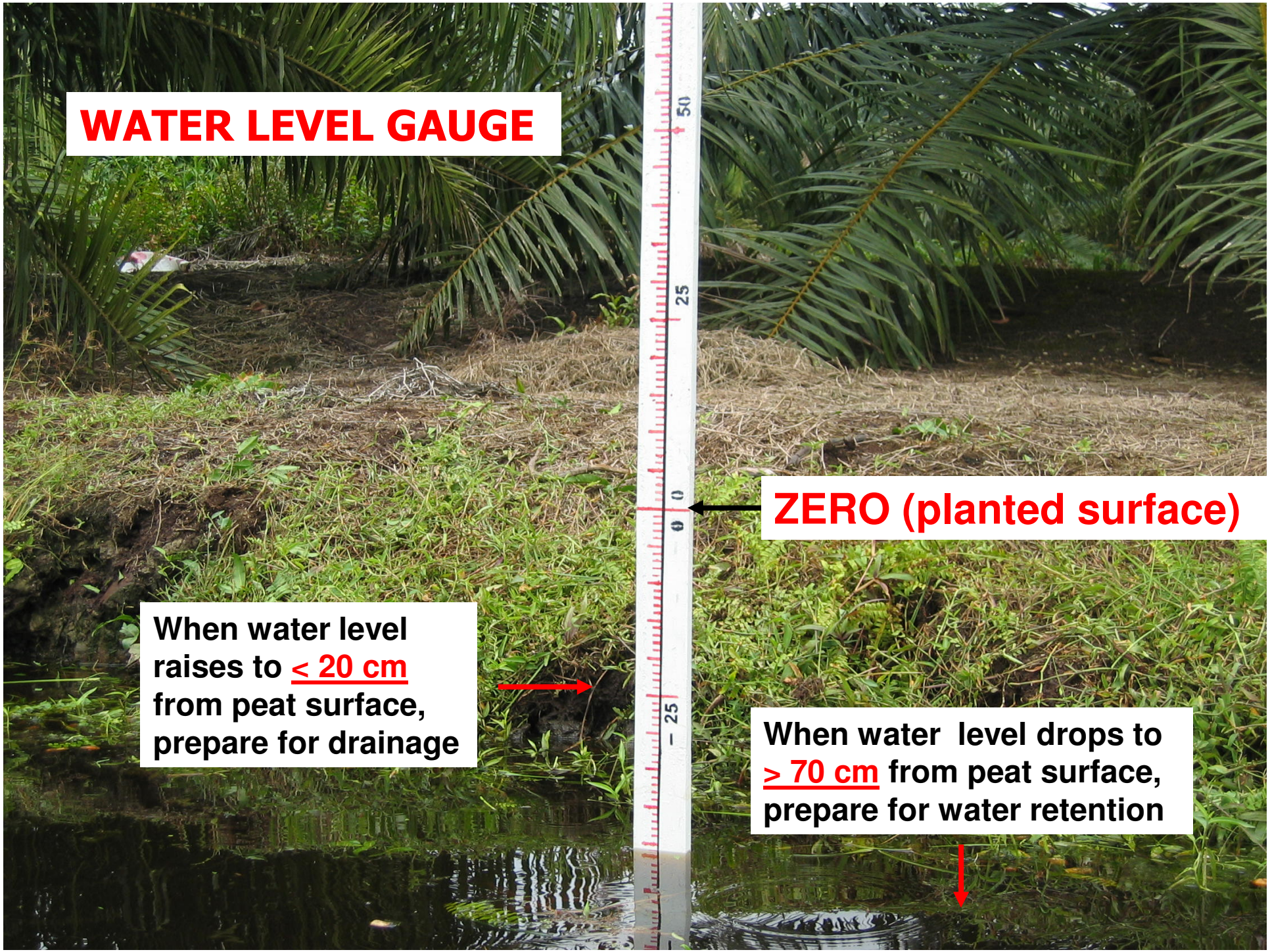
  a **controlled drainage system.**

EXAMPLE OF A CONTROLLED DRAINAGE SYSTEM



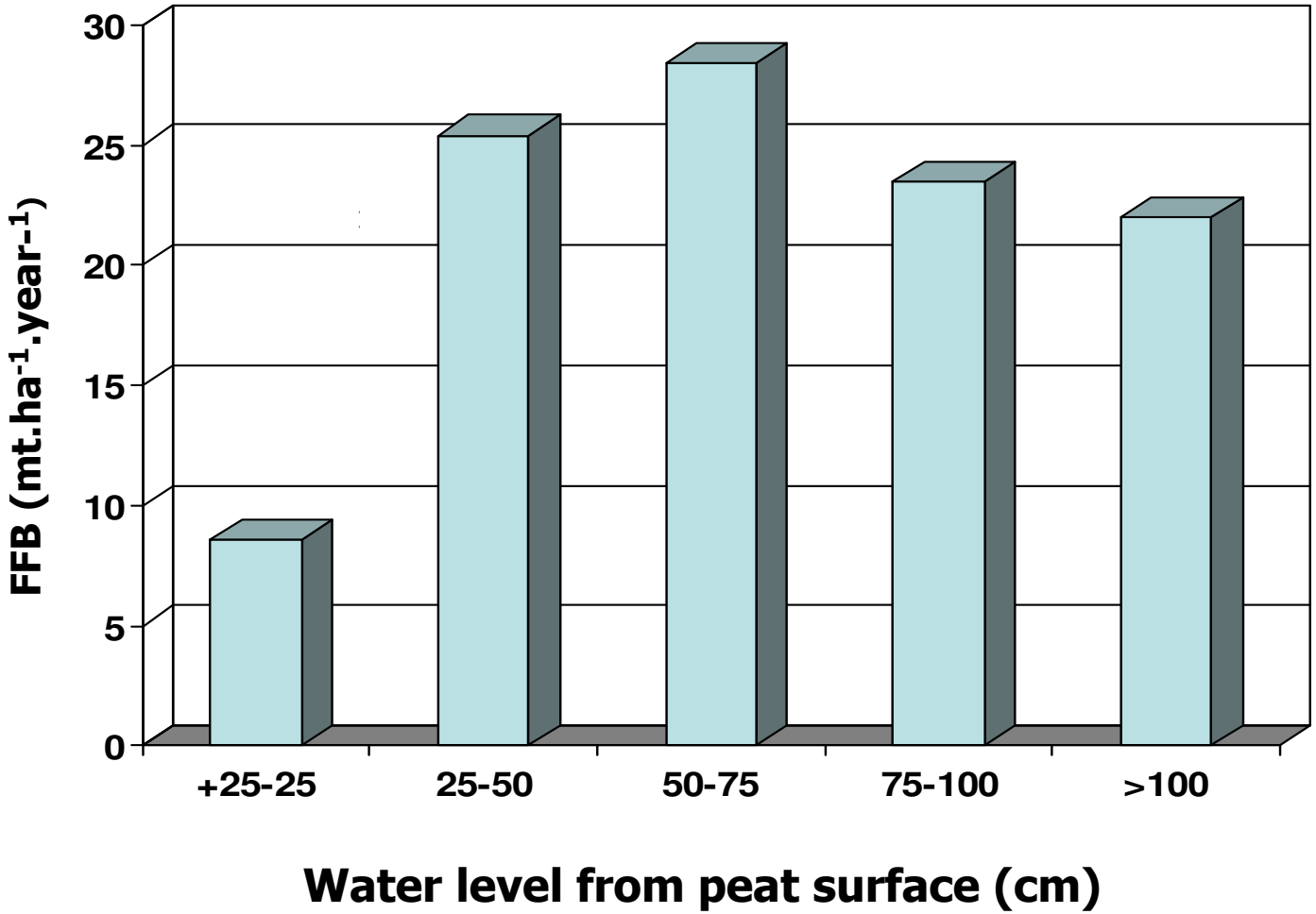

Simple wooden stop-off
along main drain.

WATER RETENTION ALONG COLLECTION DRAIN
(one stop-off for every 20 cm difference in water level)


WATER LEVEL GAUGE
50
25
0
0
25
ZERO (planted surface)
When water level raises to < 20 cm from peat surface, prepare for drainage
When water level drops to > 70 cm from peat surface, prepare for water retention


A flooded field will hinder all estate operations
N_2O and CH_4 emission

FFB YIELDS (1998 PLANTING) IN RELATION TO WATER LEVEL IN A PEAT ESTATE IN RIAU, SUMATRA.



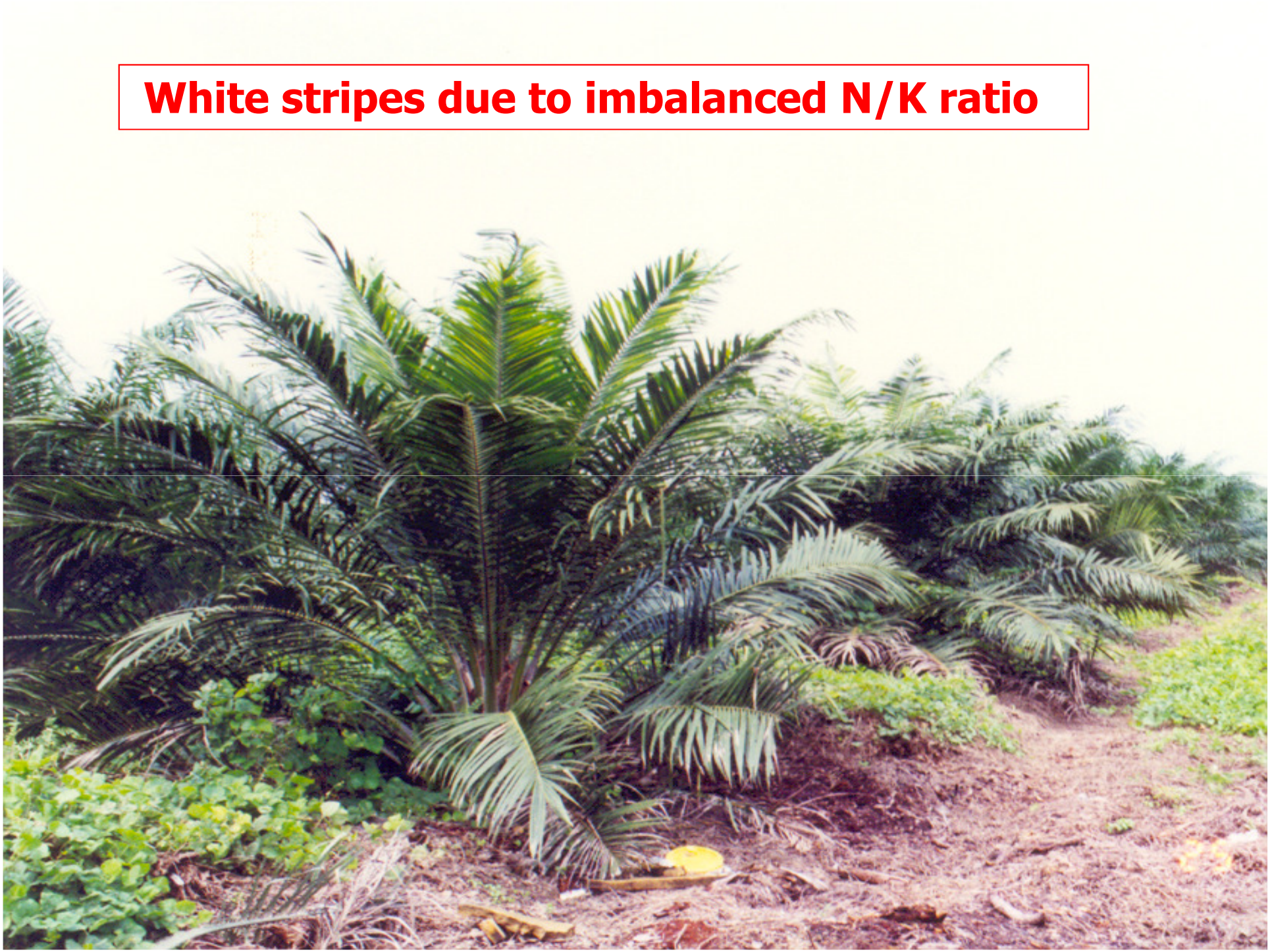
General Fertilizer Requirement for Mature Palm on Peat

- **MOP** **4.0-5.0 kg/palm/year (3 rounds)**
- **Urea** **0.5-1.0 kg/palm/year (3 rounds)**
- RP 0.5-1.0 kg/palm/year (1 round)

- $CuSO_4$ 0.15 kg/palm/year (1 round)
- $ZnSO_4$ 0.10 kg/palm/year (1 round)
- Borate 0.12 kg/palm/year (1 round)

Average - 7.5 kg/palm/year

White stripes due to imbalanced N/K ratio



Transport systems on peat and mechanization

- **Road system most commonly used.**
- **Rail (practised by United Plantations and Tradewinds plantations).**
- **Water transport (PT.TH Indo Plantations).**
- **Due to labour shortage esp. harvestors, mechanization of FFB collection is vital.**

Mechanization of in-field FFB collection

LGP tyres on compacted path

Tracked machine on soft ground

Rail system

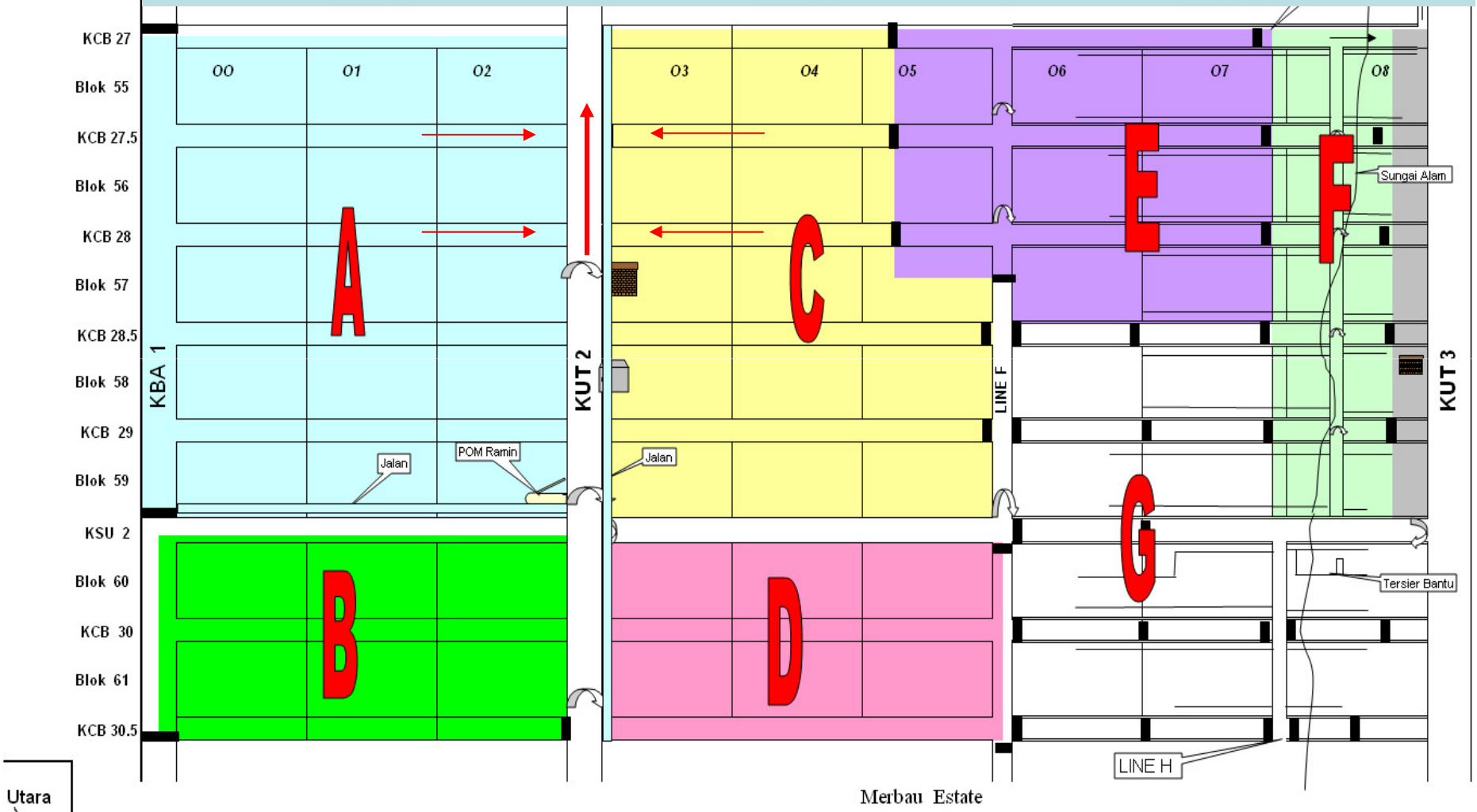
WATER TRANSPORT

- Need to zone areas with similar water level to facilitate water transport.

- An effective water transport system requires a good supply of water esp. during dry seasons.

MULTIGAMBUT
INDUSTRI

ZONING TO FACILITATE WATER TRANSPORT



Water transport

Integrated Pest Management (IPM)

- **A number of pests are attracted by the woody and moist environment in peat areas.**
  (esp. termites, *Tirathaba* bunch moths, leaf-eating caterpillars and *Ganoderma* stem rot).

- Pest outbreaks occur more quickly in peat environment compared to mineral soil areas, which can result in significant losses in yield and palm stand.

- **IPM** utilizes cultural, biological and chemical control methods and emphasizes **early detection** through **regular census** and speedy control **to minimize chemical usage**

TERMITE CONTROL - *Coptotermes curvignatus*

Effective Termite Management

Monthly census on all palms and speedy spraying of infested palms with

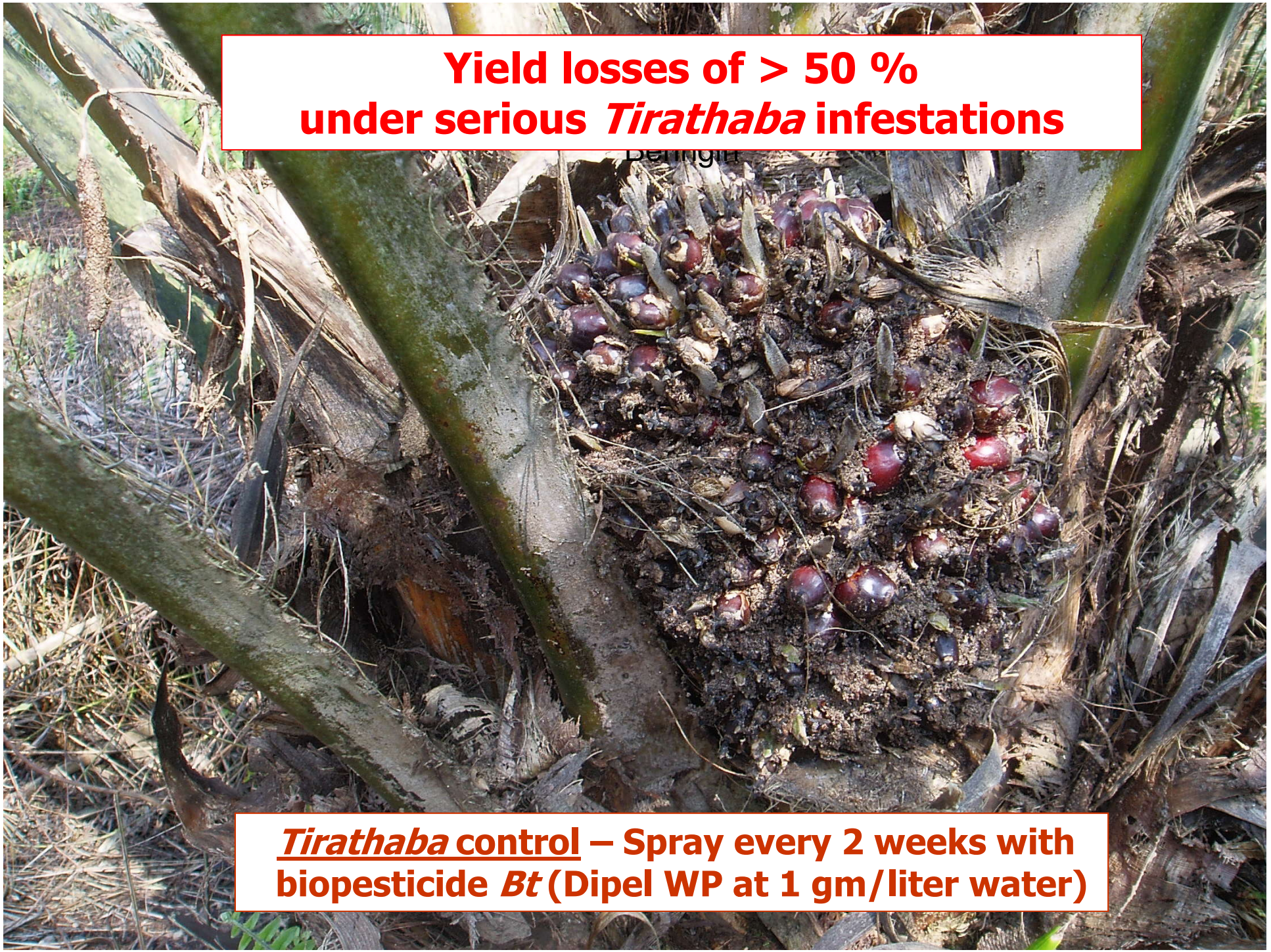
Fipronil (5%)
at 2.5 ml/5L water/palm

Tirathaba bunch moth

Life cycle is 1 month.

Attracted by rotten bunches.

Caterpillar


Yield losses of > 50 %
under serious *Tirathaba* infestations
Tirathaba control – Spray every 2 weeks with
biopesticide *Bt* (Dipel WP at 1 gm/liter water)


After 6 rounds of 2-weekly spraying with biopesticide (*Bacillus thuringiensis*).


Leaf-eating caterpillars

Planting beneficial plants for biological control

Cassia cobanensis

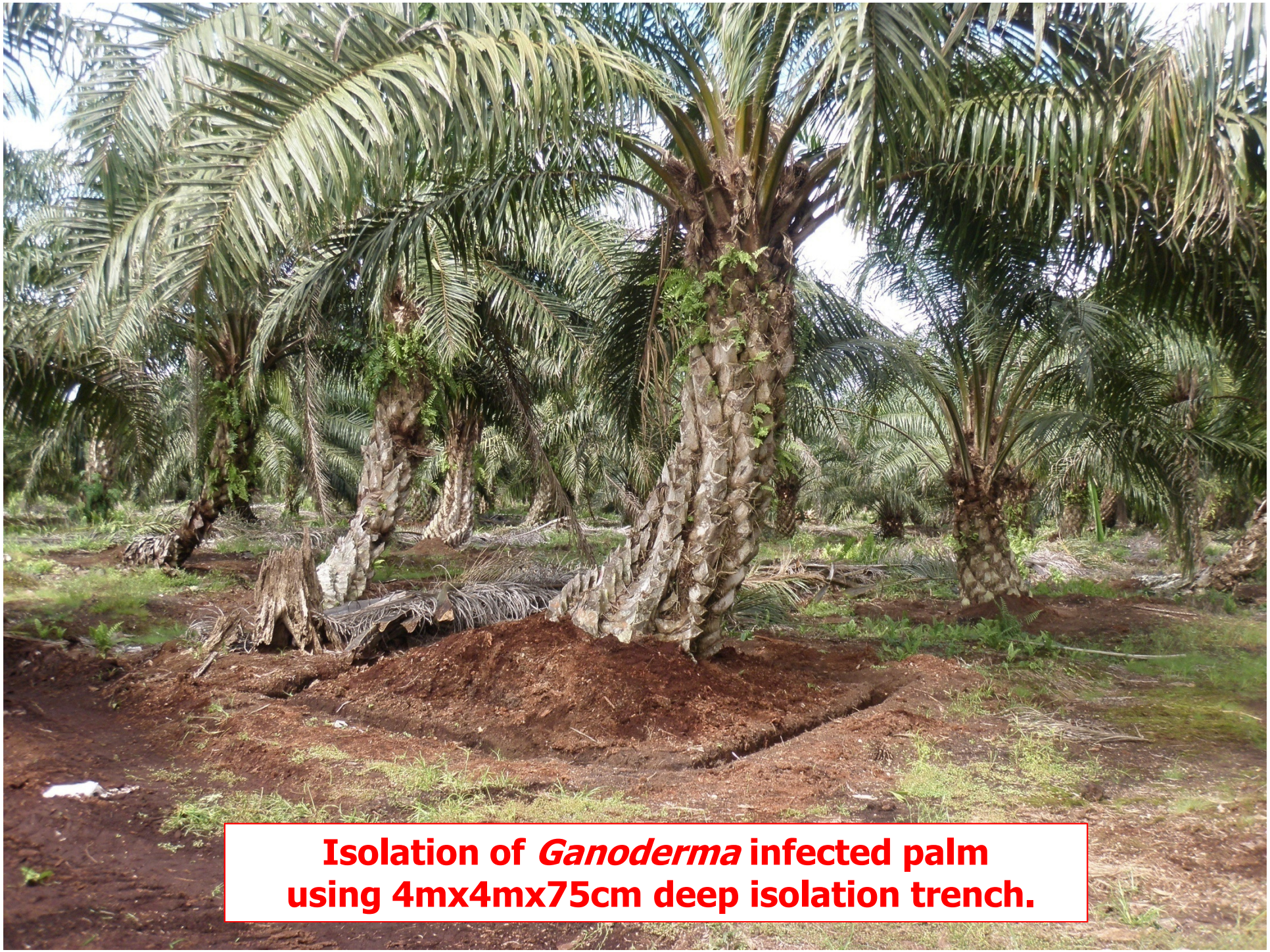
Sycanus sp. predating on Setora nitens caterpillar


Ganoderma Stem Rot
Presently no effective cure

Ganoderma boninense

Basidiomata

Two fallen adjacent palms infected with *Ganoderma* Basal Stem Rot, indicating root contact as the mechanism of palm to palm spread.



Isolation of *Ganoderma* infected palm using 4mx4mx75cm deep isolation trench.

Enviromental and Social issues

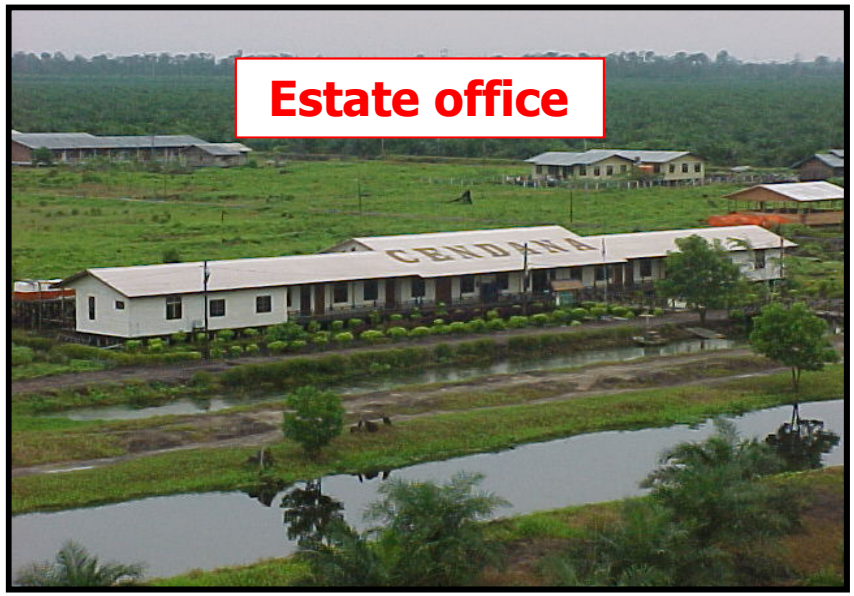
- **Minimization of GHG emissions** from oil palm plantations including fire prevention.
- Environmental monitoring of **water quality**.
- Conservation and maintenance of **river reserves** and **biodiversity**.
- **Provision of basic amenities esp. housing, school, clinic, electricity, etc are important for a productive and stable workforce.**


Maintenance of river reserve


GREEN ZONE

Monitoring of water quality

SOCIAL ASPECTS



TRAINING

- Continuous training is important to achieve higher efficiency and productivity on peat.

- All levels of estate management, including supervisory staff and workers should be trained for effective implementation of BMPs.


APD
1. PAKAIAN - (OVER ALL)
2. BOOT
3. RUBBER GLOVE
4. MASKER
5. KACAMATA
6. APRON
Fasilitator dari
PT SYNGENTA
Indonesia
Penggunaan Pestisida Aman
dan Kalibrasi herbisida
RSPO
Ir Kifly, MM
BACALAH LAB
PAKAILAH ALA
TRAINING ON SAFETY

R&D FOR CONTINUAL IMPROVEMENT

- More field trials on N, K, B, Cu under different moisture regimes and techniques of reducing leaching losses eg. testing coated urea and MOP.

- Study improved drainage system on peat dome eg. contour drainage.

- More R&D in measuring and mitigating GHG emissions from different peat types cultivated with oil palms (Role of TPL, MPOB, IOPRI).

- Intensify research on *Ganoderma* management.

- Testing of new planting materials/clones esp. compact materials (less leaning) and tolerant to *Ganoderma.*

SMALLHOLDERS

Smallholders can be broadly categorized into 3 types :

- Supported smallholders (by Government or private sector).

- Independent smallholders.

- Collective landowner schemes.

Main problems faced by small-holders esp. the independent smallholders in peat areas are :

Lack of technical and financial support,
Practise open burning,
Poor water management & fertilizer applications,
Poor pest & disease control resulting in low yield.

Summary of key points

- Vital to maintain water level at **50-70 cm** from the peat surface (40-60 cm groundwater table determined using piezometer) to maximize FFB yield and minimize GHG emissions.
- Timely/balanced fertilizer application is important to minimize nutrient leaching losses.
- Integrated Pest Management with emphasis on early detection and speedy control is vital to reduce crop losses and chemical usage.
- Ways to minimize peat subsidence, leaning/fallen palms and GHG emissions need to be emphasized.
- Environmental-friendly replanting practices esp. zero-burning.
- Independent smallholders on peat will require financial and technical support to adopt BMPs.
- **R&D and Training** are important for continual improvement of oil palm cultivation on tropical peat.


THANK YOU