Results of Carbon Balance Measurements in Mature Oil Palm Plantations for ISCC certification at PT Hindoli

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(Representing PT Hindoli, a Cargill company)

RT9 Sabah 2011 Borneo

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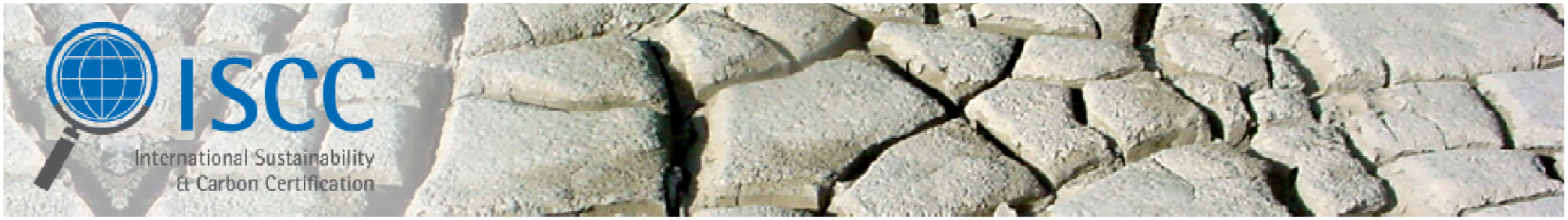
Presentation outline

- Use of the ISCC system to certify crude palm oil production
- Impact of land use change is not accounted for in the ISCC system
- Case study using data from Cargill's plantation PT Hindoli based on successful certification in 2009
- Accounting of emissions related to the production, milling and refining of fruit bunches to produce refined bleached deodorized palm oil
- Consideration of scope for reduction in emissions through improved production practices



- ISCC = International Sustainability & Carbon Certification www.iscc-system.org
- Main objectives:
  - Reduction of greenhouse gas emissions;
  - Sustainable use of land;
  - Protection of natural biospheres; and
  - Social sustainability.
- Provides evidence to stakeholders of the sustainability of raw material production

Source: ISCC website

Characteristics of sustainable production

- Features:
  - Not from bio diverse or carbon rich area
  - Not exceed GHG threshold
  - Correspond to GAP and social criteria
  - Mass balance approach
- Recognized by Germany and EU
- Procedure involves registration > preparation for audit > audit > certification

Source: ISCC website

Characteristics of production at PT Hindoli

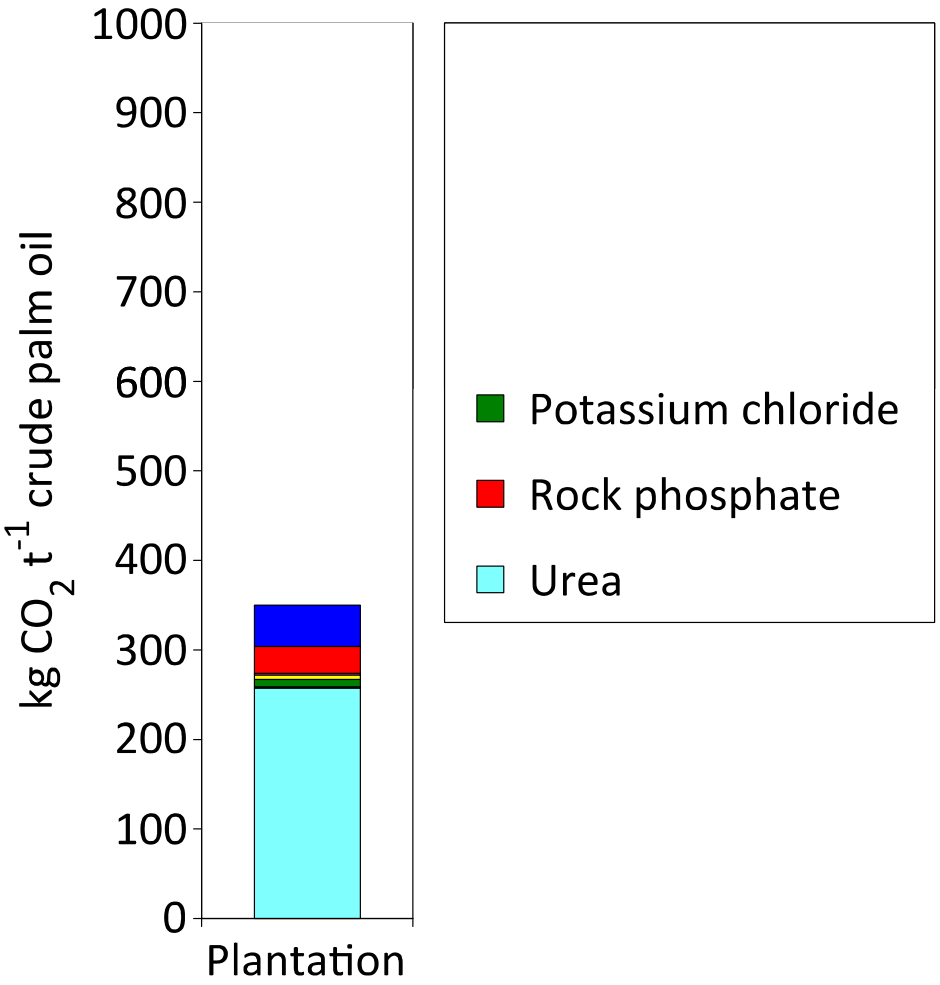
- Estates supplying Sungei Lilin Mill in 2008/09
- Area under harvest 5,896 ha
- Yield 19.4 t ha^{-1} fruit bunches (impact of drought)
- OER 22%
- Oil yield 4.3 t ha^{-1} crude palm oil
- Fertilizer used 1.6 kg/palm N (urea), 0.5 kg/palm P2O5 (RP), 0.9 kg/palm K2O (KCl) and 0.24 kg/palm MgO (Kieserite)

Source: PT Hindoli

Calculations

- Emissions are calculated for crude palm oil (CPO) by partitioning emissions between palm oil and palm kernel oil.
- 85% of emissions are allocated to CPO.

1. Crop production



Total emissions 350 kg CO_2-eq t^{-1} crude palm oil

Emissions related to crop production are mainly:

- Urea (74%);
- Electricity for housing (13%); and
- Diesel for field transport (9%)

Scope for reduction:

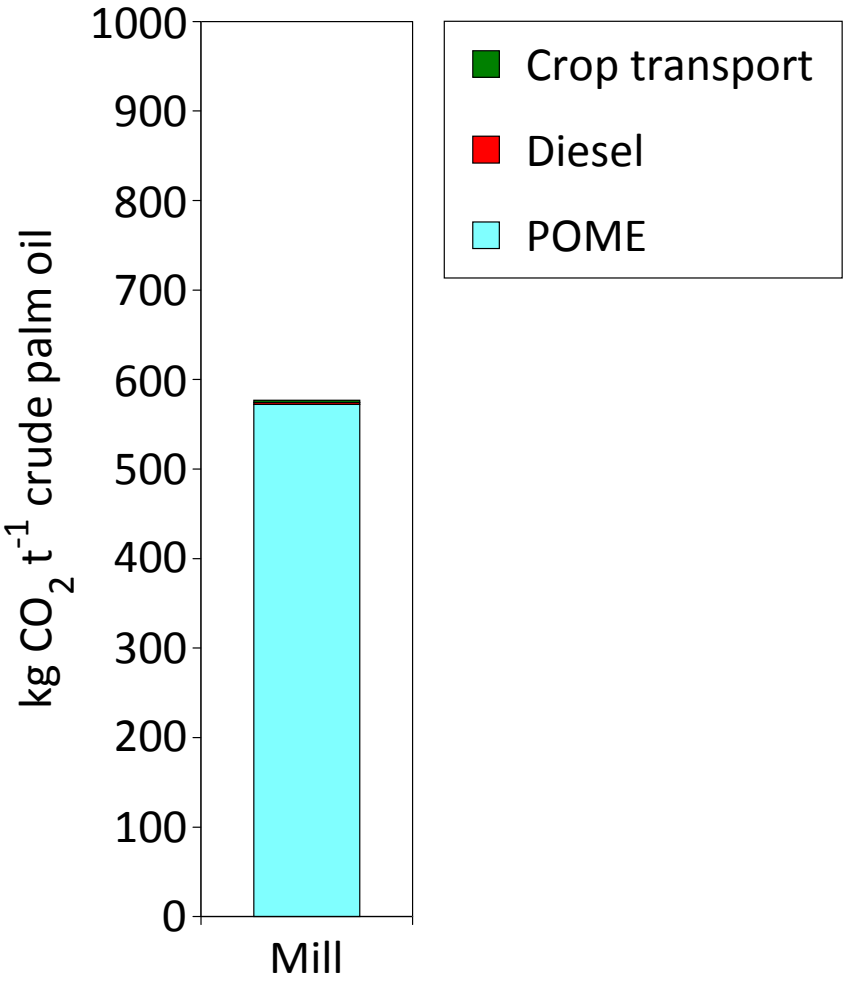
- Improve nitrogen management;
- Increase estate transport efficiency (back-loading empty bunches);
- Reduce energy use in housing; and
- Increase yield and oil extraction rate!

Source: PT Hindoli

Nitrogen management

- Maximum use of legume cover plants as source of biological N_2 fixation
- Substitution of N fertilizer with lower emissions during manufacture?
- Improved splitting, timing and spreading of N fertilizer
- Improved accuracy of N fertilizer recommendations

2. Mill processing and crop transport



Total emissions 577 kg CO_2-eq t^{-1} crude palm oil

Emissions related to mill processing are mainly:

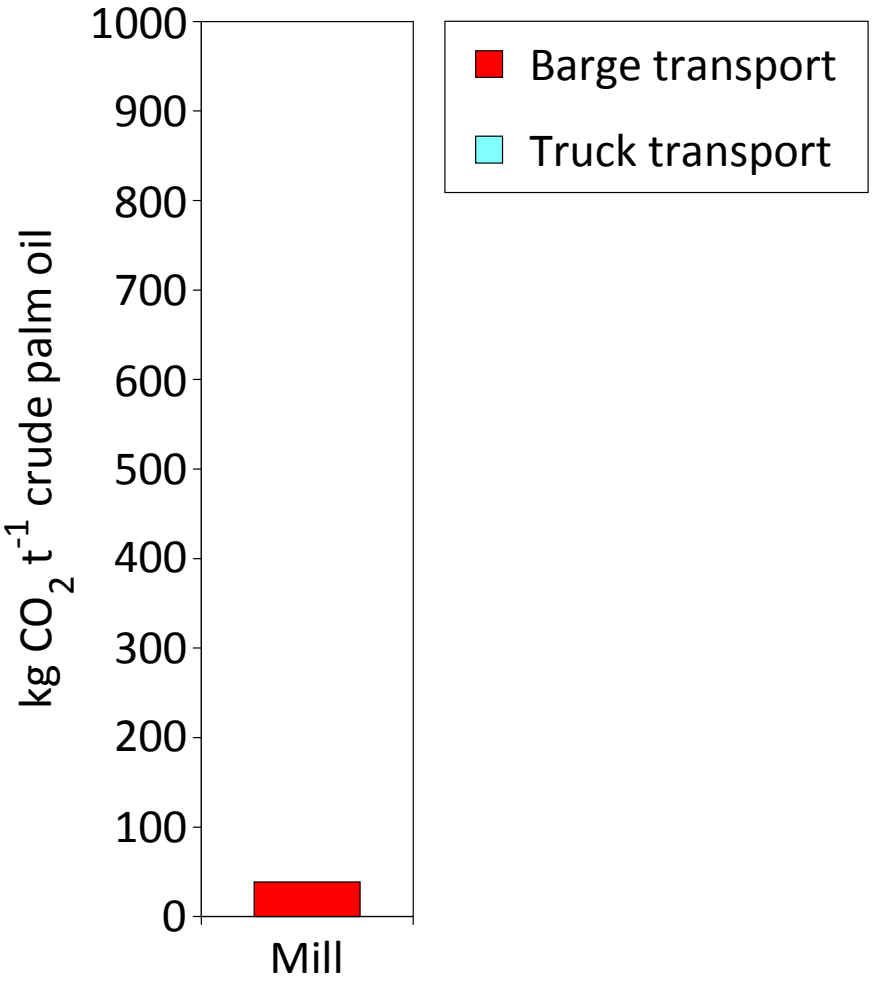
- Emissions from POME (99%)

Scope for reduction:

- Install CH_4 capture system and flare CH_4
- Install CH_4 capture and generate electricity for sale to the national grid
- Reduce mill losses (target 1.3%) to reduce pond emissions

Source: PT Hindoli

3. Mill storage



Total emissions 39 kg CO_2-eq t^{-1} crude palm oil

Emissions related to mill processing are mainly:

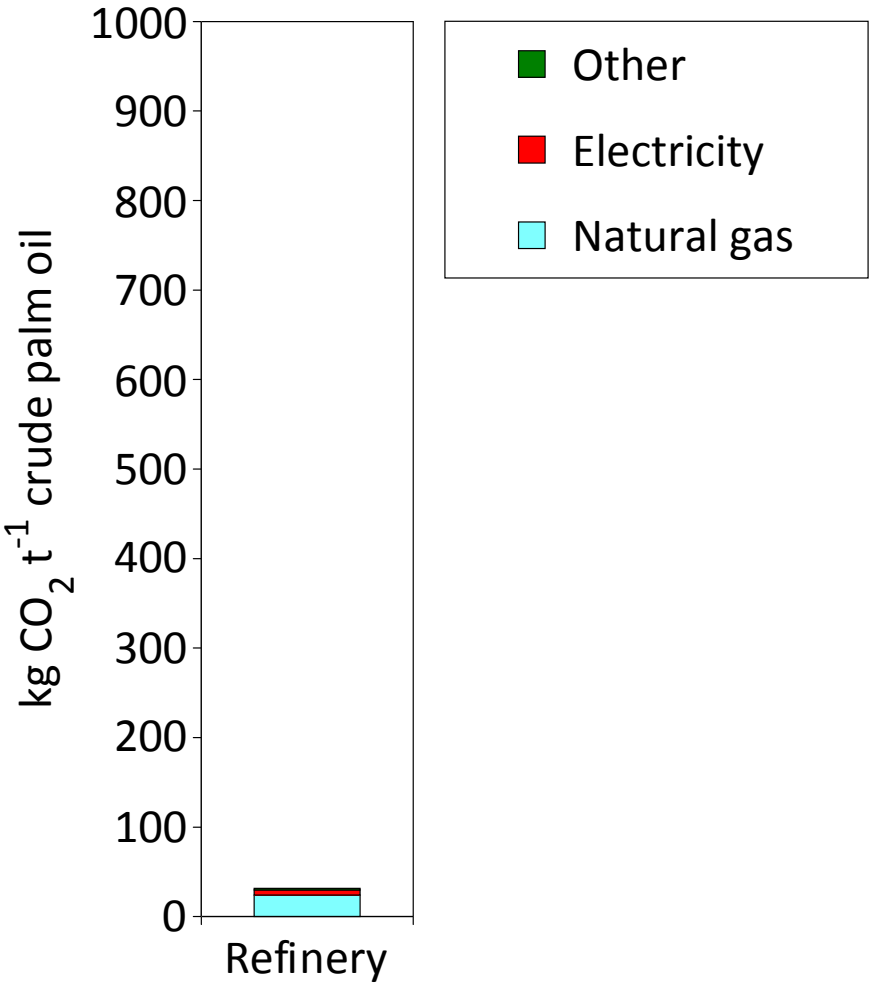
- Emissions from fuel use (100%)

Scope for reduction:

- Improved efficiency of transport by truck and barge

Source: PT Hindoli

4. Refinery emissions



Total emissions 32 kg CO_2-eq t^{-1} crude palm oil

Emissions related to mill processing are mainly:

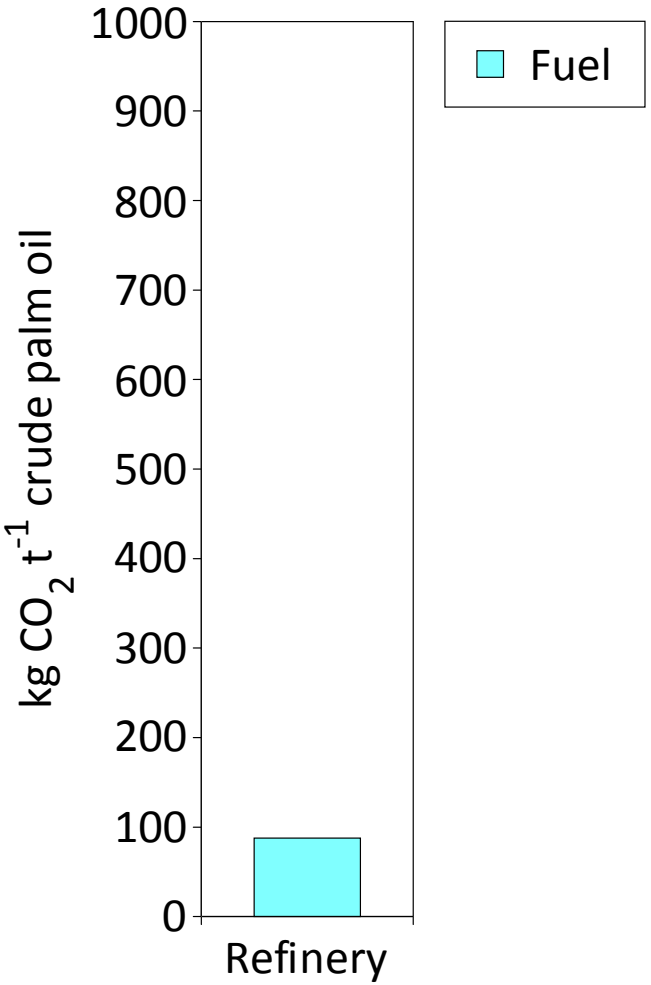
- Natural gas use (76%)

Scope for reduction:

- Increased refinery efficiency

Source: PT Hindoli

5. Refinery transport



Total emissions 88 kg CO_2 t^{-1} crude palm oil

Emissions related to mill processing are mainly:

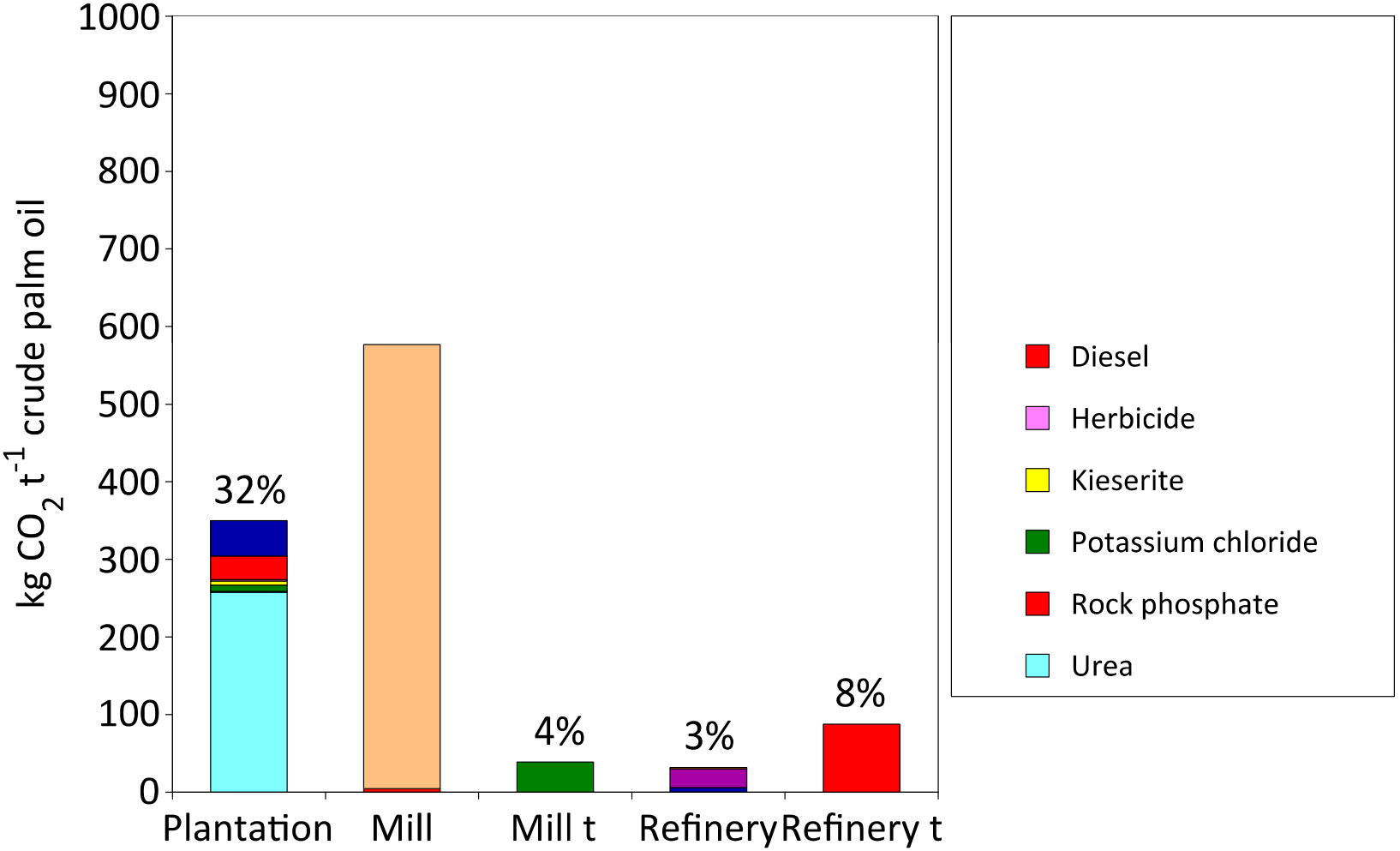
- Barge transport (100%)

Scope for reduction:

- Improved barge efficiency

Source: PT Hindoli

Summary of emissions along the production chain



Source: PT Hindoli

Summary of CO2-eq emissions

Activity		kg CO_2-eq/t CPO	kgCO_2-eq/t RBDPO	%
Plantation production	Urea	257.5	274.5	24
	Rock phosphate	1.3	1.4	0
	Potassium chloride	8.2	8.7	1
	Kieserite	5.1	5.4	0
	Herbicide	1.9	2.0	0
	Diesel	30.1	32.1	3
	Electricity	45.8	48.8	4
Milling	Diesel	2.1	2.3	0
	POME	572.4	610.1	53
	Crop transport	2.2	2.4	0
Transport to wharf	Truck transport	0.0	0.0	0
	Barge transport	38.7	41.3	4
Refining	Natural gas	23.9	25.5	2
	Electricity	5.9	6.3	1
	Other	1.8	1.9	0
Transport to refinery	Fuel	87.7	93.5	8
All		**1,084.9**	**1,156.3**	**100**

Source: PT Hindoli

Summary of CO_2-eq emissions

Item	kg CO_2-eq/t CPO	kgCO_2-eq/t RBDPO	%
Plantation production	350.0	373.0	32
Milling	576.8	614.7	53
Transport to wharf	38.7	41.3	4
Refining	31.7	33.8	3
Transport to refinery	87.7	93.5	8
Total	**1,084.9**	**1,156.3**	**100**
Saving against fossil fuel use %	**65**		

Note

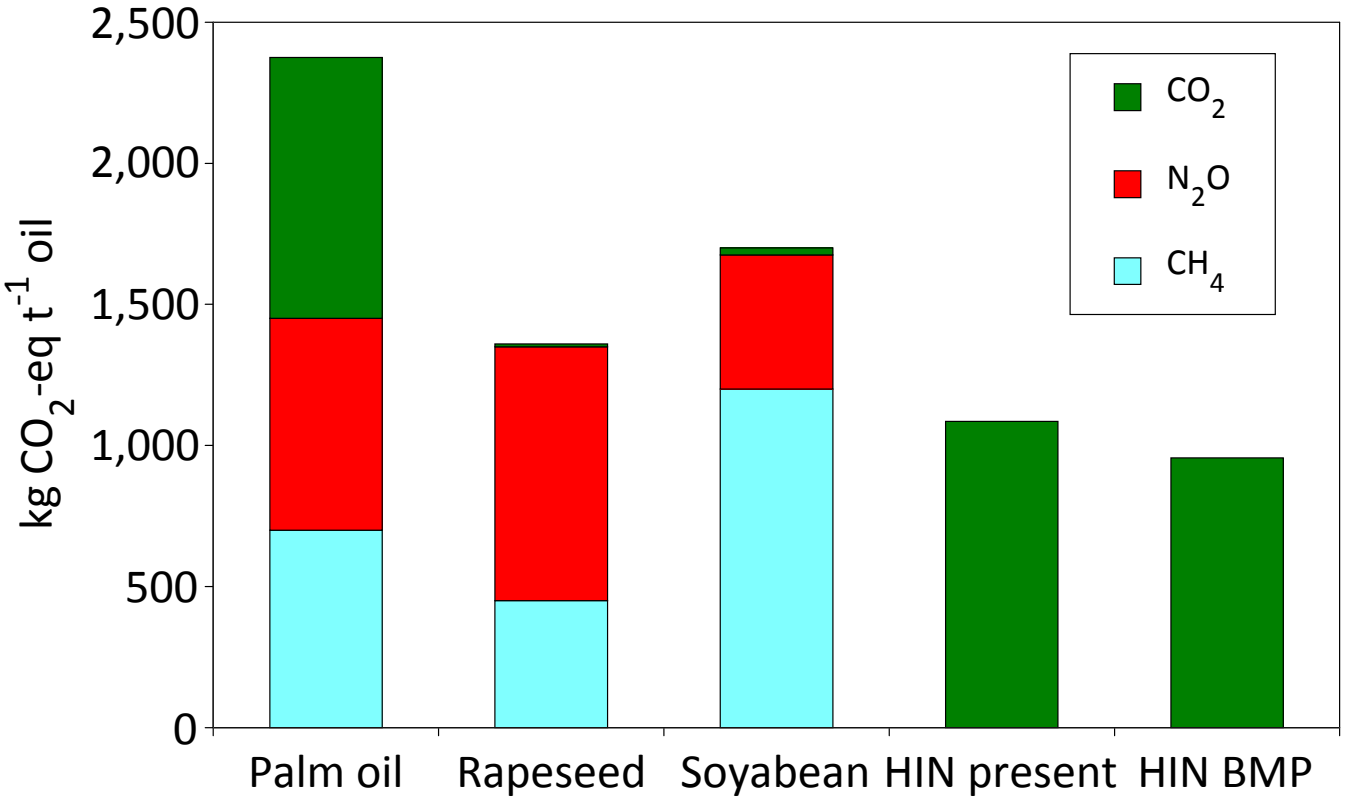
Savings against fossil fuel use compares to CO_2-eq emissions per MJ energy of palm oil with diesel using standard reference value for diesel defined by REDD Value for crude palm oil is 29.5g CO_2-eq/MJ compared with 85 g CO_2-eq/MJ for diesel

Source: PT Hindoli

Comparison with other studies

- RSPO estimates:
  - emissions from diesel use at 45-25 kg CO2-eq/t CPO compared with 34.5 in this assessment
  - emissions from fertilizer use at 250-470 kg CO_2-eq/t CPO compared with 272 in this assessment
- EU-RED has values ranging from 29 to 50 g CO_2-eq/MJ for palm oil biodiesel compared with 29.5 g CO2-eq/MJ in this assessment

Comparison of emissions between palm oil, rapeseed oil and soyabean oil



Source: AarhusKarlshamn Denmark AS Rapeseed Oil and PT Hindoli

Importance of data collection

- Importance of maintaining accurate agronomic information in each planted block in a database
  - Yield
  - Fertilizer use
  - Pesticide use
  - Diesel use
- Provides the means to calculate emissions and monitor and evaluate the efficiency of input use and track efficiency
- Improved agronomic efficiency delivers profit and emissions benefits!

Impact of best management practice on yield and CO_2-eq emissions

	Units	Present case	BMP	Δ
Yield	t/ha fruit bunches	19.4	25	5.6
Oil extraction rate	%	22	23.5	1.5
Oil yield	t/ha	4.3	5.9	1.6
Emissions	**kg CO2-eq/t CPO**	**1,084.9**	**956.35**	**128.55**

Comparable yield increases without increasing fertilizer rates but using Best Management Practices (BMPs) have been demonstrated by IPNI in eight locations in Indonesia since implementation began in 2002.

Main areas for yield improvement:

- Improved crop recovery and ripeness; and
- Improved agronomic practices (pruning, fertilizer application, soil conservation)

Average yields in the estates in 2010/11 were 24.5 t/ha fruit bunches with oil extraction of 22%

Source: PT Hindoli

Conclusions

- The greatest potential to reduce emissions related to crude palm oil production are:
  - More efficient use of N fertilizer utilizing sources from low emission fertilizer plants;
  - Capture of CH_4 from effluent ponds and either flaring or co-generation of electricity; and
  - Yield improvement by deploying best management practices
- Policy should favour measurement at each site rather than use of generic values for emissions

About Tropical Crop Consultants Limited

Tropical Crop Consultants Ltd was set up by Thomas Fairhurst in 2008 to provide consultancy services in tropical crop agronomy and management. The overall focus of the consultancy service is to assist clients with ecological and sustainable crop intensification in lowland, upland and plantation agriculture systems.

Our core areas of expertise are:

- Management and agronomy of plantation crops (particularly oil palm, coffee and rubber).
- Intensification of lowland agriculture systems (through efficient nutrient use in rice).
- Productivity improvement in upland agriculture (particularly increasing productivity through soil fertility re-capitalization in upland farming systems).
- Computer software development for data management in agriculture (particularly development and deployment of database and geographic information systems).
- Preparation of educational agricultural extension material for extension workers, managers, agricultural scientists, and farmers.
- Trouble shooting in plantations, agriculture projects and farming systems.

For more information, visit www.tropcropconsult.com

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