

# **PALM OIL RELATIVE AVAILABILITY AS A SOURCE OF BIOFUEL**













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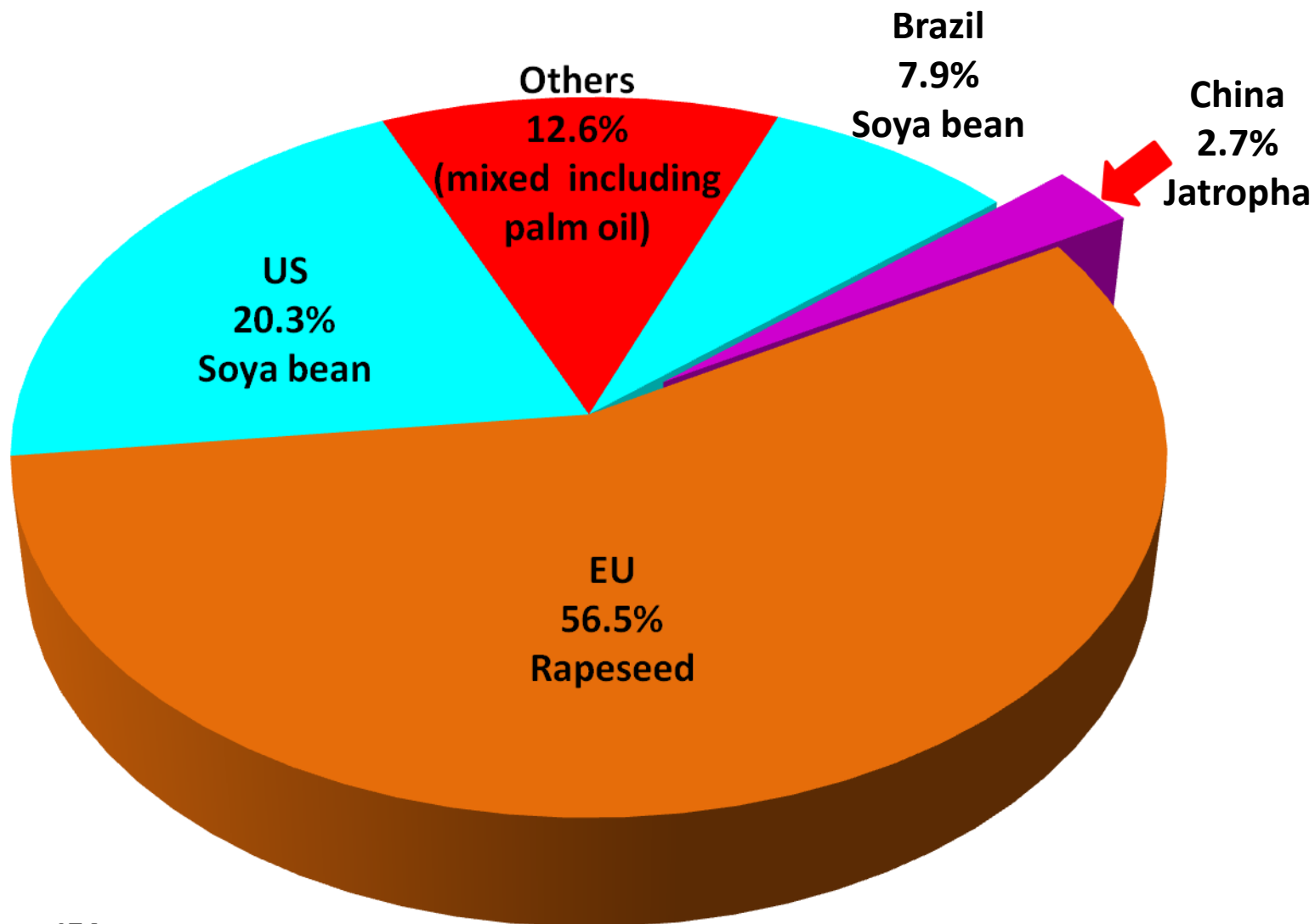
# Presentation

- 1. Availability of palm oil as a feedstock**
- 2. Its comparative advantage in terms of cost**
- 3. Palm oil as the more sustainable feedstock**
  - **3Ps**
  - **Direct land use effects**
  - **Indirect land use change**
  - **LCA results**
- 4. Conclusions**

# Common First Generation Feedstocks

BIODIESEL		BIOETHANOL	
Rapeseed		Sugarcane	
Soyabean		Sugarbeet	
Sunflower		Sweet sorghum	
<b>Palm oil</b>		Maize	
Jatropha		Cassava	

# Biodiesel consumption by country and main feedstock used



Source: IEA

# Views of some biodiesel feedstock plants



- Oil Palm
- Perennial { producing oil 365 days a year }
- More resemblance to a forest
- Lush leguminous cover crops covering the ground



# Views of some biodiesel feedstock plants

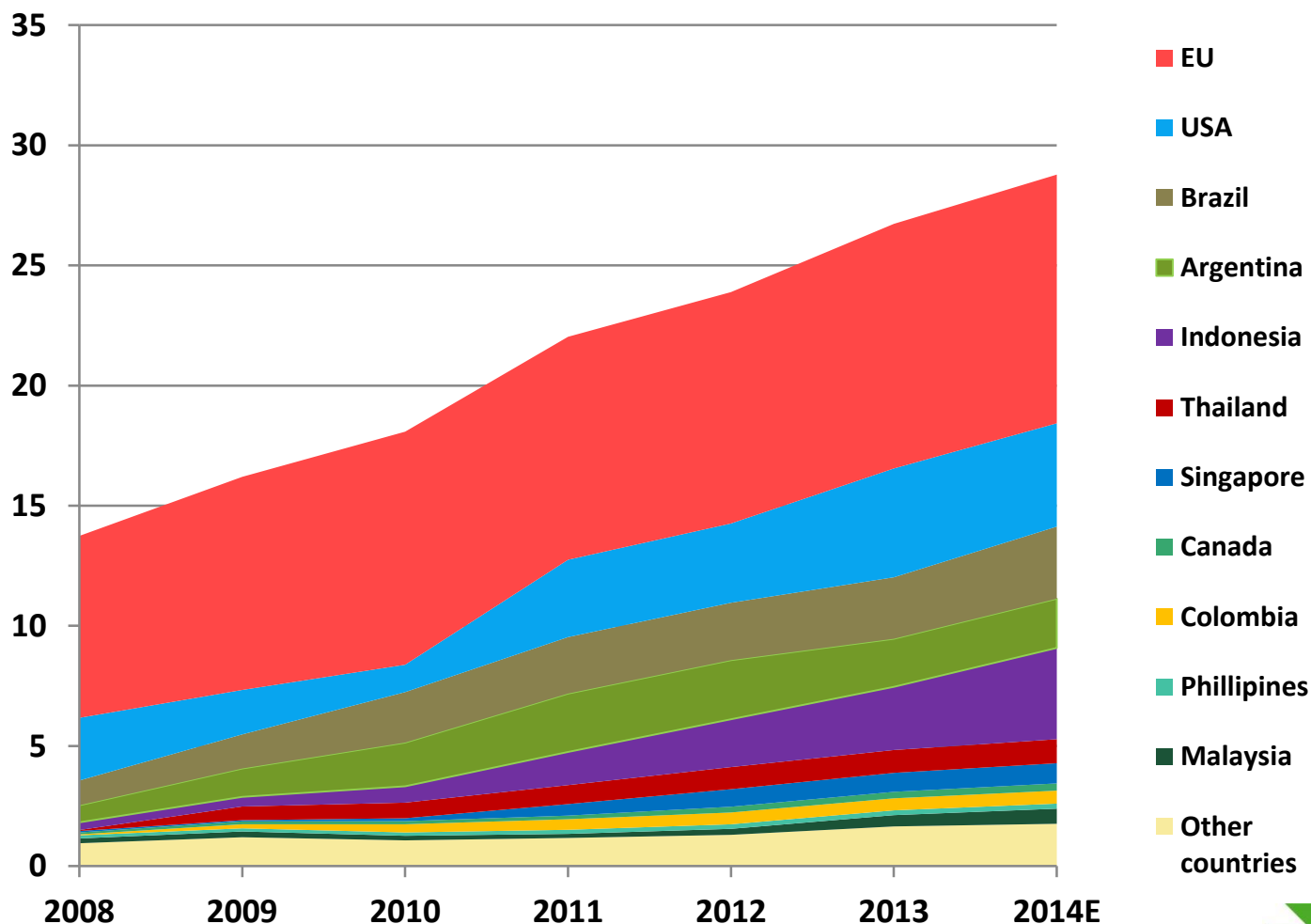


- Soya on left, beautiful field of rapeseed on right
- Short term annuals (few months), Not perennial like OP
- Producing oil for a season only, not 365 days a year
- Once flowering over, fruits obtained, harvested & wait for next season
- Oil palm removes 8.3 X more CO<sub>2</sub> per area basis than soya

# World Biodiesel Production (MMT)

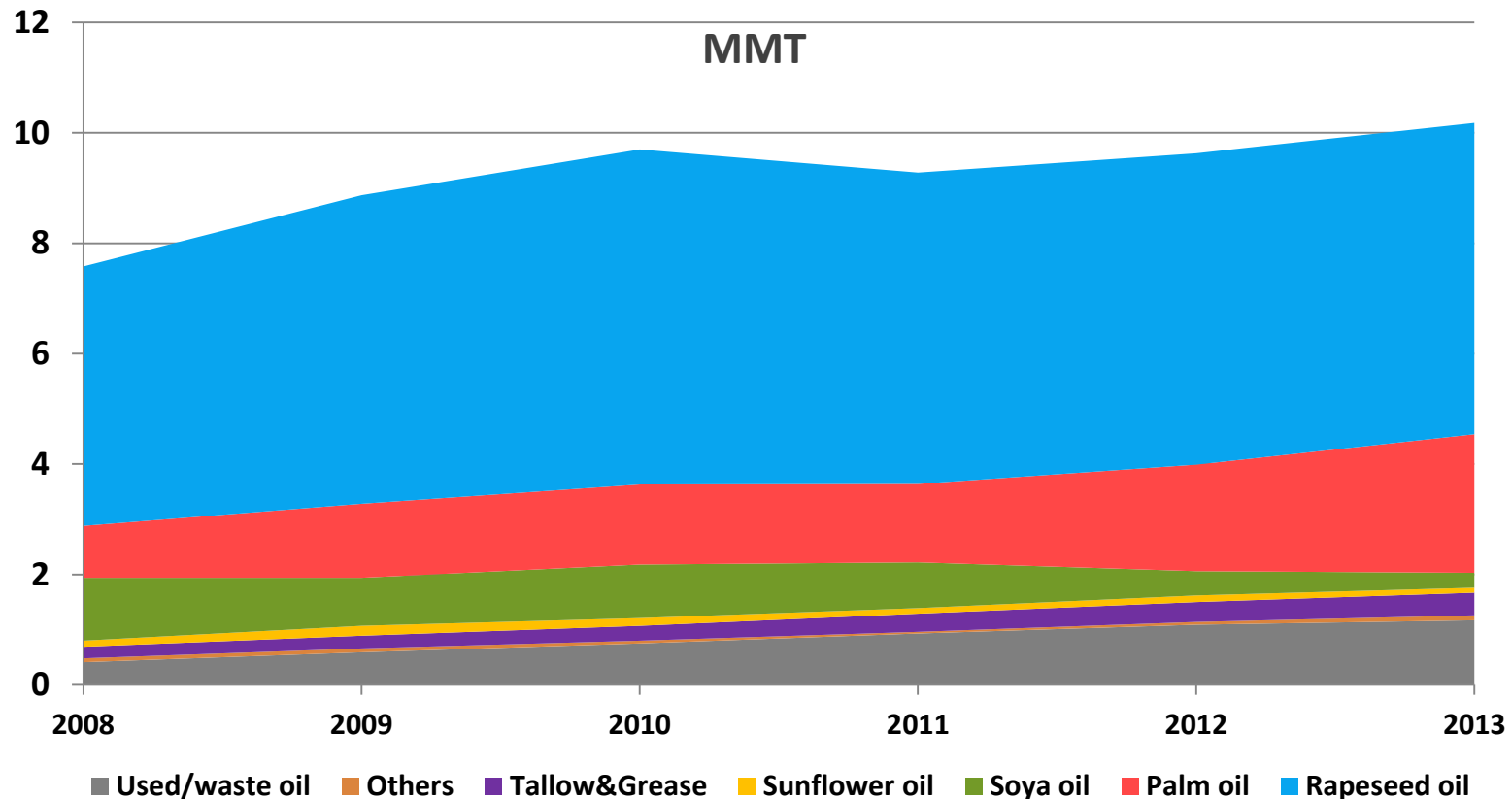
World Biodiesel Production (MMT)

- The EU is the world's leading biodiesel producer with output increasing from 10.18 MMT in 2013 to 10.35 MMT in 2014.



Source: Oil World

# Usage of type of feedstock in EU

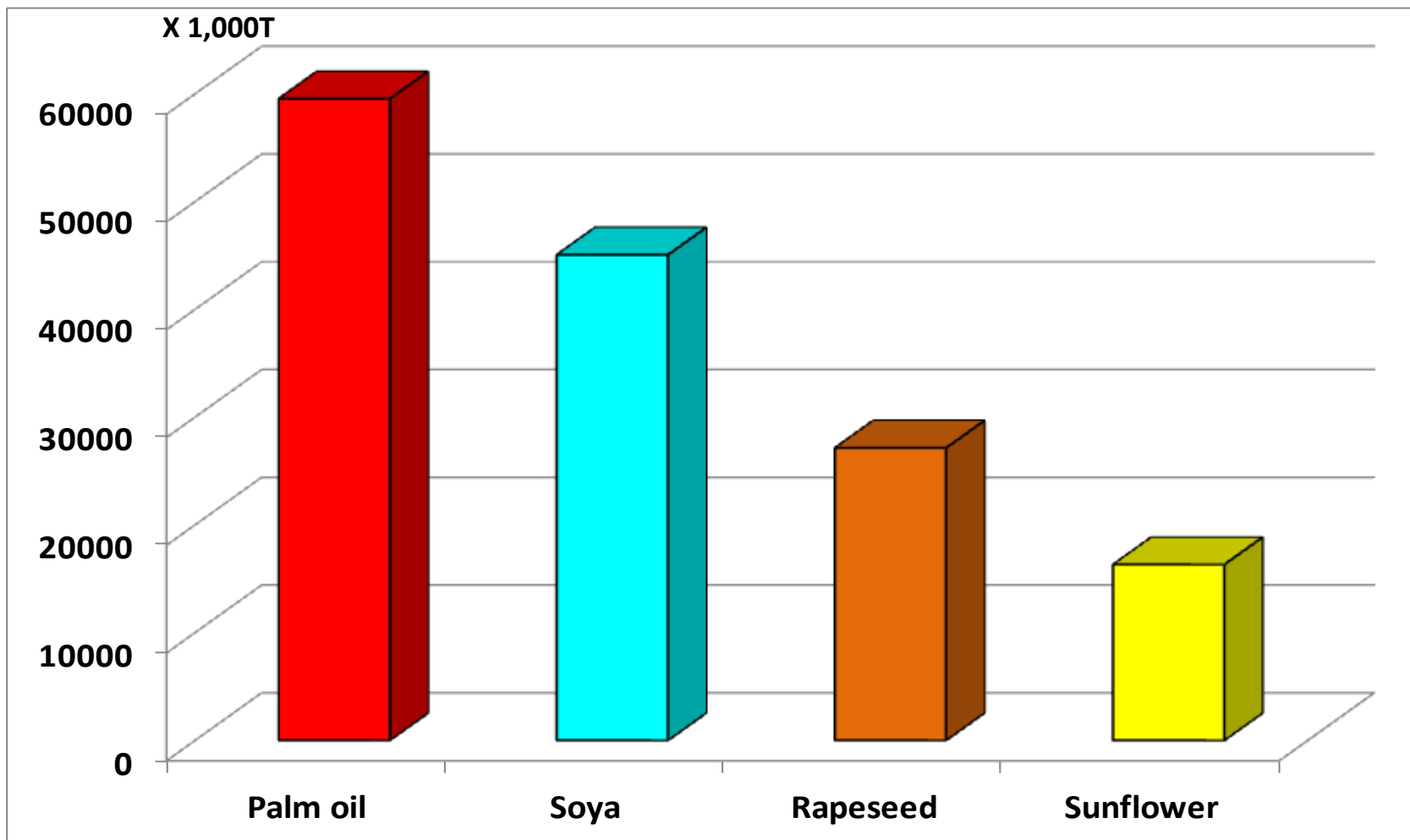


Source: Oil World

Rapeseed oil is still the dominant feedstock but its share of EU biodiesel production diminished from 63% in 2008 to 55% in 2013. Palm oil has gained its market share since 2009 due to its price competitiveness. Used cooking oil's market share has also soared as a result of the double-counting measure.

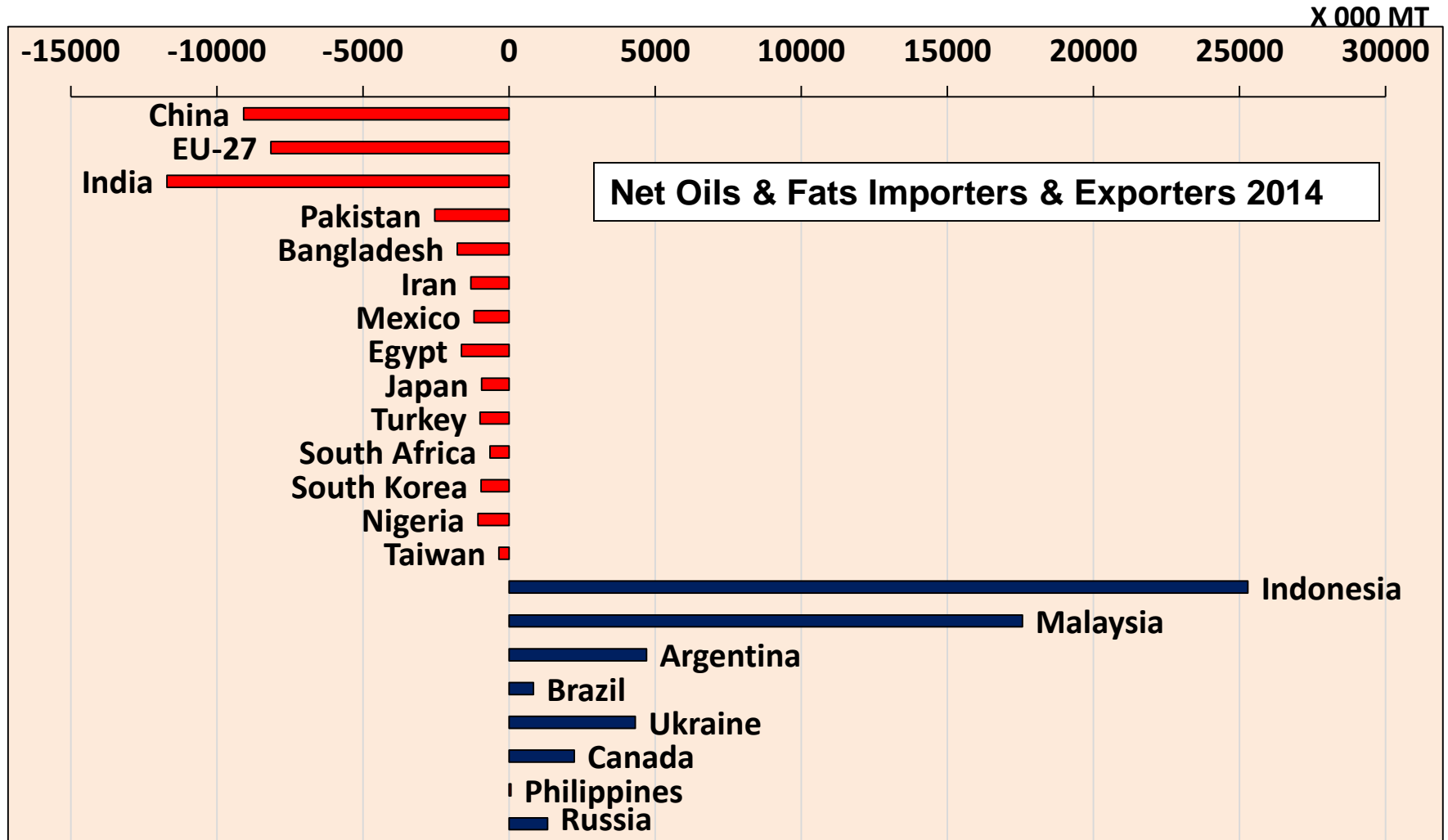


# Availability of feedstock (based on production of oil in 2014)



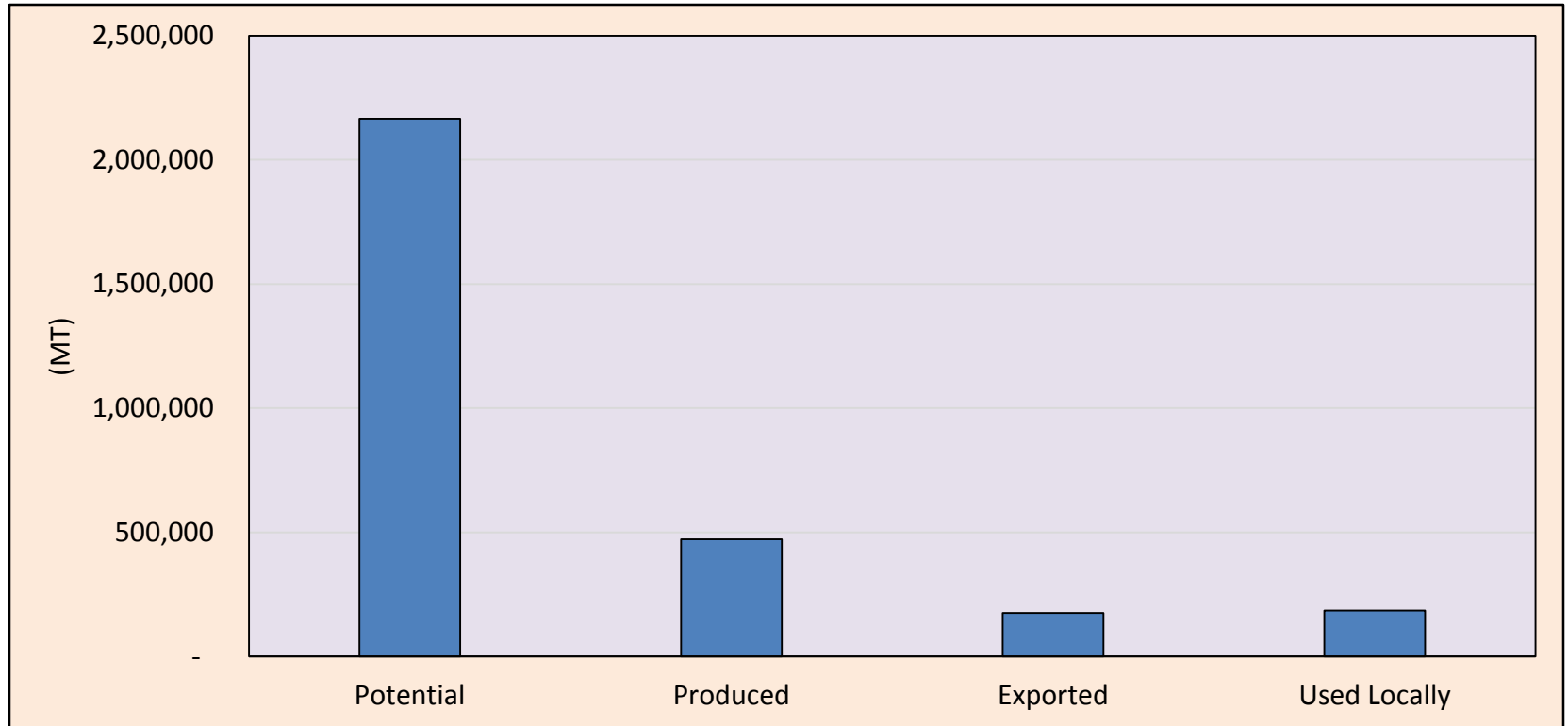
Source: Oil World

# Palm Oil: Essential item to ensure continual availability of biodiesel feedstock source



Source : Oil World

# Poor demand for ISCC certified palm oil biodiesel\*



- ❖ Production of palm biodiesel in Malaysia is only 22% of total possible capacity
- ❖ 76 % of ISCC production used; 24% stock left over
- ❖ Only 37% of ISCC production exported
- ❖ EU bought only 30% of ISCC production

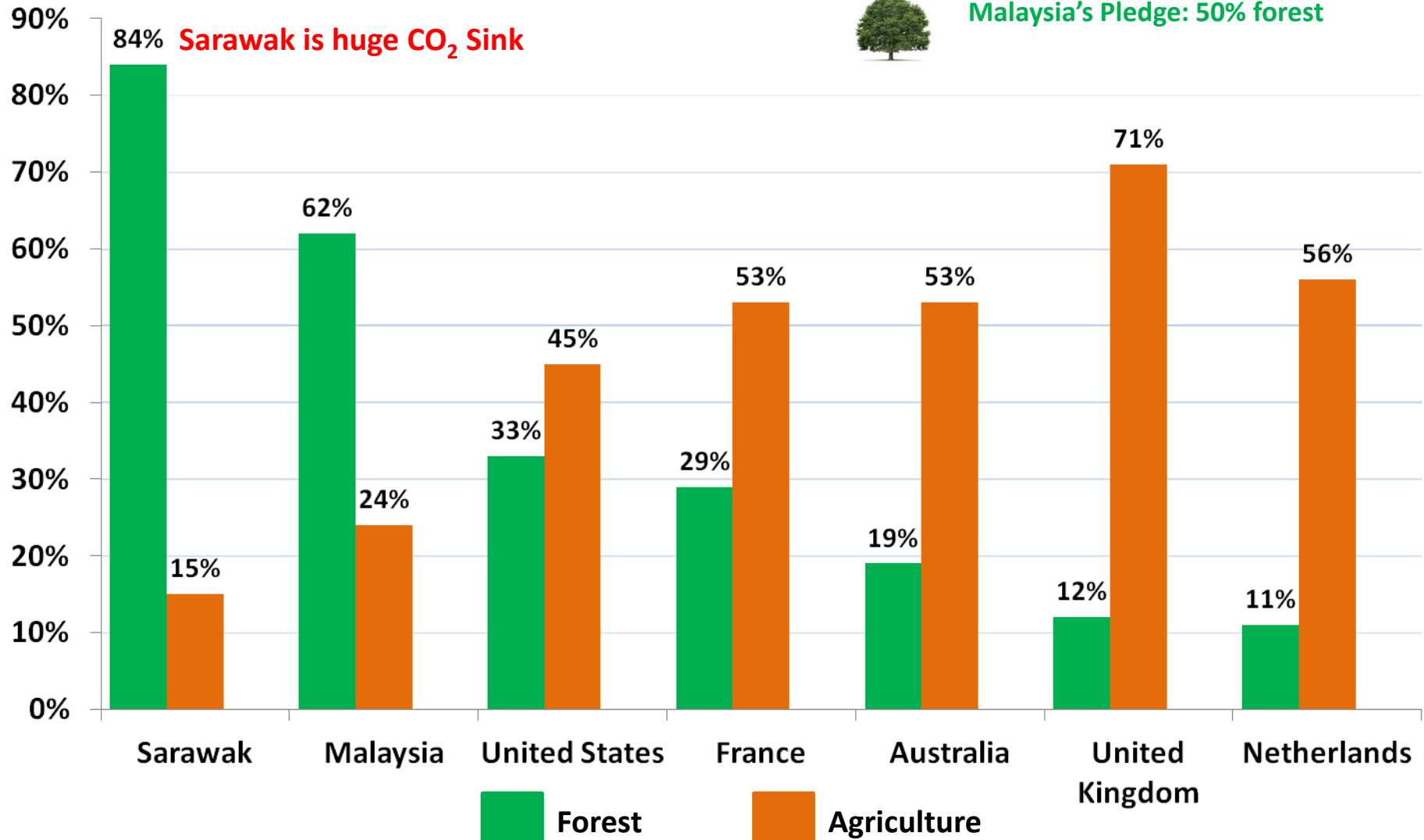
# Forest Area vs Agriculture Area Percentage



UN Convention Baseline: 10% forest

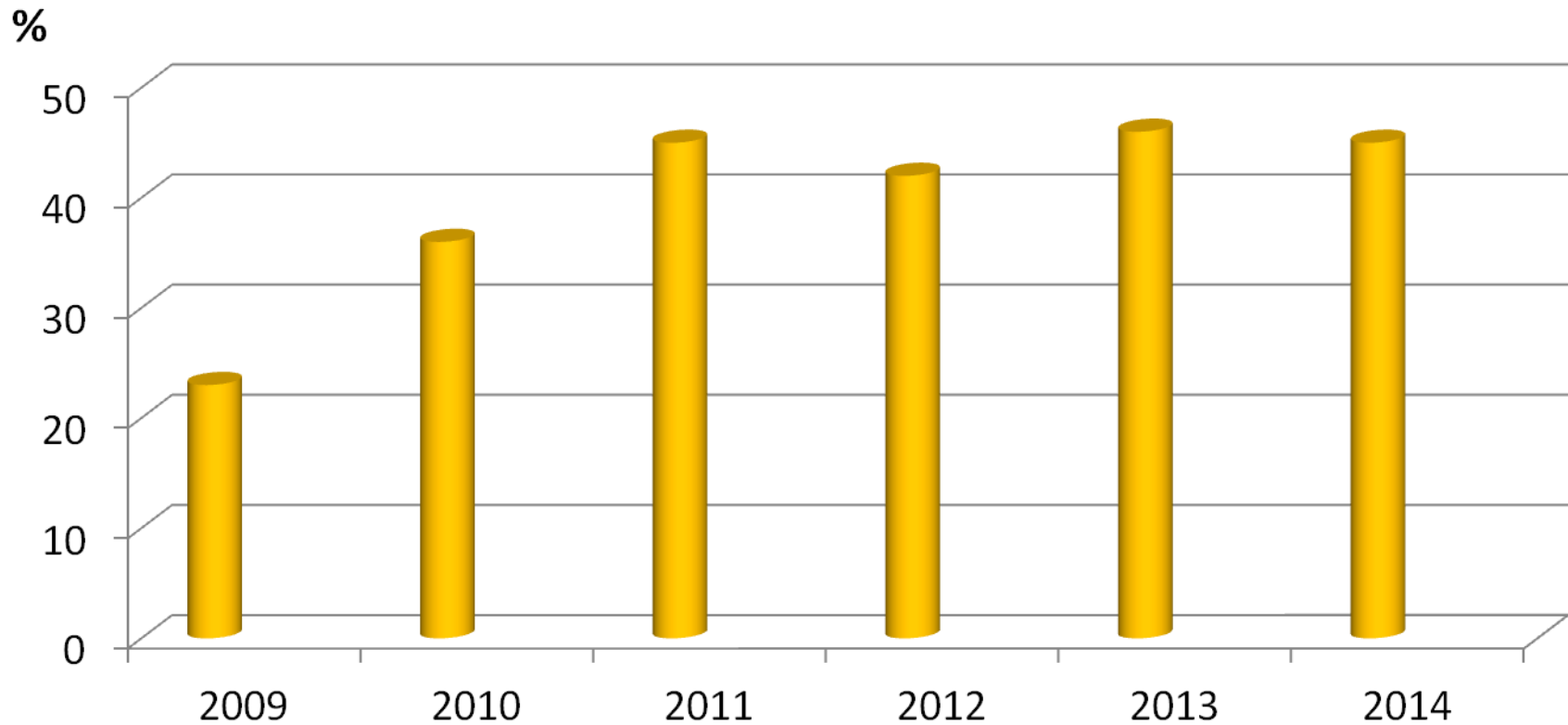


Malaysia's Pledge: 50% forest



Source: World Bank (<http://data.worldbank.org>)

# Very poor uptake of CSPO in world

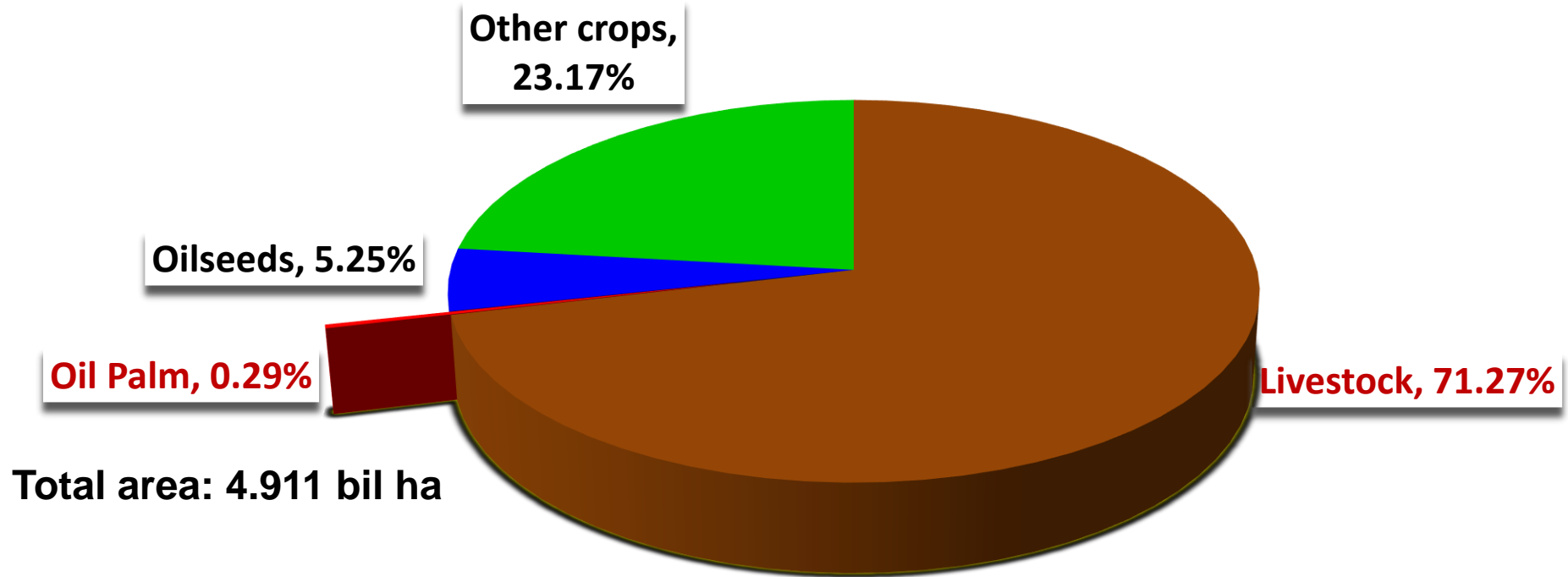


Source:  
RSPO

- In spite of low volumes of RSPO oil available in world market (less than 20 %), demand is only lukewarm (maximum uptake never exceeding 46 %) over the years

- Yet more demands made to produce more RSPO palm oil

# Utilization of World's Agricultural Land

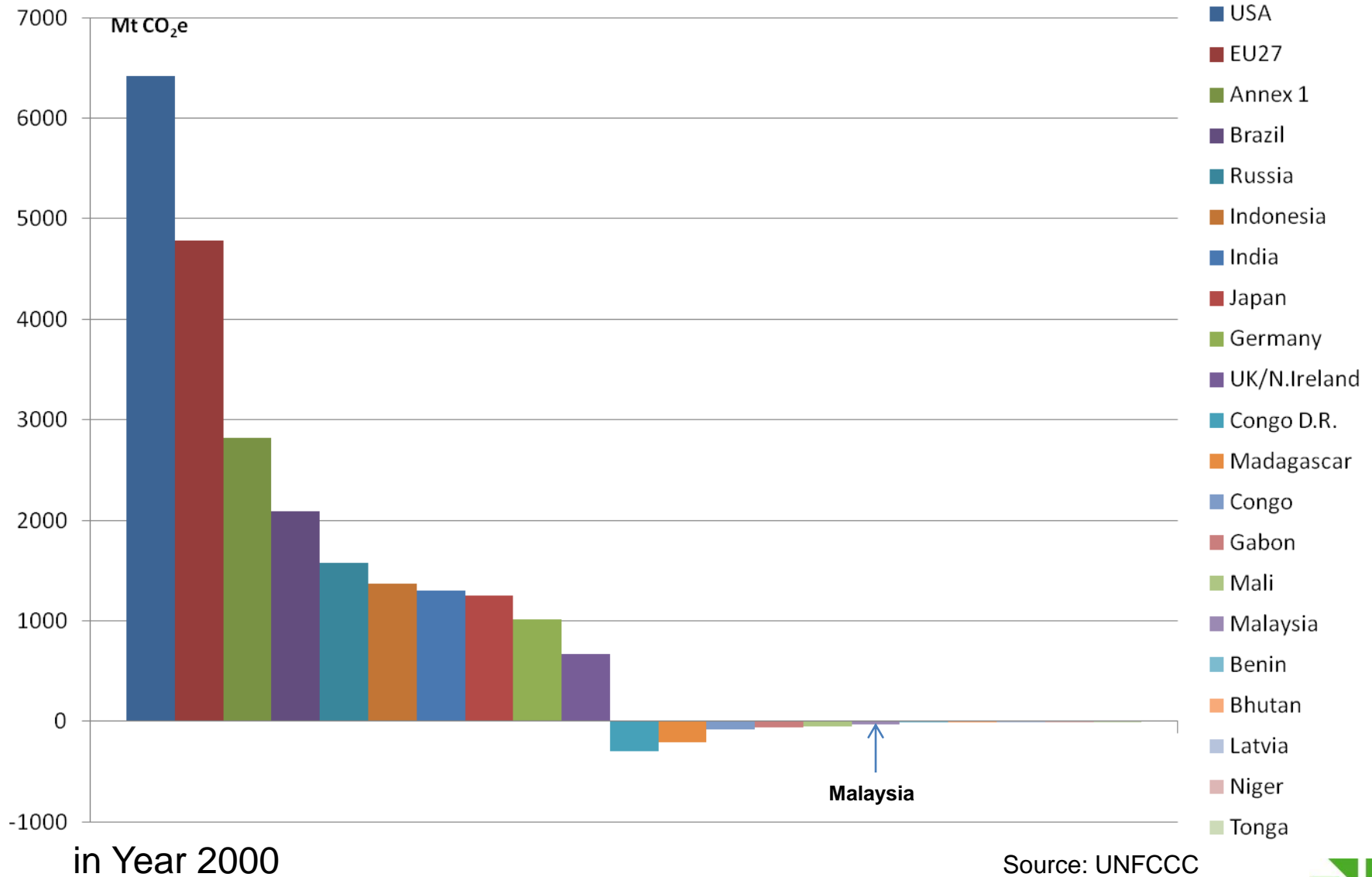


Source: FAO (2011), Oil World, MPOB (2012)

Livestock industry uses the most land and therefore is the main driver for global deforestation. Oil palm has been made a scapegoat

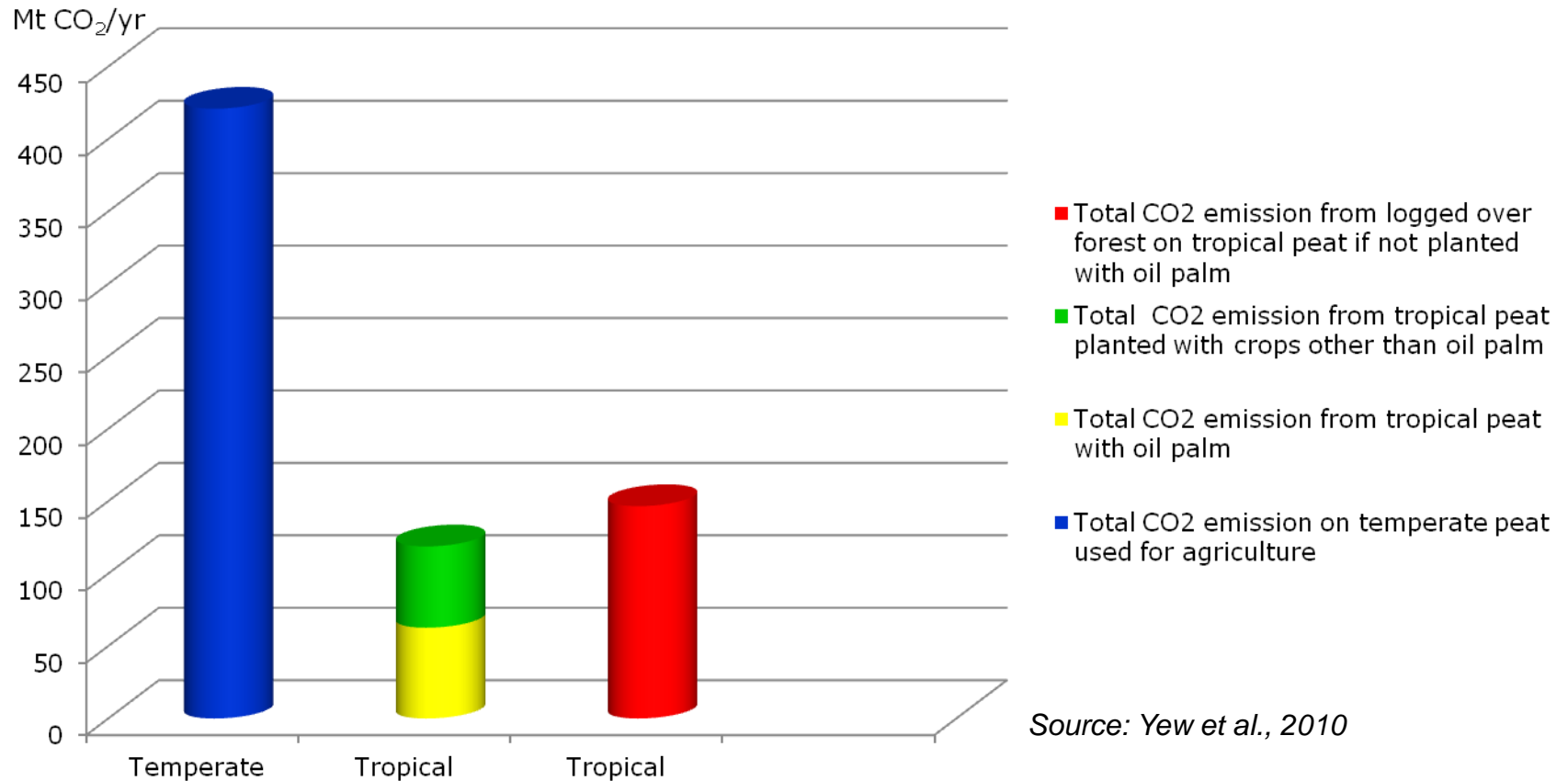


# Malaysia is a net C sink according to UNFCCC (Highest & lowest emitters in world)



# The Reality of PEATLAND USAGE

**CO<sub>2</sub> emission from peatland used for agriculture in temperate countries far exceed that in tropical countries (oil palm cultivation included)**



- CO<sub>2</sub> emission from temperate peatland used for agriculture is 3.5 times greater than in tropical agriculture
- CO<sub>2</sub> emission from oil palm cultivation on peat in SE Asia is only 12% of total global emission from agriculture on peatland

# Key Drivers That Influence Demand

- There are a few forces that drive the demand in the EU biodiesel sector, namely:-
  - ✓ Vegetable oils and crude oil price differential
  - ✓ Fiscal incentives to promote biodiesel
  - ✓ Different feedstocks in biodiesel
  - ✓ Biodiesel demand in the EU
  - ✓ Price competitiveness of biodiesel against ethanol, gasoline and diesel

# EU: Higher Domestic Biodiesel Production

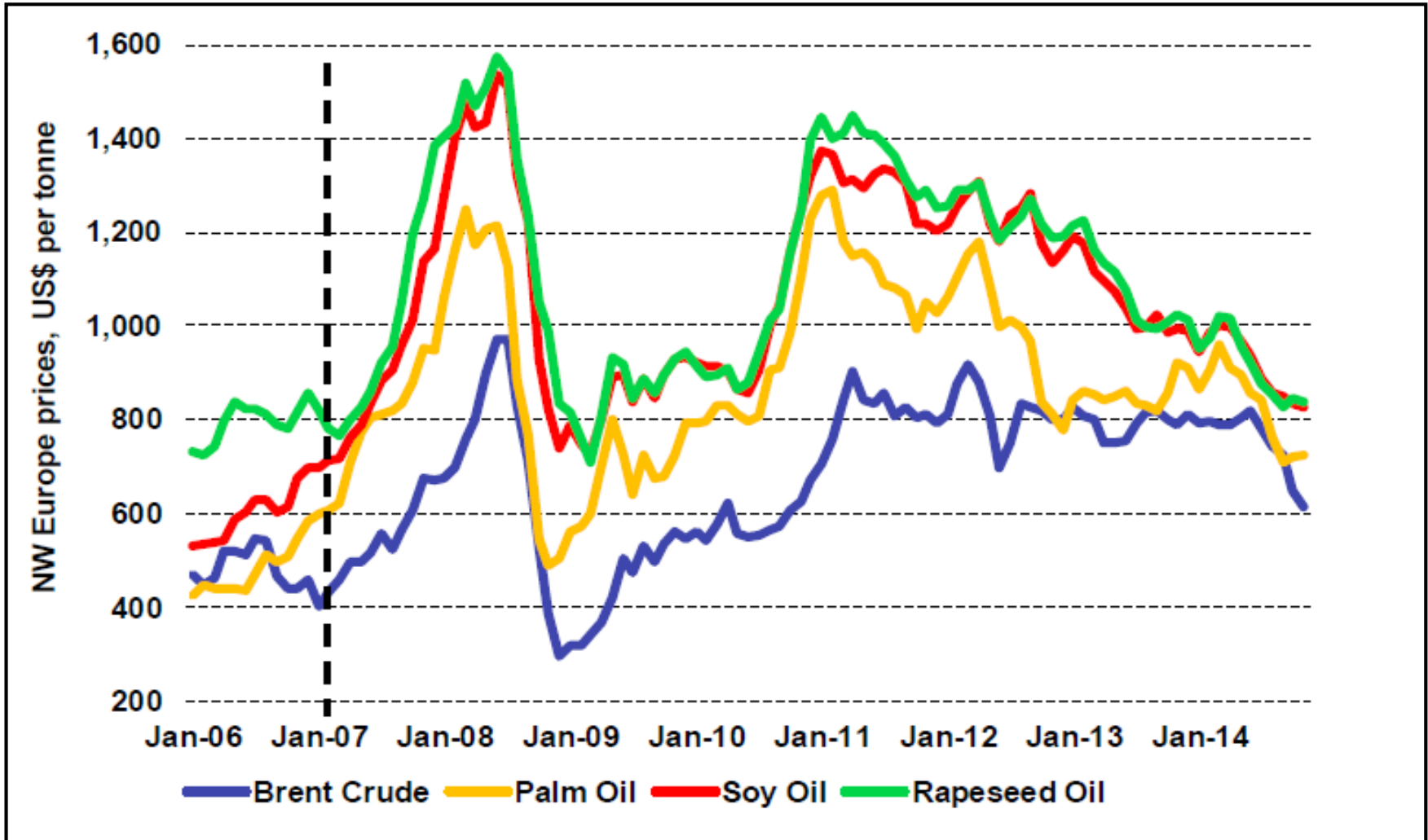
## Curbing Import Requirements

- EU biodiesel production benefited from a major setback in biodiesel imports in the vicinity of 1.4-1.5 MMT after the imposition of punitive import duties on biodiesel from Argentina and Brazil.
- The net effect was probably a decline of biodiesel consumption in the EU in 2013, as a result of partial reduction of national biodiesel mandates and double-counting of used oils and tallows.

# **Double Counting Measures and Reduced Mandates Are Affecting The Demand and Production**

- In contrast to previous expectations, EU biodiesel peaked in 2011 and domestic production does not seem to be benefiting from increased use mandates. Double counting measures in some member states, and reduced mandates since 2013 in Spain, are having a negative impact on EU demand and production.
- In addition there is an increasing competition to conventional biodiesel coming from increased production and availability of hydrotreated vegetable oils (HVO). Production of conventional biodiesel in 2012 dropped by about 11%.

# PALM OIL FEEDSTOCK PRICE IS LOWER THAN OTHER COMMONLY USED FEEDSTOCKS



Source : LMC International



# History of Malaysian palm oil biodiesel

Year	Event
July 1982	Research on palm oil biodiesel (palm oil methyl esters) carried out at laboratory scale at MPOB
October 1983	Filing of first patent
November 1984	Palm oil biodiesel pilot plant construction
1984-1985	Preliminary field testing (7 taxis)
1990-1994	Exhaustive field testing (26 commercial buses)
2002	Field testing of palm diesel with petroleum diesel blends (B2, B5, B10)
2005	Transfer of technologies to companies to build palm biodiesel plants

# Malaysian palm oil biodiesel is produced sustainably

- Many publications to showcase that Malaysian palm oil is produced sustainably by following 3Ps:-
- Take care of **Planet** with good agricultural practices
- **People** (uplift rural economy)
  - Yet makes **Profit**
  - **Reuse waste** (EFBs used as organic fertilizers, oil palm trunks for furniture)





# Oil palm cultivation conserves natural resources



**Zero burning**

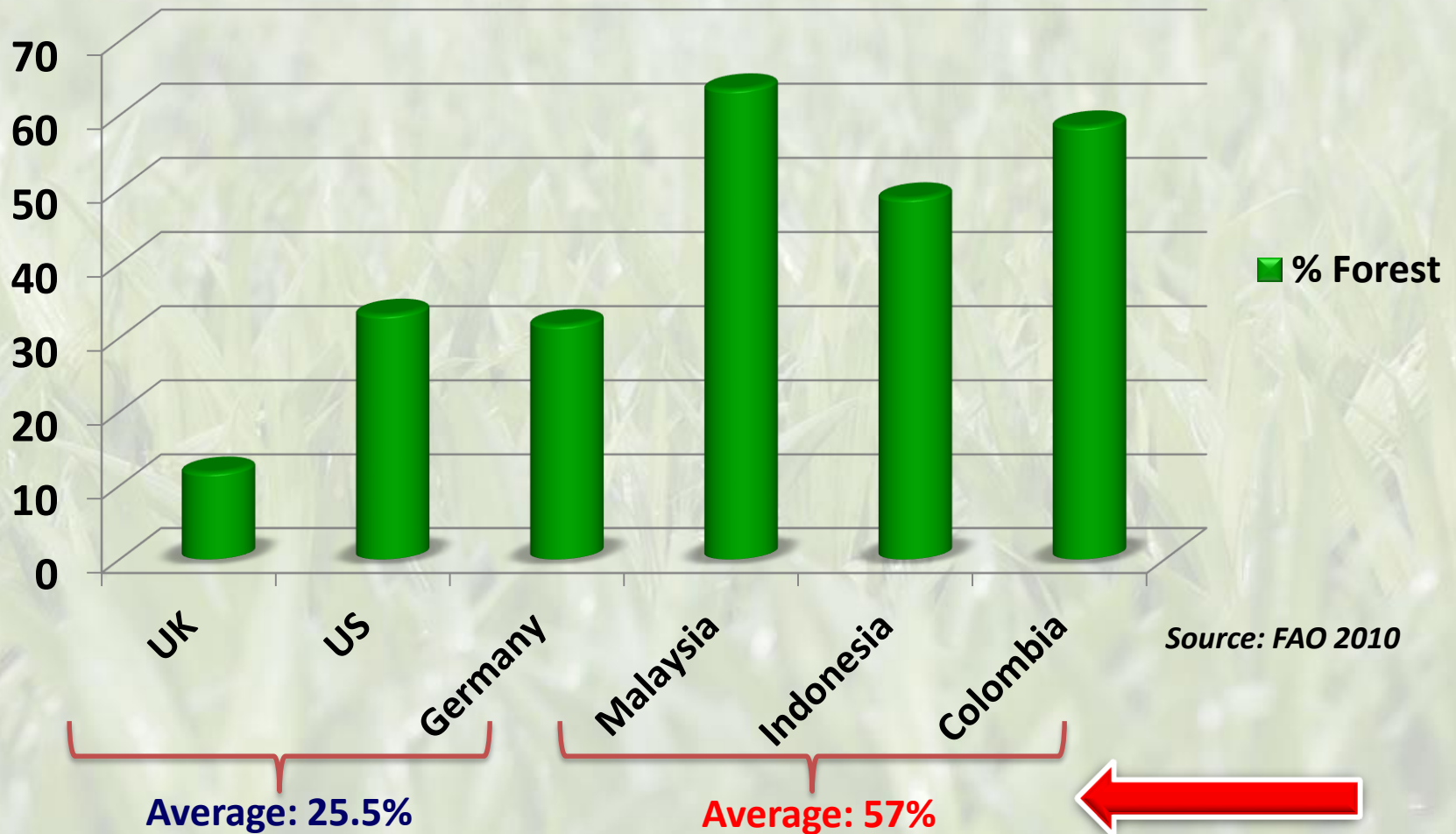


**Leguminous cover crops**

# Misconceptions on “zero deforestation”

- Oil palm growing countries are developing nations
- A developing country has sovereign right to develop some of her land so as to uplift the economy and improve livelihood of the citizens
- Most oil palm growing countries are at infancy of development
- Why can't *developing country* clear some of her land for development purposes so as to reach *developed country* status later?
- **ZERO DEFORESTATION** policy suppresses right of citizens of developing country to develop

# Oil palm growing countries have large areas under forest and must be allowed to use part of it



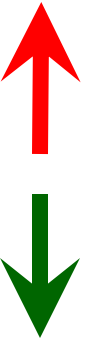
- Malaysia is still honouring her commitment 22 years after Rio Summit
- In 2013, 74% of country under forest cover



# Malaysia's deforestation rate is lowest

## Forest area & deforestation rate in selected countries (1990-2010)

Country	Forest area (Million ha)			Deforestation ( Million ha)	
	2000	2005	2010	2000-2005	2005-2010
Australia	154.92	153.92	149.30	1.0	4.62
Indonesia	99.41	97.86	94.43	1.55	3.43
Argentina	31.86	30.60	29.40	1.26	1.20
Malaysia	21.59	20.89	20.46	0.70	0.43



Source: FAO Global Forest Resources Assessment (2010)

- Malaysia would not deforest unnecessarily and will continue to use land judiciously
- Committed to Rio Summit pledge – to maintain at least 50% of total land area under forest



# Countries with Greatest Average Annual Tree Cover Loss 2011-2013

\*Tree cover loss includes both permanent deforestation and temporary cover losses

RANK	COUNTRY	AVERAGE ANNUAL TREE COVER LOSS 2011- 2013 (thousands of hectares)
1	Russia	4,319
2	Canada	2,450
3	Brazil	2,157
4	United States	1,736
5	Indonesia	1,605
6	Democratic Republic of the Congo	608
7	China	523
8	Malaysia	465
9	Argentina	439
10	Paraguay	421

*Rankings derived from an average of annual tree cover loss figures for 2011-2013. The average may represent a more accurate picture of the data due to uncertainty in year-to-year comparisons.*

*All figures calculated with a 30% minimum tree cover canopy density.*

*Data generated as update to "High-Resolution Global Maps of 21st-Century Forest Cover Change" by Hansen et al.*

# Misconceptions on “deforestation”

- Malaysia (as an example of oil palm growing country)
- Malaysia’s Land Use Capability Classification has apportioned land
  - for development (including agriculture)
  - to be kept as forests perpetually (Permanent Forest Reserves)
- Clearing of areas marked for development will be spread out over time (many years)
- Such land may still be forested at stage when converting to oil palm cultivation
- **Clearing of such land marked for development (agriculture) must not constitute “deforestation”**

# THE RIGHT PICTURE OF PLANTING OIL PALM

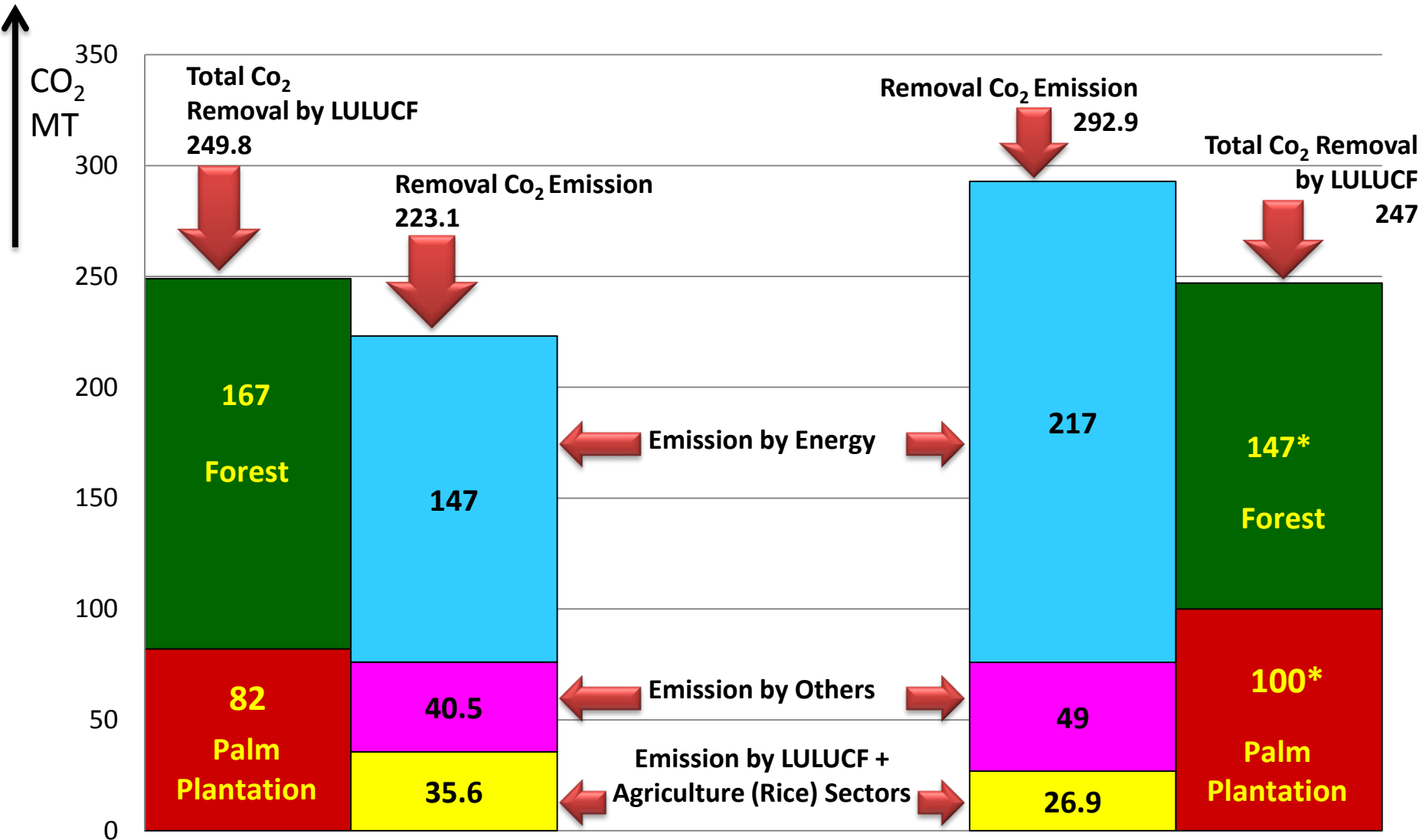
## WRONG VIEWS

- X Oil palm planting causes **deforestation**
- X Oil palm expansion must be stopped by imposing a **Zero Deforestation** policy

## CORRECT VIEWS

- ✓ **Zero deforestation** is anti-development & suppresses livelihood of citizens of poor nations
- ✓ It is sovereign right for country to use some of the land for development, including agriculture
- ✓ Oil palm is grown on such designated agriculture land
- ✓ This must not be misconstrued as **deforestation**

# MALAYSIAN GREENHOUSE GAS EMISSION AND REMOVAL



Land Use, Land Use Change and Forestry (LULUCF) is made up of Forestry and (Oil Palm) Plantation Sector

\* Trend Estimate

# Biofuel Sustainability

## EU Renewable Energy Directive Year 2011

- Greenhouse gas emission (GHG) saving from use of biofuel shall be at least 35%
- $\text{Saving} = (E_F - E_B) / E_F$   
where  $E_F$  = total emissions from fossil fuel  
and  $E_B$  = total emissions from biofuel
- Default GHG emission saving for palm oil biodiesel (process not specified) is 19%
- Palm oil cannot meet the threshold value
- Cannot qualify as a renewable source

# Great potential to improve GHG savings for palm oil biodiesel

Biodiesel source	Sunflower	Palm oil
Total emissions (CO2/t biodiesel)	2,008	1,711
Fertilizer use (kg/t)	688	112
Fertilizer application (kg/t)	294 (49% of total LCA emissions)	125 (14% of total LCA emissions)
Pesticide use (kg/t)	32	32
Cultivation & harvesting (kg/t)	397	49
Transport to crusher/mill (kg/t)	29	37
Waste from milling (kg/t)	0	876 (51%)..much can be done without affecting yield
Oil extraction/Milling (kg/t)	133	18
Refining (kg/t)	26	26
Oil transport (kg/t)	18	45
Esterification (kg/t)	391	391

**IMPLICATION:** reducing fertilizer use result in lower crop yield for sunflower

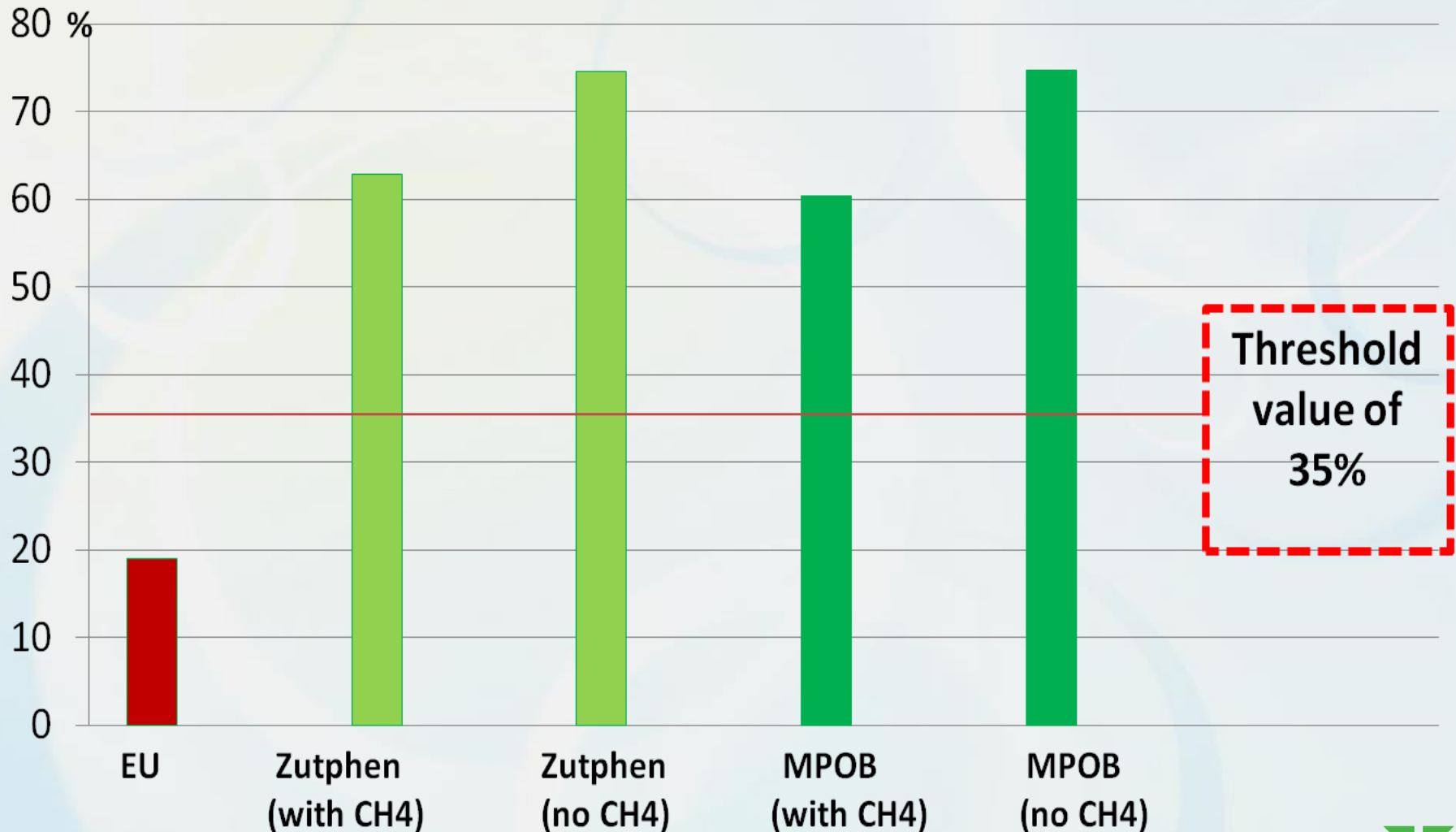
Limited ability to reduce C footprint for annual vegetable oil crops

Palm oil has big possibility to reduce C footprint



# EU Directive

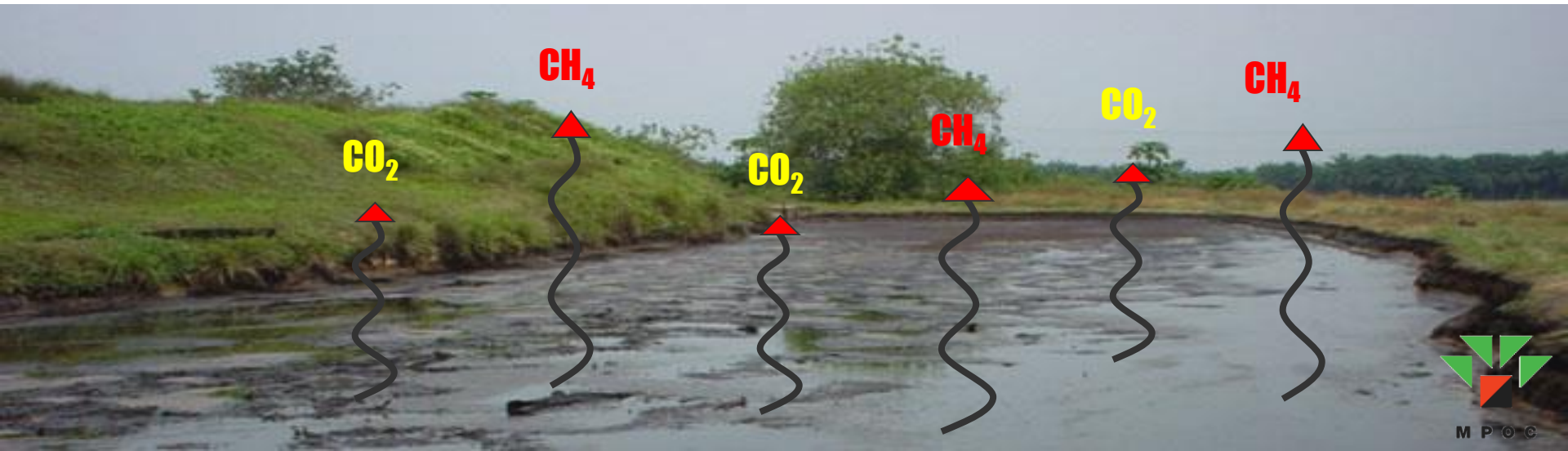
## Malaysian palm oil biodiesel can meet GHG emission reduction



# Treatment of Palm Oil Mill Effluent (POME)

Department of Environment, Malaysia has strict laws which disallow the direct discharge of palm oil mill effluent (POME) into the waterways. POME has high content of organic waste materials. Treated to reduce its BOD levels before discharge.

- These wastes are channeled into a series of ponds.
- First pond is cooling pond where wastes are kept for a day.
- Second pond is anaerobic pond where it remains for 45-60 days.
- Third pond is facultative pond where it remains for 20 days. Mixture of anaerobic & aerobic conditions.
- Fourth & fifth ponds are shallow algae ponds. Retention time of 7 days each.
- Can only discharge into water ways after all these steps.



# PALM OIL MILL EFFLUENT (POME) PONDS

- Overall view of effluent ponds
- Anaerobic breakdown of organic matter
- Produces methane (60-70%) & CO<sub>2</sub> (30-40%) & traces of H<sub>2</sub>S
- Methane is major source of NCGG (non CO<sub>2</sub> GHG) in palm oil biodiesel production
- So if this is got rid of the LCA figures will be much improved



# Malaysian Government/Palm Oil Initiatives

## National Key Economic Areas (NKEA)

### Economic Transformation Programme (ETP)

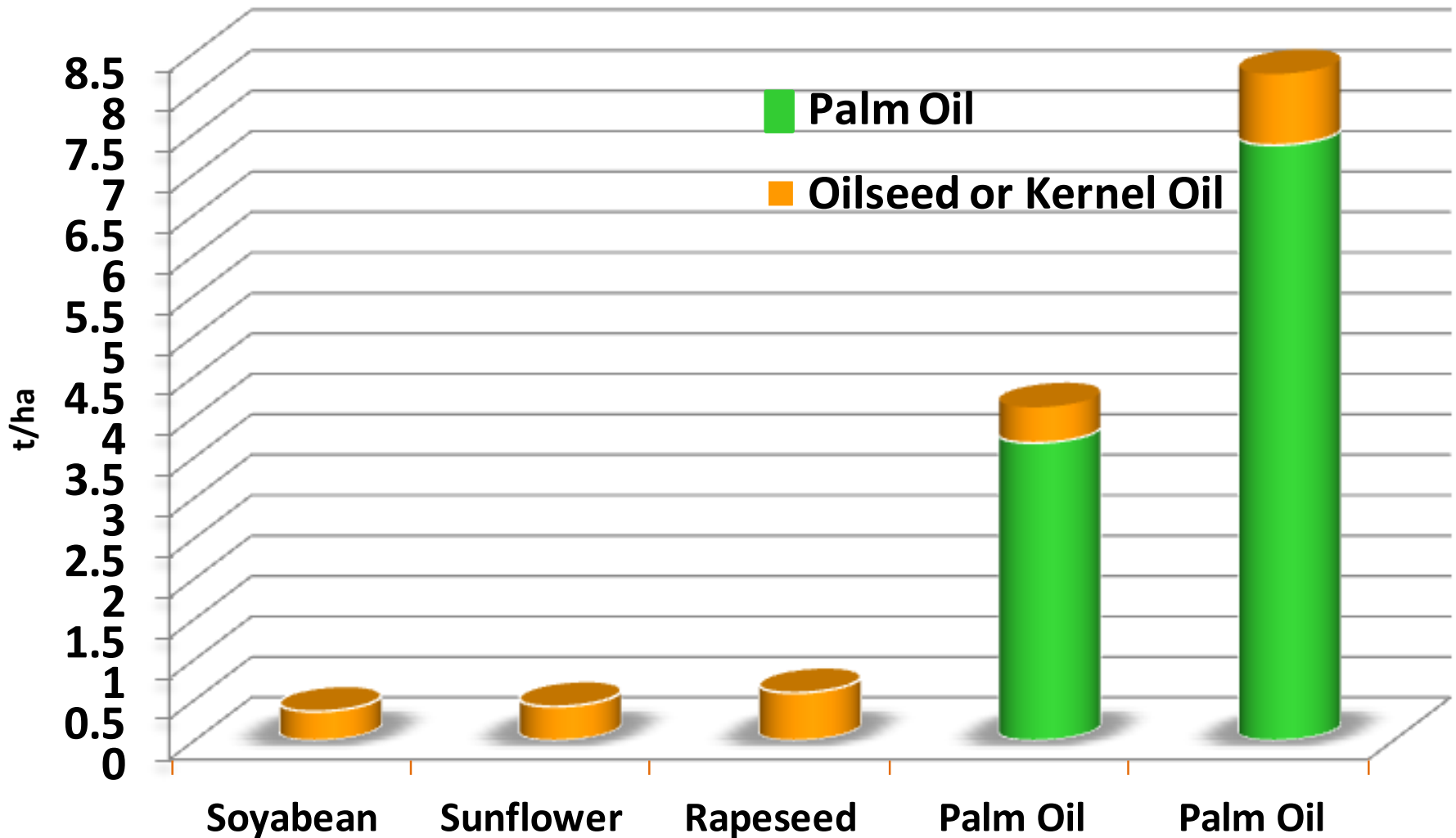


Palm Oil & Rubber

#### Palm Oil Entry Point Project No.5

- Develop biogas facilities
- Transform to RE and use it at site or link to National Electricity Grid
- By 2020 all palm oil mills will not be emitting methane to atmosphere

# High land productivity is key to oil palm sustainable production



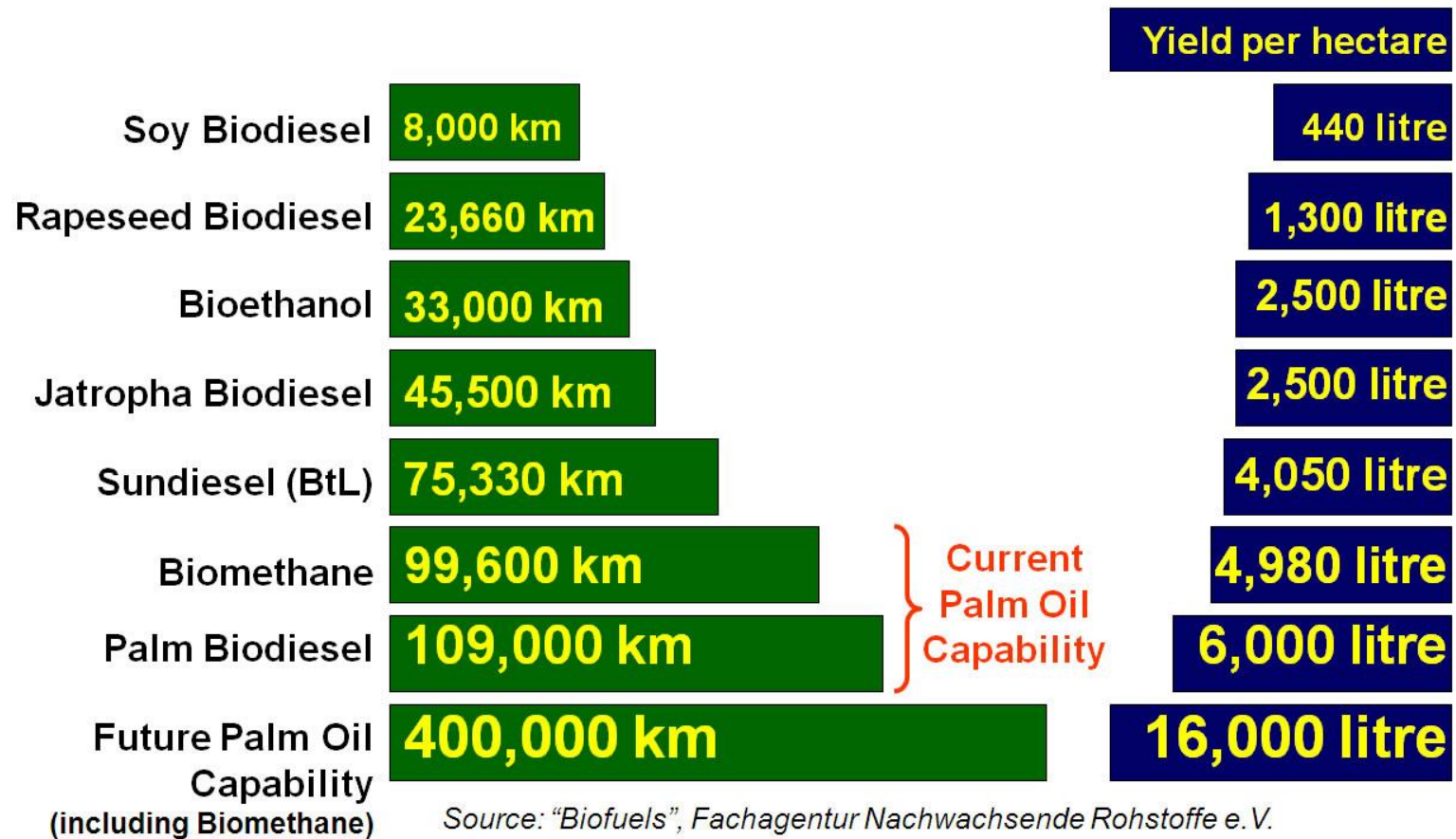
- Oil Palm produces 11x more than Soyabean, 10x Sunflower & 7x Rapeseed
- Less deforestation as less area to produce same amount of oil
- High yield per area basis

**Future  
Potential**



# Oil palm's very high yield per hectare is a key sustainability factor

**Milage per hectare per year  
- based on a VW Polo -**



Source: "Biofuels", Fachagentur Nachwachsende Rohstoffe e.V.  
(FNR), 2006 and own data

# DIRECT LAND USE EFFECTS

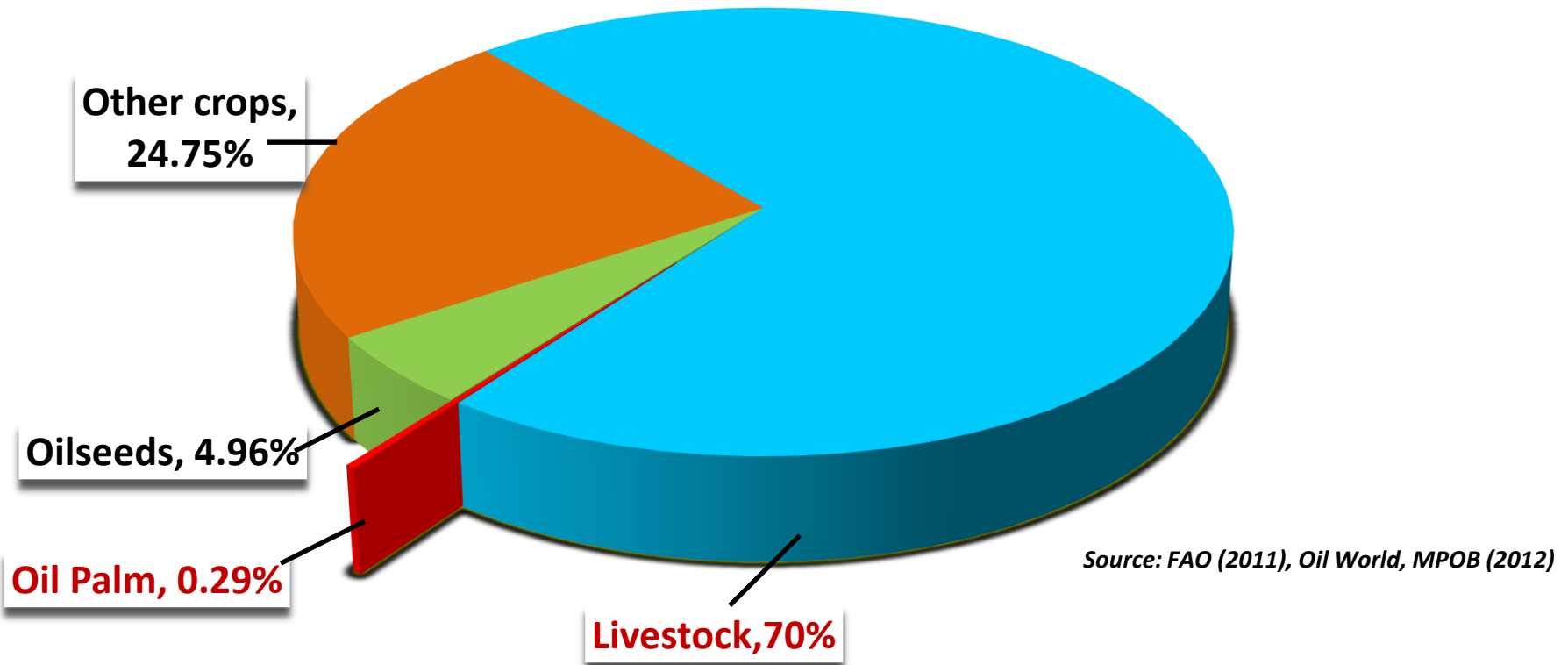
## Cultivated Area of Oil Seeds in the World in 2014

Land Use Type	Total Area (million ha)	As % of Area
Total Agricultural Land *	4267	100
Oil Seeds **	276	6.47
Soyabean **	120	2.81
Rapeseed **	35	0.82
Sunflower **	25	0.59
Oil Palm **	17	0.40
Coconut **	10	0.23
Other Oil Seeds **	69	1.62
Malaysian Oil Palm	5.3	0.12

Sources: \* FAO \*\* Oil World

\*\*\* Oil palm cultivation occupies **6.2%** of total land area planted with oil crops  
 & **0.40%** of world agricultural land  
 Direct Land Use effect on land utilization globally is small

# Oil palm's footprint in land use is very small



Agriculture production needs land. Direct land use effect of palm oil feedstock is very small relative to other forms of agricultural land use



# Direct Land Use Effect if Malaysia stops future growing of oil palm

Year	2025	2040	2080
Population (billion)	7.9	8.5	9.1
Projected additional <b>palm oil</b> needed to be supplied by Malaysia (million MT)	2.7	5.3	7.7
Estimated additional land needed for palm oil cultivation in Malaysia (m ha)	<b>0.7</b>	<b>1.4</b>	<b>2.1</b>
Additional land needed to cultivate <b>Rapeseed</b> to offset this palm oil cultivation (m ha)	<b>4.5</b>	<b>9.0</b>	<b>13.4</b>
Additional land needed to cultivate <b>Sunflower</b> to offset this palm oil cultivation (m ha)	<b>5.7</b>	<b>11.3</b>	<b>17.0</b>
Additional land needed to cultivate <b>Sunflower</b> to offset this palm oil cultivation (m ha)	<b>7.2</b>	<b>14.4</b>	<b>21.6</b>

- 7-11 times more land needed if other oil crops used
- 21.6 m ha of land for soya cultivation in 2080 is 2/3 land area of Malaysia
- **DEFORESTATION or AVOIDANCE OF DEFORESTATION**

# Indirect land use change (ILUC)

- What is ILUC?
- Simple example
- Rapeseed diverted to make biofuel
- Creates a shortage of rapeseed
- New land cleared to plant rapeseed
- Results in ILUC effects
- Loss of new land area
- Loss of carbon stock when new land is cleared
- Other linked effects on economics, social etc.
- No consensus of which method to use to determine ILUC

# Better ILUC effect by choosing palm oil biodiesel instead of rapeseed biodiesel

- In 2012, 60% of EU's rapeseed production made into biodiesel
- Calculated that 5.69 MT of rapeseed channeled for biodiesel production
- To replenish this shortage of 5.69MT of rapeseed, land needed is shown in Table

Biofuel crop	Land area needed (m ha)
Rapeseed	9.61
Oil palm	1.55
<b>Difference (land saved by choosing palm oil biodiesel, lower deforestation)</b>	<b>8.26</b>

# Conclusions

- Palm oil biodiesel technology is 32 years old
- As a feedstock it is readily and abundantly available compared to other commonly used feedstocks
- It is obtained from a source that is sustainably grown
- In spite of that palm oil biodiesel cannot qualify as a sustainable source of biofuel for EU based on EU Directive
- However, research studies show that palm oil biodiesel GHG emission reduction saving is  $> 35\%$
- Thus, it should qualify as sustainable source of biofuel in EU
- Many people forget that agriculture involving crops needs land to grow
- Palm oil is perennial (palm) and produced throughout the year

# Conclusions

- It yields 7-11 times more per hectare compared to common biofuel crops such as rapeseed and soya
- Palm oil biodiesel therefore requires 7-11 times less land to produce same amount of biofuel
- Its direct land use effects are much lower than rapeseed or soya biofuel crops
- Oil palm cultivation does not result in much deforestation
- Palm oil biodiesel has a positive ILUC effect compared to rapeseed biofuel
- If palm oil biodiesel replaces rapeseed biofuel used in EU in 2012, 8 m ha of land could be reallocated for other purposes, including to grow more food
- Palm oil biodiesel is readily available, lower price, sustainable, has better direct and ILUC effects over other commonly used biodiesels

# THANK YOU

Follow me on Twitter:

<https://twitter.com/yusofbasiron>

The screenshot shows the Twitter profile of Dr Yusof Basiron (@YusofBasiron). The header features a large background image of palm trees and a circular profile picture of Dr Basiron. Below the profile picture, his name and handle are displayed, along with his bio: "CEO of the Malaysian Palm Oil Council. Follow for real insight into the palm oil industry." His location is listed as Malaysia, and his website is ceopalmoil.com. He joined Twitter in August 2011 and has 23 photos and videos. The statistics show 2,588 tweets, 271 following, 2,525 followers, 13 favorites, and 1 list. A "Follow" button is visible. The "Tweets" tab is selected, showing three retweeted tweets from The Oil Palm (@TheOilPalm) dated 18 hours ago. Each tweet contains a link to a report and a retweet count of 1. The bottom of the page shows a tweet from Dr Yusof Basiron dated 19 hours ago, which reads: "This report reveals the true +ve contributions of palm oil to people, planet". On the right side, there is a "New to Twitter?" section with a "Sign up" button, and a "You may also like" section with several recommended accounts: RAN Agribiz Team, RSPO, MY Palm Oil Council, GreenPalm, and MPOC Europe. A "Trends" section is also visible at the bottom right.

Dr Yusof Basiron (@YusofBasiron)

CEO of the Malaysian Palm Oil Council.  
Follow for real insight into the palm oil industry.

Malaysia  
ceopalmoil.com  
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.@robertolapira .@FattoAlimentare your protectionist attempts to smear palm oil are both untrue & misleading [bit.ly/1HGqmJY](https://bit.ly/1HGqmJY)

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