The Truth about Palm Oil | Palm Oil Milling Initiatives

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Research & Development, Sime Darby Plantation Berhad

June 17, 2019

OUTLINE

The Company

- Sime Darby Plantation – An Integrated Plantation Company

The Truth about Palm Oil

- Current Scenario & Challenges
- Facts about Palm Oil

Palm Oil Milling Initiatives

- Overview on Milling Processes & Performance
- Current Challenges & Research Prospect
- Technological Development

The Company

Sime Darby Plantation

An Integrated Plantation Company

Business Overview

Integrated Plantation Company

Upstream

Oil palm estate

Mill

Oil palm, rubber & sugarcane estates

- Developing, cultivating and managing oil palm, rubber and sugarcane plantation estates

Milling of FFB and processing & sales

- Milling of FFB into CPO and PK
- Processing and sales of rubber and sugarcane

Others

- Cattle rearing and beef production

Downstream

Refinery

Food application

Bulk and refined oils & fats

- Production and sales of refined oils and fats (which includes specialty and end-user oils and fats)

Oleochemicals, biodiesel products & derivatives

- Production and sales of oleochemicals, biodiesel products and derivatives

Others

High-yielding genome seeds

Renewables

R&D

- Focused on yield and productivity improvements, increasing revenue streams and developing sustainable practices while pursuing innovative strategies

Renewables business

- Development of green technology and renewable energy which includes bio-based chemicals, biogas and composting

Agribusiness

- Provision of agriculture products and services

Sime Darby Plantation R&D Centre

Units & Roles

Plantation Research & Advisory
Provide technical support to maximize yield & productivity:
- Continuous improvement in agro-management practices
- Reduction in chemical inputs through IPM, biofertilsers & biopesticides
- Improve nutrient & water use efficiency

Biotechnology & Breeding
Breeding for continuous improvement in yield & other desirable economic traits:
- Marker assisted breeding program
- Optimisation production & performance of oil palm clones

Advanced Agricultural Tech
Developing new technologies to support R&D and Plantation operations:
- Labour reduction through mechanisation & automation
- Precision Agriculture Data analytics

Processing Technology
Audit & Advisory to maximise mill & refinery product recovery:
- Continuous improvement in processing technology to improve efficiency & cost
- Towards zero waste
- Waste to wealth initiatives

Sime Darby Seeds & Agricultural Services
Production & sale of elite planting materials
Agro-technology and management services to external parties

Innovation Centres
Provide technical service to all global customers, develop new products and provide technical support to refineries

Minamas Research Centre
Liberia Research Centre
OPRS Dami
Regional research centres providing similar functions as PRA & Breeding for the local estates.

Upstream Portfolio Spread Across 5 Countries

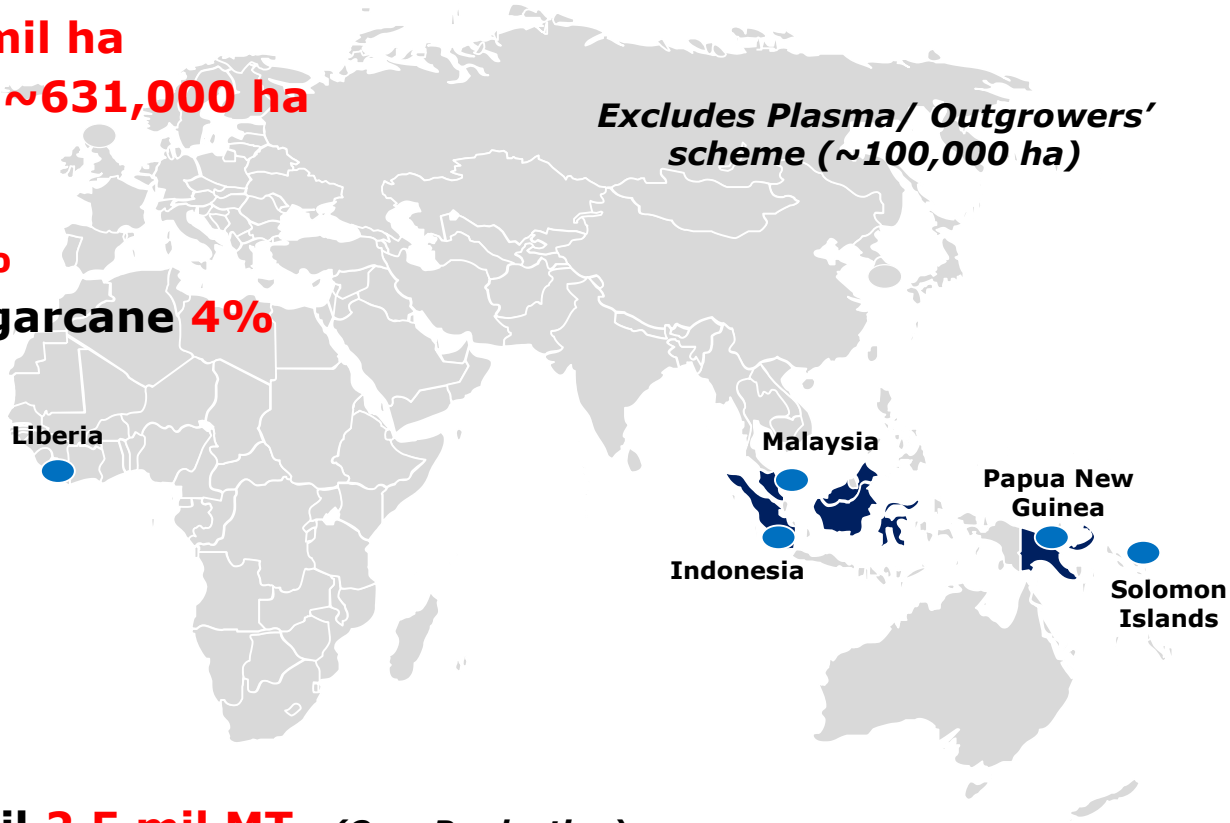
HA

- Landbank **1 mil ha**
- Planted area **~631,000 ha**

Excludes Plasma/ Outgrowers' scheme (~100,000 ha)

%

- Oil Palm **96%**
- Rubber & Sugarcane **4%**
- Cattle



#

- Estates **250**
- Mills **71**

MT

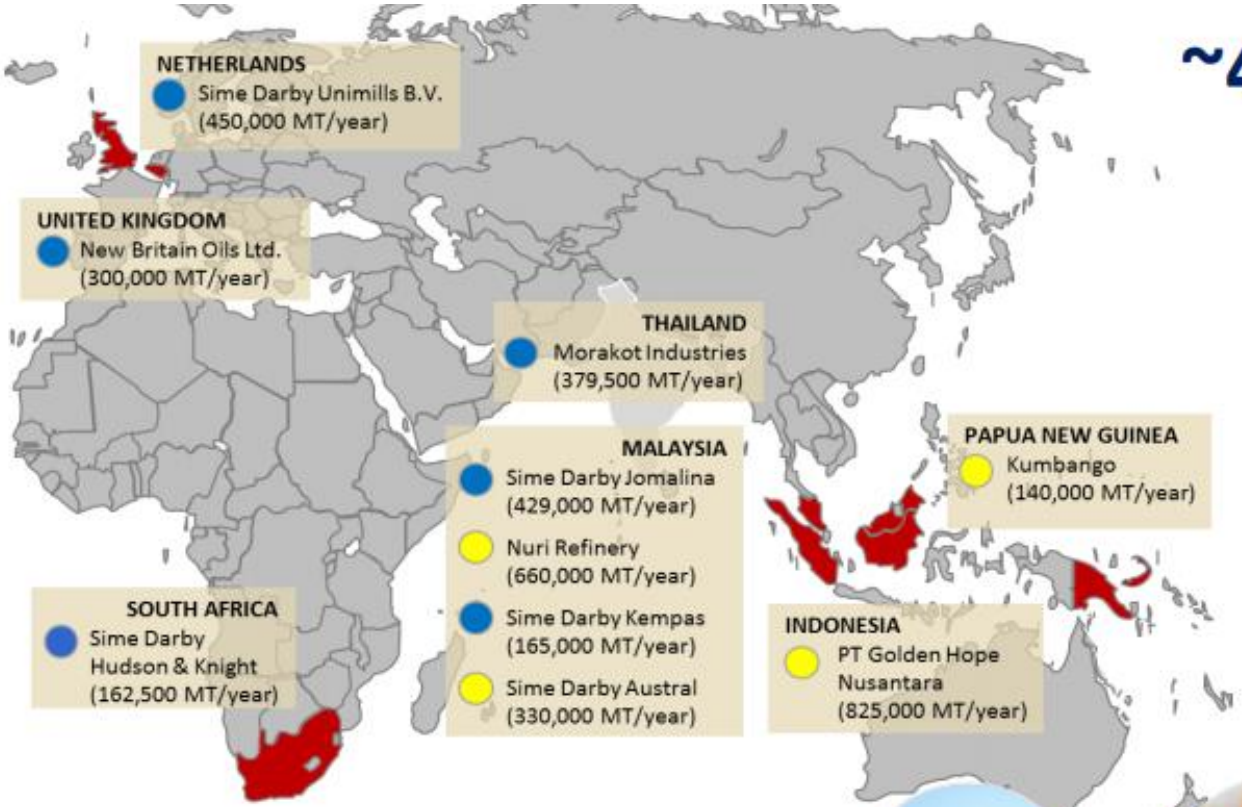
- Crude Palm Oil **2.5 mil MT** ***(Own Production)***
- Palm Kernel **0.6 mil MT** ***(Own Production)***

SDP accounts for

- *~4% of total world CPO production*
- *~ 20% of total world certified sustainable palm oil*

Snapshot – Downstream Operation

Sime Darby Plantation



~4 million MT
Refining Capacity

10*
Refineries

73%*
Average Refinery Utilisation

Key Products

Refined bulk products *produced by the Group's bulk refineries: RBD Olein, RBD Stearin, CPKO, RBD PKO, etc.*

Ingredients *produced by the Group's refineries: Bakery fats, specialty oils, confectionery fats*

Non-food products *produced by the Group's biodiesel, oleochemicals and nutrition plants*

Note: Bulk Processing, Differentiated Food

** Excluding Industrial Enterprises (IE) Soya in Thailand and GH Nhabe in Vietnam*
Figures as at 30 June 2018

The Truth about Palm Oil

Current Scenario & Challenges

Facts of Oil Palm

Rang-tan, the story of dirty palm oil

Facts about palm oil?

Source: YouTube

Play it!

Negative Perception: Anti-Palm Oil Campaign

Changing Perception : Love MY Palm Oil

Malaysia launches “Love MY Palm Oil” campaign in the face of Europe’s anti-palm oil stand

By **Anna Maria Romero** - January 11, 2019

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24 March 2019 at Sime Darby Plantation, Carey Island, Selangor.

NEW STRAITS TIMES ESTABLISHED 1845

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3 minute read

MAHB, Malaysia Airlines, AirAsia and Malindo to help promote palm oil

NEW STRAITS TIMES ESTABLISHED 1845

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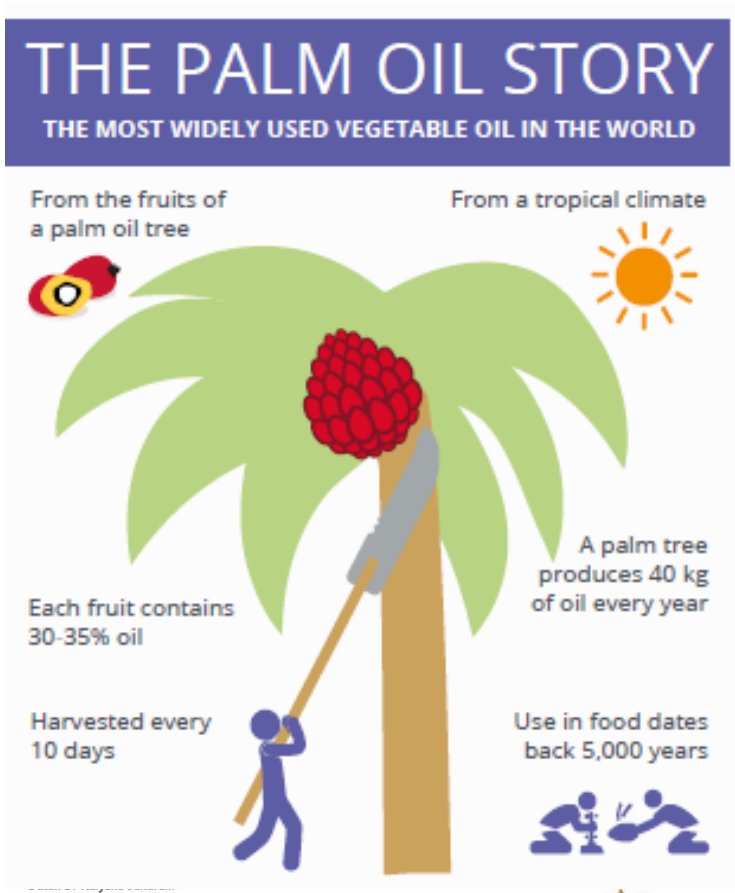
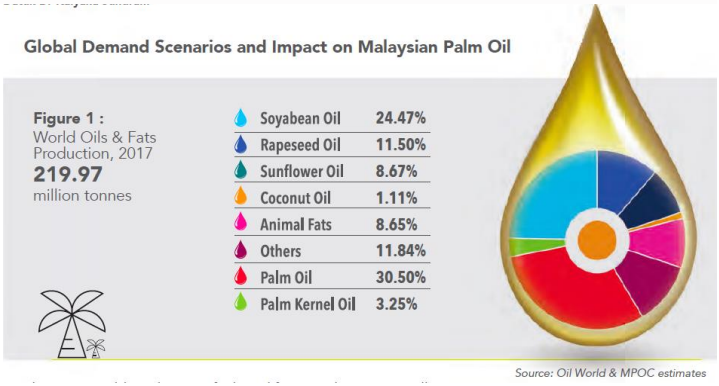
April 7, 2019

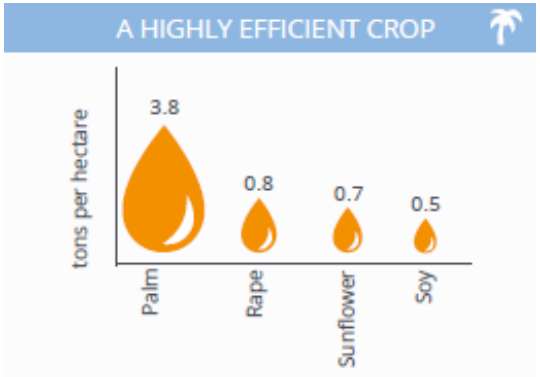
3 minute read

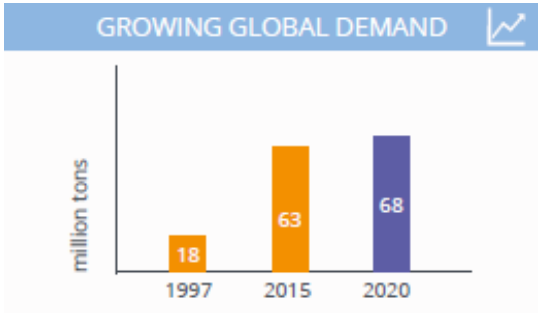
Indonesia and Malaysia unite to fight EU's ban on palm oil

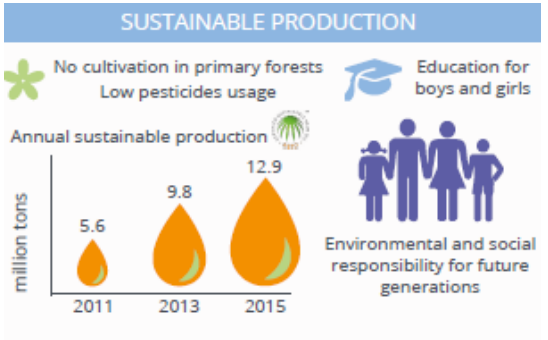
The Truth

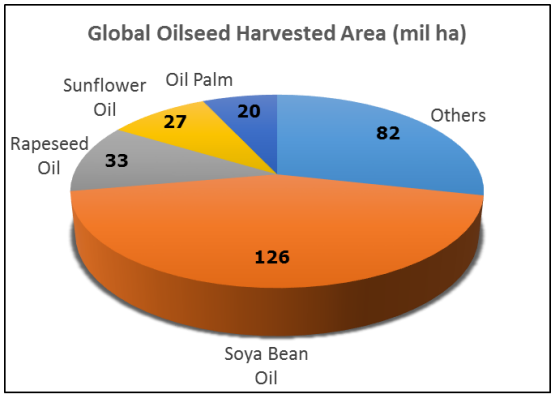










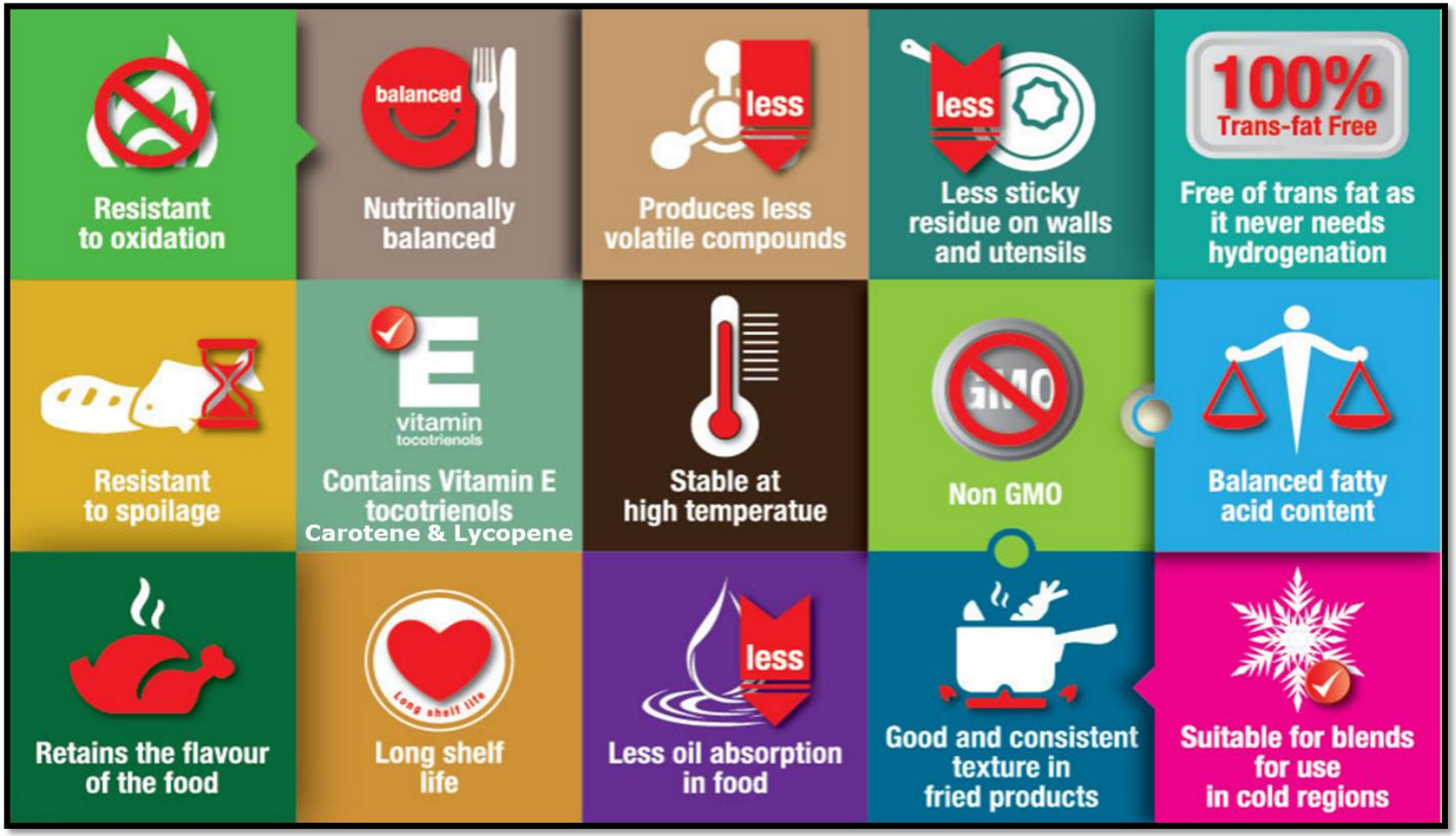


Source: FAO, Oil World 17/18

Source: European Palm Oil Alliance

Immense Health Benefits of Palm Oil

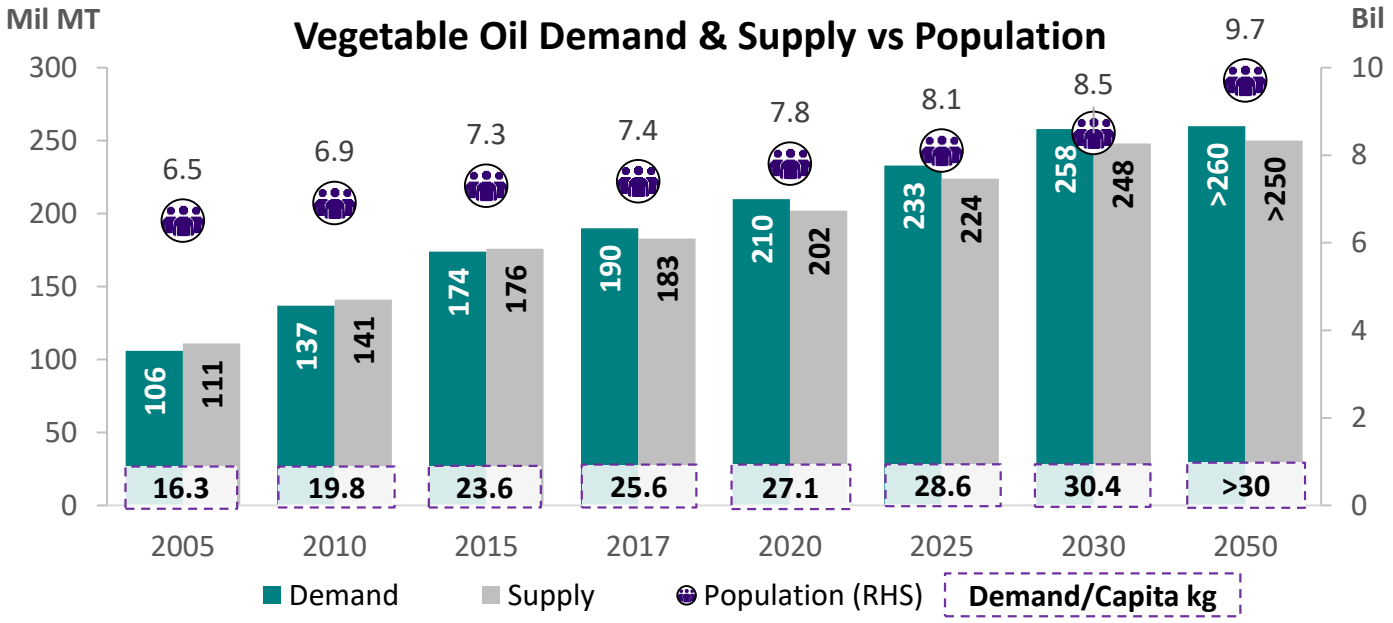
A healthier, high-carotene & trans-fat free alternative



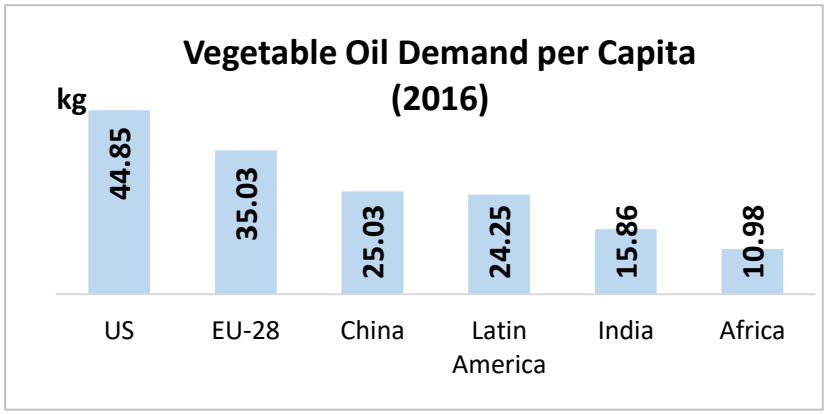
Source: MPOC

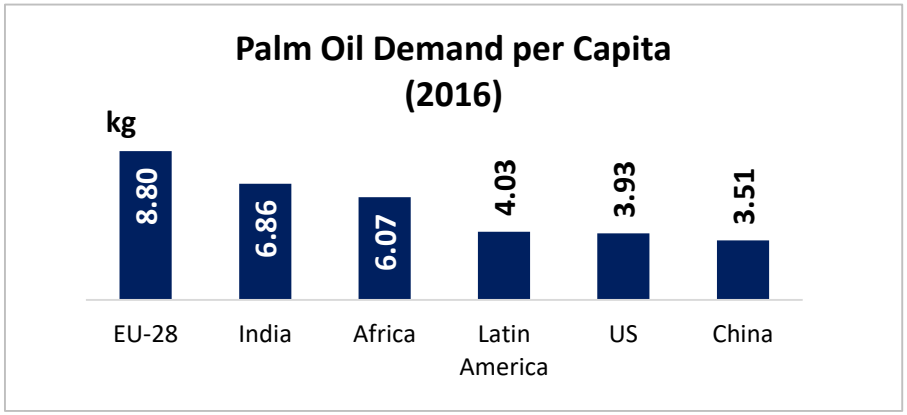
Global Vegetable Oil Demand & Supply

Population Growth is a Key Driver



Source: USDA United States Department of Agriculture, Washington https://www.fas.usda.gov/commodities
Oil World ISTA Mielke GmbH, Hamburg www.oilworld.biz





Note: Europe consumption per capita for EU-28 only, excludes Russia & Eastern Europe countries

Source: LMC Oilseeds & Oils Report 2016, United Nations, USDA

Immense Opportunities Await...

- Growing population (9.7 bil by 2050) + increased life expectancy, raising concerns over Food Security, Food Safety and Sustainability

- Global oils and fats consumption expected to increase
  - From **180 mil MT** to **250 mil MT** in the future

- Dr. James Fry's study in 2013 – that the world will lose **145 million Ha** of Forest land by the year 2050 to feed the 9.7 billion people if it uses other edible oils such as Soya, Sunflower, Rapeseed etc.
- With Oil Palm it will be less than **10 – 14 million Ha**.

145 millions hectare is equivalent to?

145 millions Ha	**=**	**2x the size of France**	**or**	**43x the size of Netherlands**	**or**	**2,111x the size of Singapore**

Source: James Fry (2016). What are the implications of a halt to all expansion in oil palm areas? PAC Seminar, Malaysian Palm Oil Board.

Immense Opportunities Await…

- Palm Oil plays a critical role in helping to feed 3 billion people in more than 150 countries worldwide
- Feeding another 2 billion people by the year 2050 is **NO** small feat
- Palm Oil will remain relevant as it is now an Irreplaceable part of the Global Food Supply Chain
- Palm Oil is expected to account for 55% of the Global Edible Oil Consumption in the next 35 years!

(Source: Global Oils & Fats. June 2017)

Palm Oil Milling Initiatives

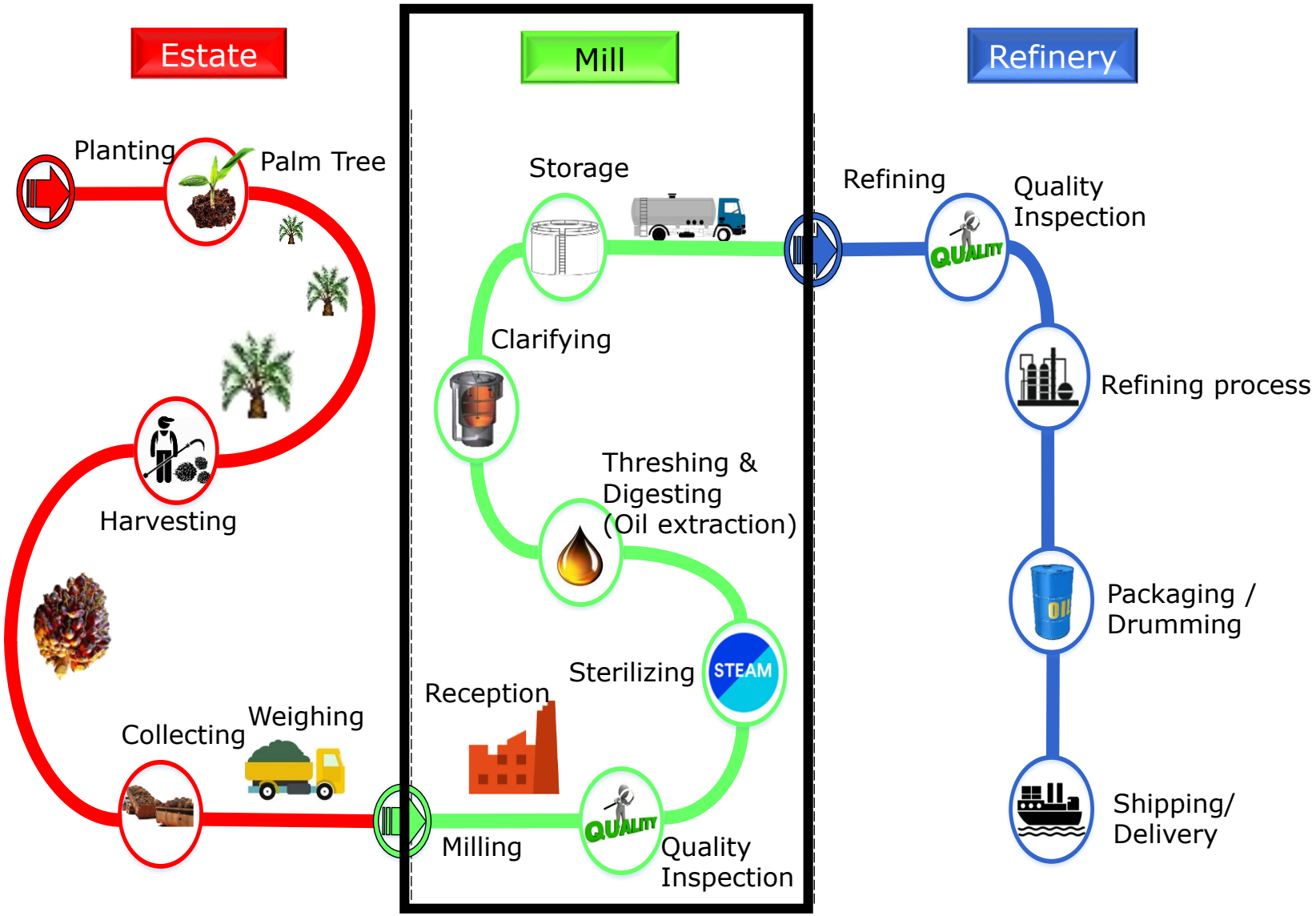
Overview on Milling Processes & Performance

Current Challenges & Research Prospect

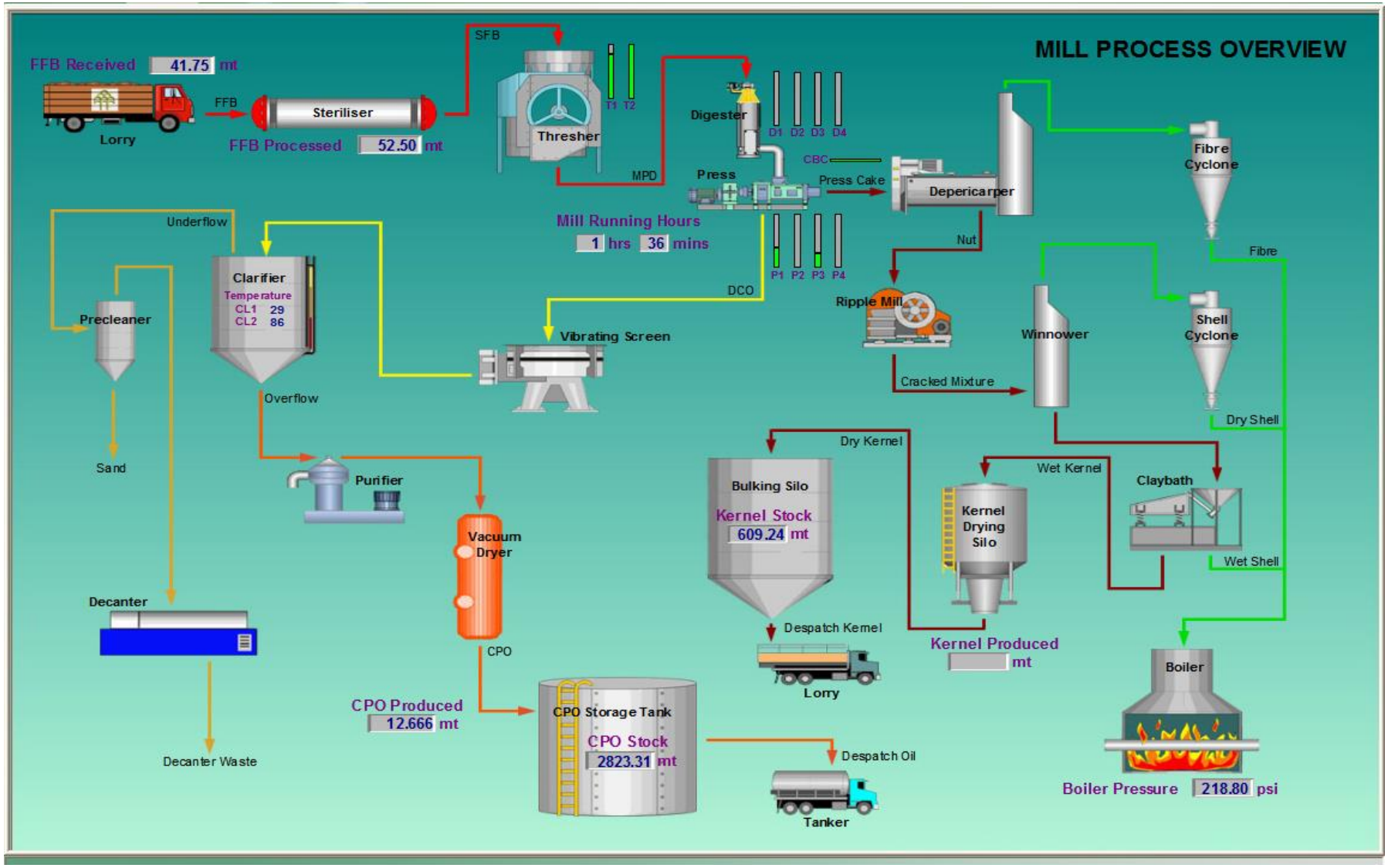
Technological Development

Oils Processing

From Oil Palm Tree to Edible Palm Oil

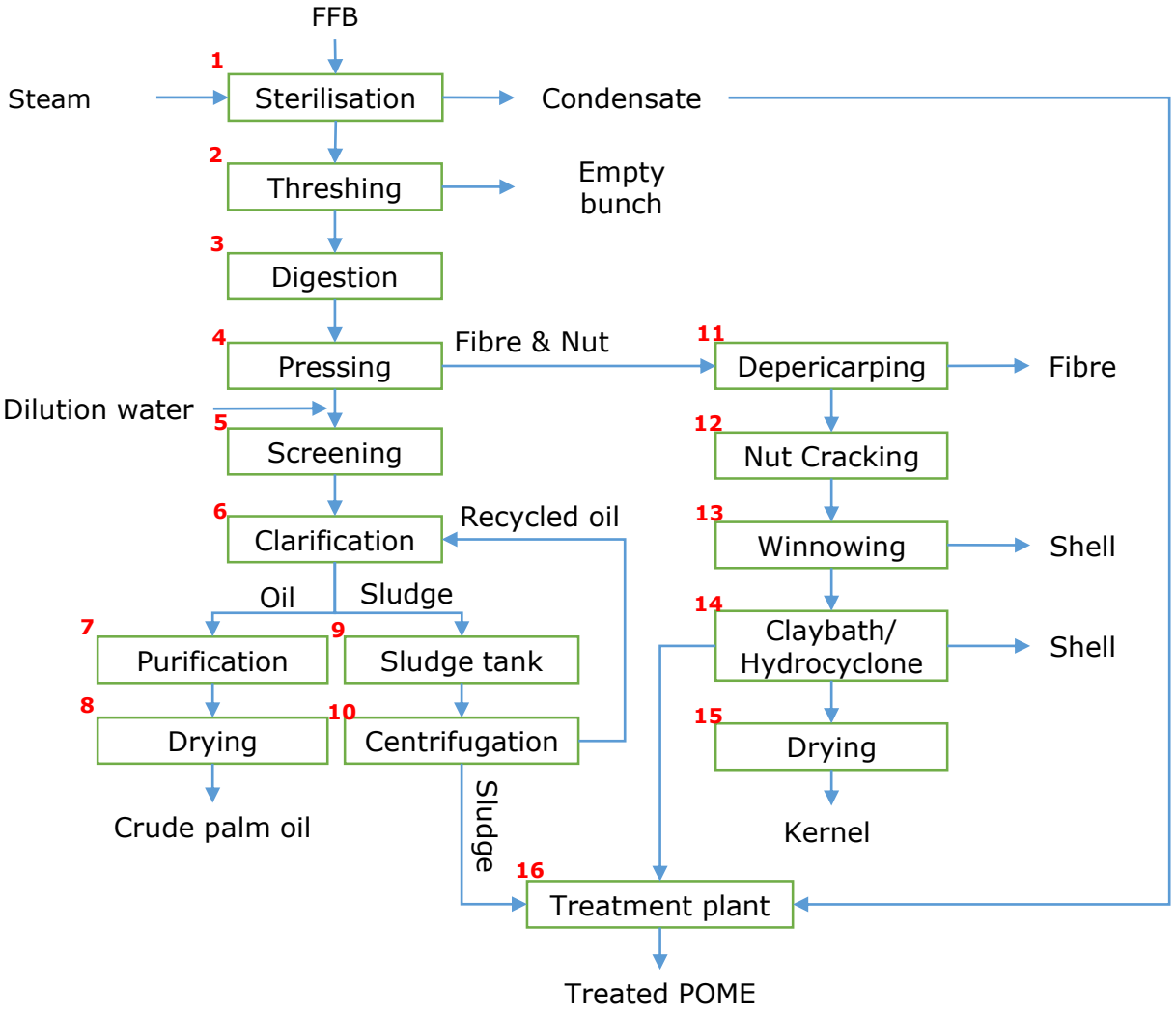


Palm Oil Milling



Oil Extraction Rate (OER) = 20-22%
Oil Losses = 1.40-1.60%

Research/Improvement Opportunities



Today's Mill Challenges

Stagnant process	• Same process for the past 30-40 years • Stagnant oil extraction and mill efficiency • Increase of operational cost
Additional New Requirement	• New parameter such as 3-MCPD and GE
High Energy Utilisation and Carbon Footprint	• Solid waste as fuel – tendency for low boiler efficiency • Malaysian commitment for 40% Carbon Emission reduction by year 2020
Stricter Emission and Discharge Limit	• More stringent effluent and boiler emission standard • More CAPEX and OPEX utilisation
Perception	• Consumer perception on non-hygienic means of oil palm fruits handling and processing during milling • GMP, HACCP, HALAL Certifications, etc
Weather	• El Nino affected the production of palm oil in Malaysia, reduce productivity and increase cost of production
Labour Issue	• Increase in wages • Human error

Research/Improvement Opportunities

Economic	**High Efficiency** 93% Oil 96% Kernel	**Low Processing Cost** RM20-25/FFB	**High Value Products** CPO, Kernel
Environmental	**Green Mill** Power 25-30kW POME 0.7-0.75/FFB	**Environmental Friendly** DOE compliance	**Zero Discharge** Liquid waste Solid waste
Technology Advancement	**Automation/ Mechanization** Manpower, human error, hazard	**Compact Mill** Multiple unit operation Large footprint	**Minimal Labour** 70-80 pax/mill
Standard	**High Safety Standard** LTIFR	**Food Grade Factory**	

Example:
High Efficiency Improvement

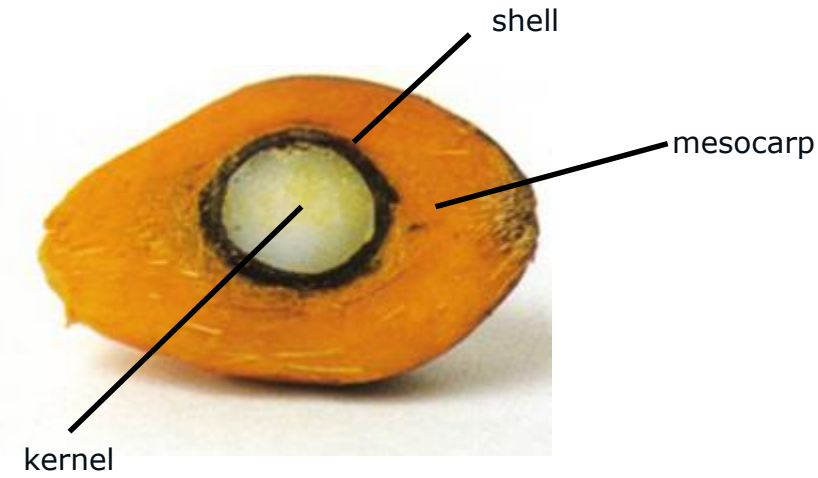
High Efficiency Improvement

- OER is Oil Extraction Rate.

Oil Input = OER + Oil Losses

$$OER = \frac{Weight\ of\ Oil\ Produced}{Weight\ of\ FFB\ Processed}$$

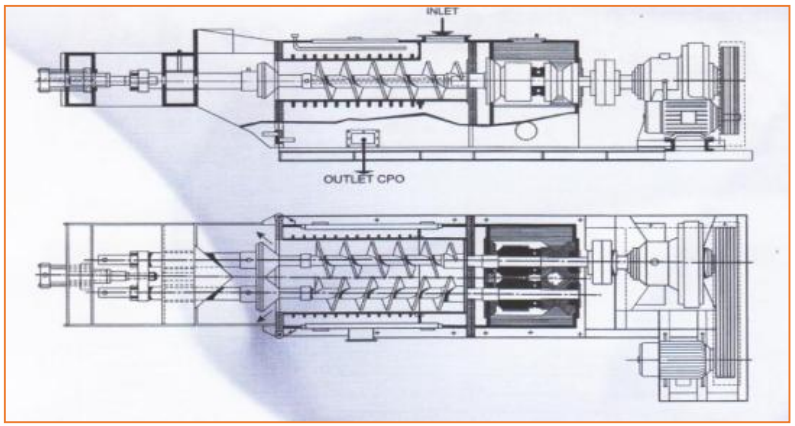
	Target
Oil loss in press fibre	0.60%
Oil loss in final effluent	0.40%
Oil loss in empty bunch	0.30%
Oil loss in decanter cake	0.10%
Total oil loss	**<1.40%**



High Efficiency Improvement

Separate Mesocarp Extraction

Screw Press-continuous process



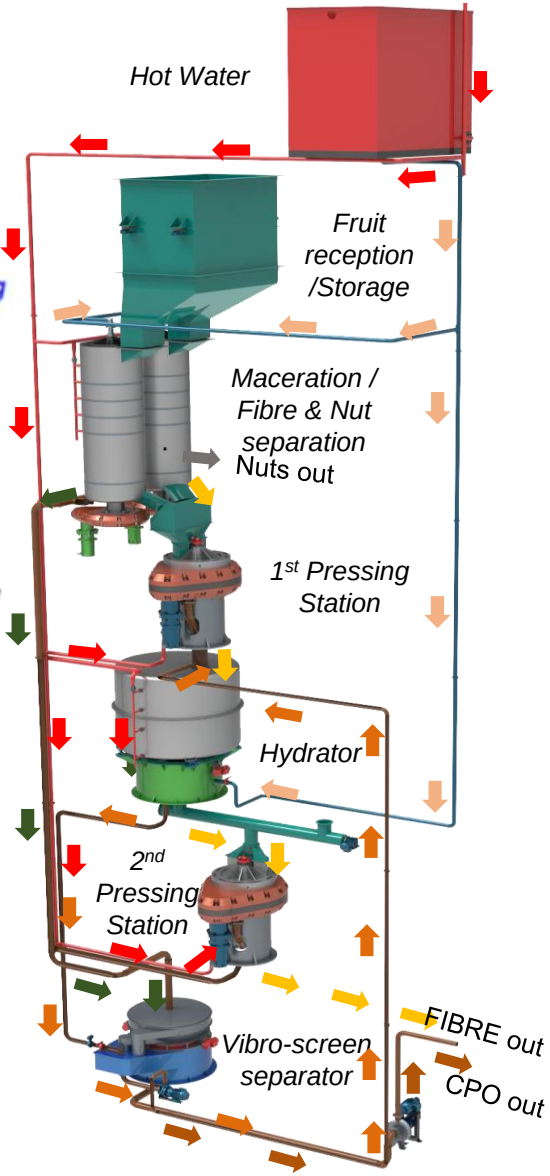
MICRONES is an acronym for
Maceration Induced Cell Rupturing
Oil Nut Extraction Synthesis

Stage I - Maceration & Nut Separation

Stage II - Tri-compression Screw Press

Stage III- Hydration

Stage IV - Tri-compression Screw Press

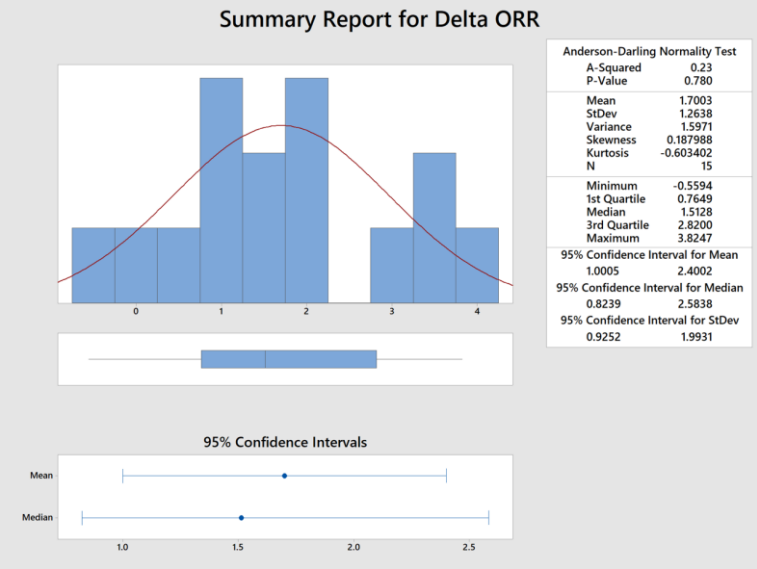


High Efficiency Improvement

Inorganic Enhancer

No	Title	Author	Summary
1	Surfactant for Oil Recovery	G.P. Ahearn	Usage of surfactant as support for the current water injection system for oil recovery
2	Improved Oil Recovery by Surfactant and Polymer Flooding	L.A. Wilson. Jr	Usage of surfactant and type of water are influence by the type of oil, pH, temperature and fluid composition
3	Biosurfactant Production by Bacillus Subtilis B20 using Date Molasses and its possible application in enhanced oil recovery	S.N. Al Bahry	Biosurfactant can reduce the surface tension and allow for additional 9.7% oil recovery.
4	Treatment of Cutting Oi/Water Emulsion by Coupling Coagulation and DAF	K.Bensadok	Usage of sulphuric acid, ferric chloride and calcium chloride can destabilize the emulsion thus assist in turbidity removal and oil recovery
5	Coagulation of Residue Oil and Suspended Solid in POME by Chitosan, Alum and PAC	A.L. Ahmad	Usage of chitosan, Alum and PAC will assist in removal of oil together with suspended solid from POME. Therefore, it cannot be used to recover oil from POME

- Evaluation conducted in 4-months period
- Results illustrates a 95% confident internal for a mean difference of 1% increase for oil recovery rate



Regression Analysis: %ORR versus Dosing, Day, Line

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Seq SS	Contribution	Adj SS	Adj MS	F-Value	P-Value
Regression	38	1238.83	97.94%	1238.83	32.6009	43.74	0.000
Day	36	1168.47	92.37%	1169.11	32.4752	43.57	0.000
Line	1	52.69	4.17%	52.69	52.6927	70.70	0.000
Dosing	1	17.67	1.40%	17.67	17.6721	23.71	0.000
Error	35	26.09	2.06%	26.09	0.7453		
Total	73	1264.92	100.00%				

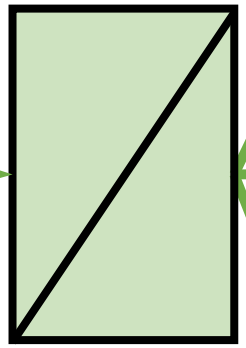
Model Summary

S	R-sq	R-sq(adj)	PRESS	R-sq(pred)
0.863335	97.94%	95.70%	115.464	90.87%

High Efficiency Improvement

Membrane Oil Recovery System

Raw POME
SS – 2-5%
Oil – 0.5-1.2%



Membrane
Oil & Biosolid
Recovery System

Oil

- Maximising oil recovery/ minimising oil losses

Filtered POME

- To reduce biological load of raw POME i.e BOD, COD, SS, etc.
- 50-60% BOD & COD reduction
- To ease and reduce effluent treatment plant cost.
- To support compliance to the new DOE effluent discharge limit.

Biosolid

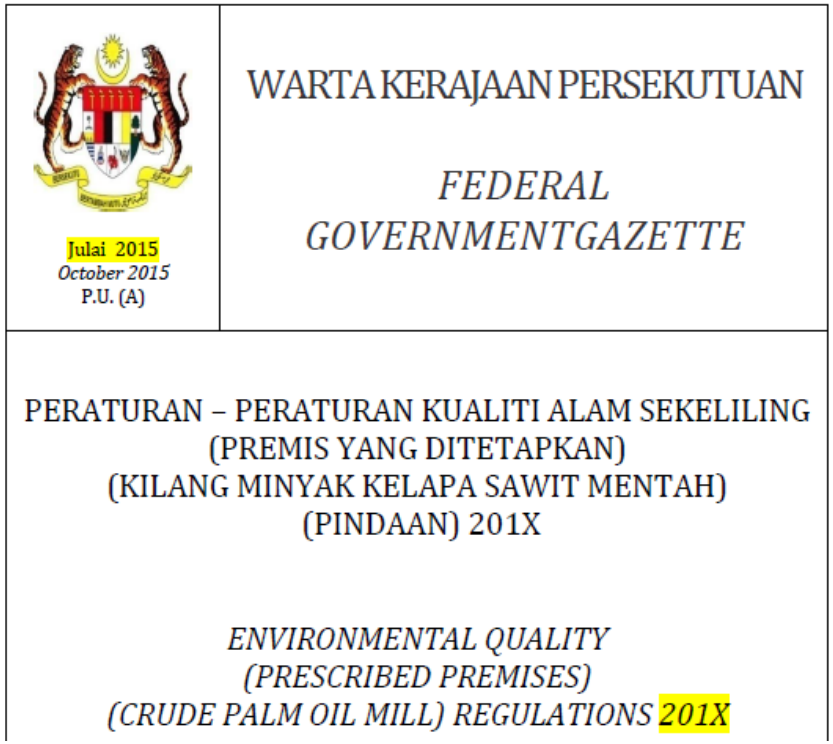
- Biosolid recovery before effluent treatment plant (ETP)

Example:
Environmental Friendly

Environmental Friendly

Department of Environment (DoE) has circulated new draft in 2015:

- More stringent on treated effluent discharge
- Proposed to be enforced by July, 2016 but deferred after hearing comments from industries.



Julai 2015
October 2015
P.U. (A)

WARTA KERAJAAN PERSEKUTUAN

FEDERAL GOVERNMENTGAZETTE

PERATURAN – PERATURAN KUALITI ALAM SEKELILING
(PREMIS YANG DITETAPKAN)
(KILANG MINYAK KELAPA SAWIT MENTAH)
(PINDAAN) 201X

ENVIRONMENTAL QUALITY
(PRESCRIBED PREMISES)
(CRUDE PALM OIL MILL) REGULATIONS 201X

JADUAL KEEMPAT

[Peraturan 24, 25, 26]

HAD-HAD PARAMETER BAGI PEMBUANGAN KE DALAM PERAIRAN PEDALAMAN ATAU PERAIRAN WILAYAH

Parameter	Had Mengikut Tempoh Pembuangan		
	Sedia ada sehingga 30 Jun 2016	1 Julai 2016-31 Dis 2019	1 ~~Jan~~ Julai 2020 dan seterusnya
Oksigen Biokimia yang diperlukan (BOD_3) 3-hari, 30°C; mg/L	100	50	20
Pepejal Terampai; mg/L	400	200	200
Minyak dan Gris; mg/L	50	5	5
Nitrogen Amonikal; mg/L	150	20	20
pH	5.0-9.0	5.0-9.0	5.0-9.0
Suhu; °C	45	45	45
Warna (ADMI unit)	-	100	100

Environmental Friendly

Fresh Fruit Bunches (FFB)

Sterilisation

Threshing

Digestion/Pressing

Oil Room
Clarification/Oil Purification & Sludge Separation

Kernel Recovery Plant
Depericarping
Nut Cracking
Kernel/Shell Separation

Power House
Boiler & Power Generation

Effluent Treatment Plant

Sterilliser condensate

Empty Fruits Bunch (EFB)

Centr.waste/ decanter h.phase

Decanter solid

Hydrocyclone/ claybath waste

Fibre

Shell

Excess fibre

Excess shell

Boiler ash/ clinker

Anaerobic solid

Aerobic solid

Final Discharge Water

CPO

Kernel

EFB: 22-23% to FFB

Fibre: 12-13% to FFB

Shell: 6-8% to FFB

POME: 60-75% to FFB

Environmental Friendly

Fresh Fruit Bunches (FFB)

Sterilisation

Threshing

Digestion/Pressing

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Clarification/Oil Purification & Sludge Separation

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Power House
Boiler & Power Generation

Effluent Treatment Plant

CPO

Kernel

Sterilliser condensate

Centr.waste/ decanter h.phase

Hydrocyclone/ claybath waste

Fibre

Shell

Empty Fruits Bunch (EFB)

Compost

Mulching in oil palm plantation

Decanter solid

Organic fertilizer

Excess fibre

Compost

Excess shell

Road surface

Boiler ash/clinker

Surface landfill/compost

Anaerobic solid

Aerobic solid

Final Discharge Water

Organic fertilizer

Biogas

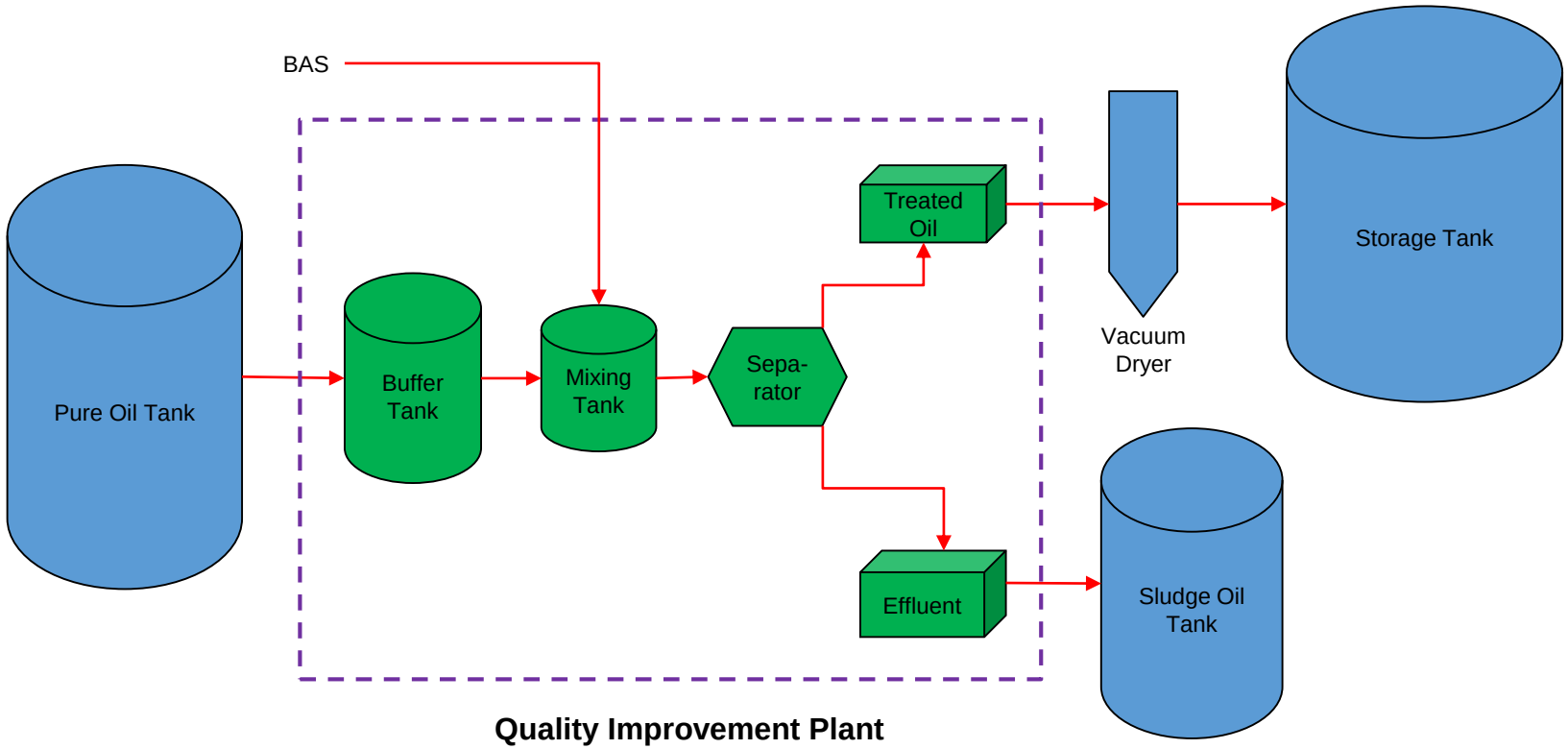
Recycled as process Water or boiler water feed

Environmental Friendly

Effluent Treatment System

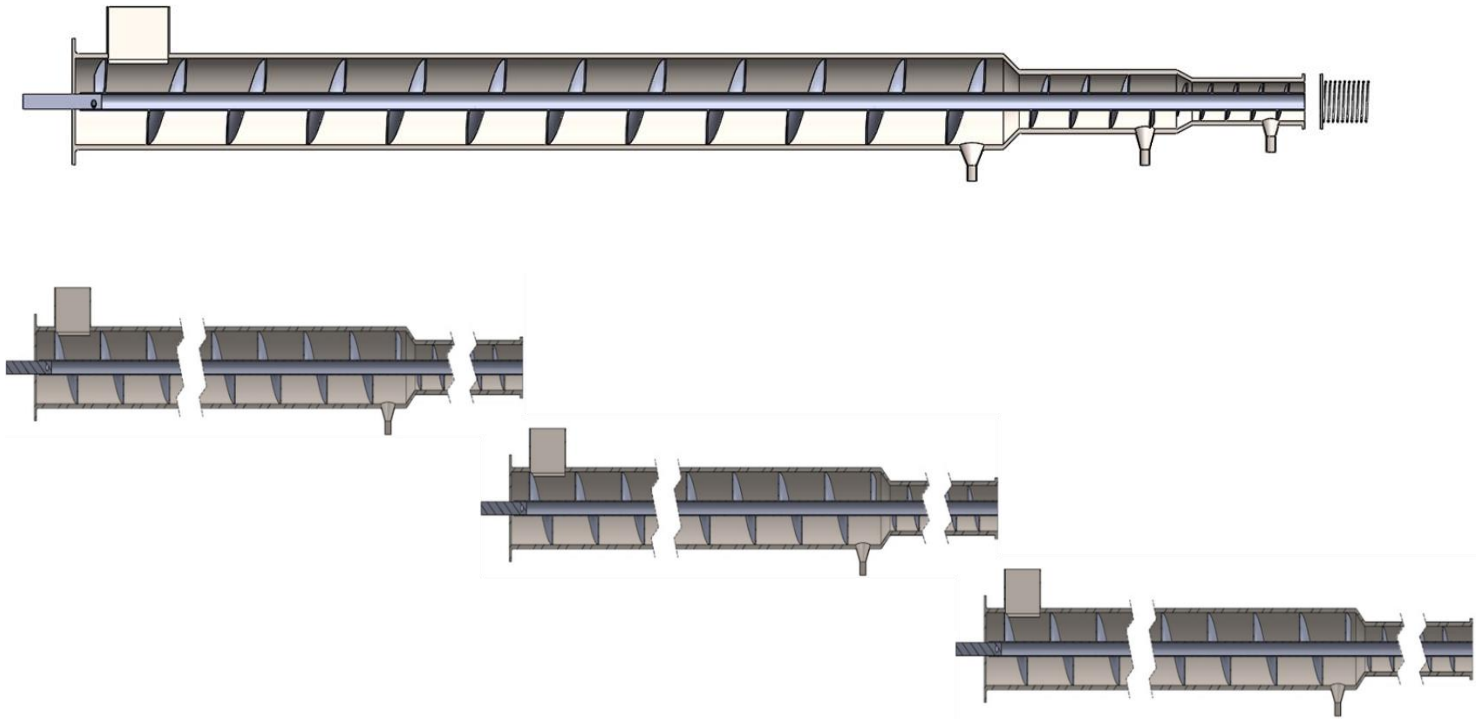
Example:
High Value Products -Oil Quality Improvement

Palm Oil Washing with Bio-based Solution



- Improve the CPO quality (FFA, 3-MCPD)
- Highly Commended for Palm Oil Award, IChemE 2018
- Patent filing: WO2016167638A1 (PCT Filing)
  PI 2018702151 (Malaysia)
  P00 2017 03656 (Indonesia)

Separate Loose Fruits Processing



- Improve the CPO quality
- Reduce Steam Consumption
- Reduce Oil Loss in EFB
- Patent filing: PI 2018000689 (Malaysia)

Example:
Technology Advancement Improvement

Experimental Plant

Pilot Plant

- Carey Island
- Fundamental Study
- Control Trials
- Laboratory to pilot scale trials

Experimental Station

- Bestari Jaya
- Pilot to commercial study
- 200+ sensors
- Pilot to commercial trial
- Mill optimization

THANK YOU

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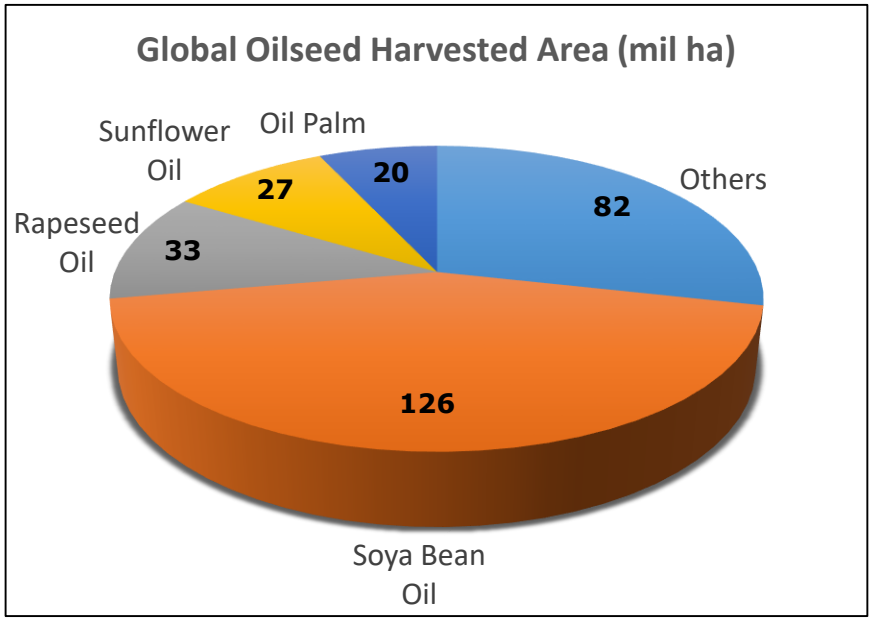
Sime Darby Plantation

Appendix

The Truth



Source: FAO, Oil World 17/18

Emits **8-10x** more O_2

Absorbs **10x** more CO_2

Per ha/year compared to other crops

CEO'S REPORT

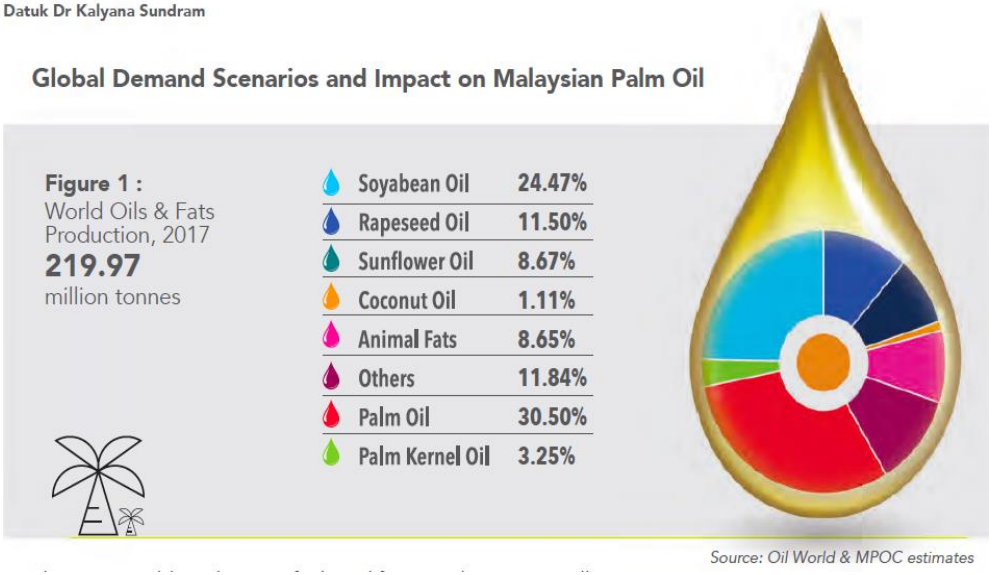
Datuk Dr Kalyana Sundram

Green cover for 97% of the total oil palm areas

The oil palm industry is a net carbon sink

Oil Palm plantations are capable of removing as much CO2 as tropical forests

Source: MPOC, The New Straits Times, MPOB, Oil World 17/18, Palm Oil Action Group Australia, The Guardian 2014



Source: MPOC Annual Report 2017

Sime Darby Plantation

WWF

OUR WORK SPECIES PLACES ABOUT US HOW TO HELP Search DONATE ADOPT

WORLD WILDLIFE MAGAZINE SUMMER 2018

IN-DEPTH

WHAT ARE THE BIGGEST DRIVERS OF TROPICAL DEFORESTATION?

THEY MAY NOT BE WHAT YOU THINK

THE FOOD BEHIND DEFORESTATION

Beef and soy production are driving **more than two-thirds of the recorded habitat loss** in Brazil's Amazon and Cerrado regions and Argentina and Paraguay's Gran Chaco region. Demand for soy is closely connected to demand for beef and other animal proteins. Between 70% and 75% of all soy becomes livestock feed—for chickens, pigs, and farmed fish, as well as for cows.

No.1

BEEF

Beef production is the top driver of deforestation in the world's tropical forests. The forest conversion it generates more than doubles that generated by the production of soy, palm oil, and wood products (the second, third, and fourth biggest drivers) combined. Beef also drives conversion of non-forest landscapes, from grasslands to savannas.

No.2

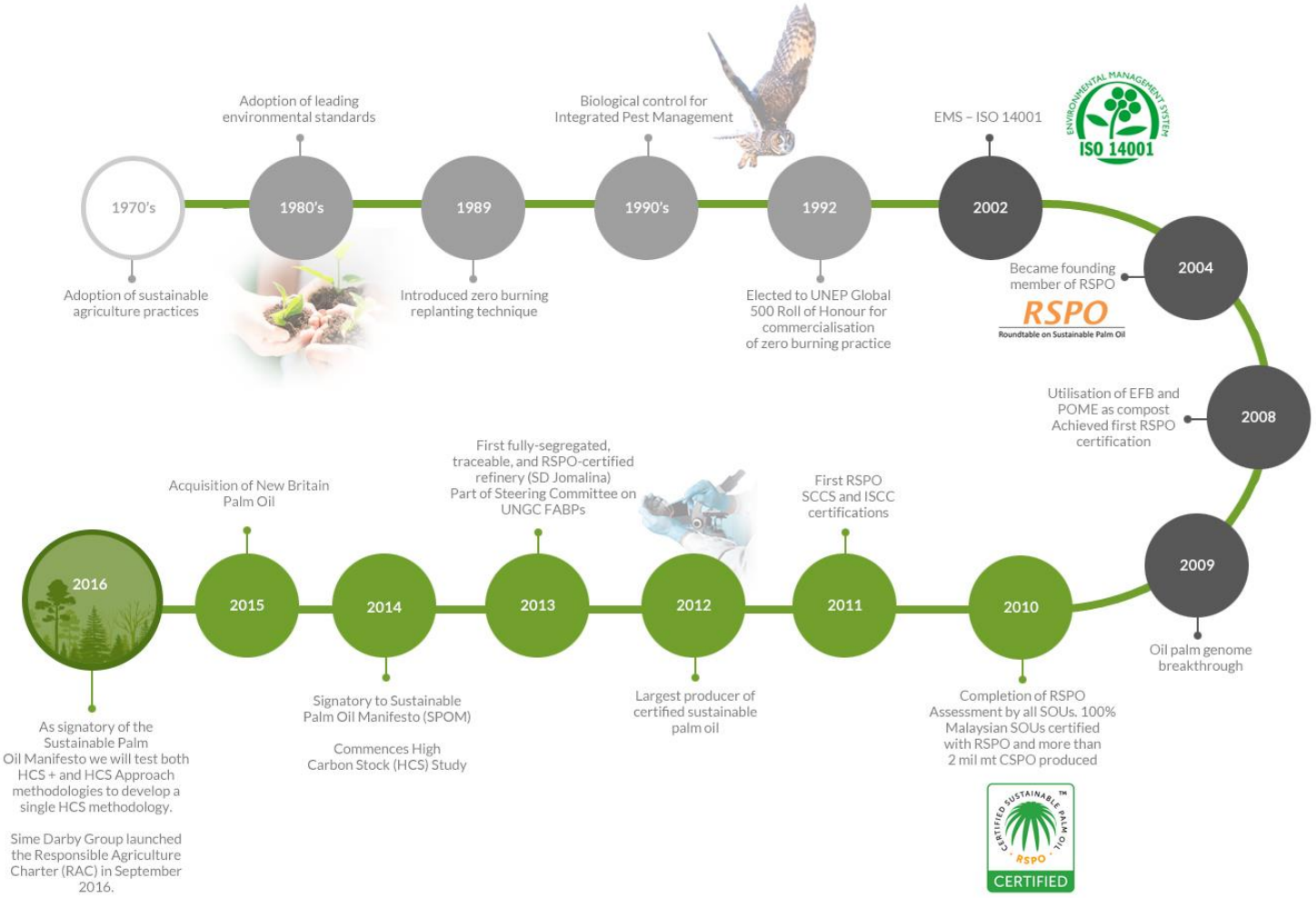
SOY

The second biggest driver of tropical deforestation is soybean production. Global soybean production has increased more than fifteenfold since the 1950s. Between 1990 and 2010 in South America, the land used for soy production swelled from 42 million acres (roughly the size of Washington State) to 114 million acres (bigger than the state of California).

Behind beef, soy is the second largest agricultural driver of deforestation worldwide.

Source: WWF 2018

The company initiative



http://www.simedarbyplantation.com/sustainability/our-sustainability-journey

Sime Darby Plantation

NEW PLANTING

Our New Planting Policy takes into account not only local laws and the Principles and Criteria of the Roundtable of Sustainable Palm Oil (RSPO), but also the traditions and practices of the local communities living in the areas of our operations.

Social & Environmental Impact Assessments (SEIA)

Sime Darby Plantation undertakes Social & Environmental Impact Assessments (SEIA) as a standard operating procedure before any development begins. The company does not plant on High Conservation Value (HCV) ground.

As a founding members of RSPO, Sime Darby Plantation respects and fulfils the principles and criteria set. The company has strict policies against the clearing of HCV forests and virgin jungles, graveyards, identified buffer and riparian zones. All of these commitments have been discussed at the RSPO's RT5-7 summits and have been endorsed by the Board of Directors of Sime Darby Berhad, the parent of Sime Darby Plantation.

Sime Darby Plantation's commitment towards sustainable plantation practices includes maintaining High Conservation Value (HCV) areas in its estates. The following areas will be considered to be maintained as HCV:
natural forests within the estates.

- Wetland areas
- River boundaries
- Water catchments and effluent pond areas
- Marginal soil areas
- Areas with slopes of more than 20 degrees gradient
- Land belonging to local indigenous peoples

As per RSPO's requirement, we shall only use HCV assessors accredited by the HCVRN Assessor Licensing Scheme (ALS) in conducting assessments.

http://www.simedarbyplantation.com/sustainability/beliefs-progress/practices-key-initiatives/good-agricultural-practices/new-planting

CROSSCHECK

'Crosscheck' is Sime Darby Plantation's major step forward in our journey to creating a deforestation-free supply chain. It is an open source online tool that is available to everyone.

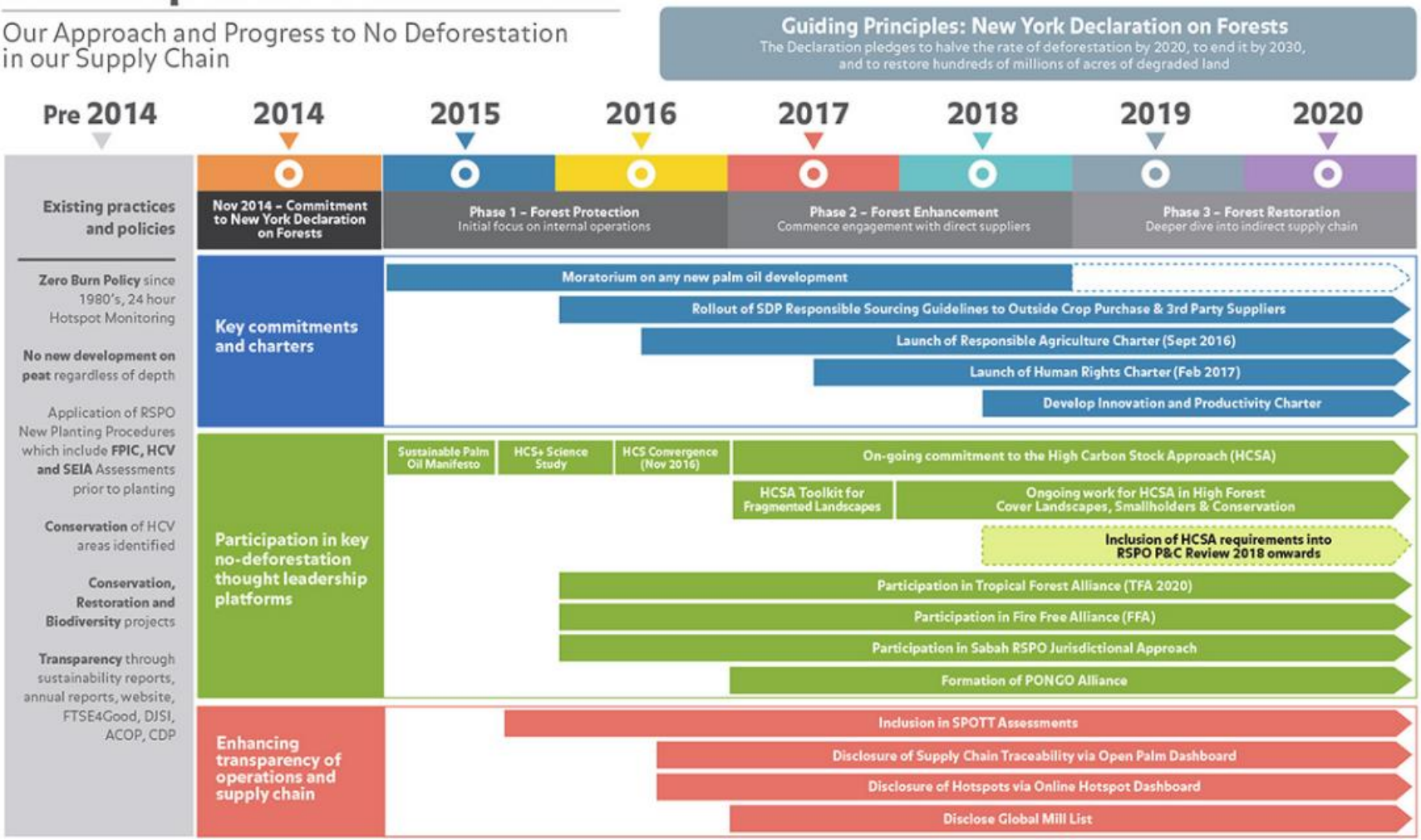
We believe the frontier to halting deforestation is traceability. 'Crosscheck' allows us to trace to supply back to its source, making it possible to identify where problems exist - and take action.

http://www.simedarbyplantation.com/sustainability/crosscheck

Sime Darby Plantation

Sime Darby Plantation : Roadmap to No Deforestation

Our Approach and Progress to No Deforestation in our Supply Chain



http://www.simedarbyplantation.com/sustainability/responsible-agriculture-charter

GenomeSelect™

100 ha 2016 → 1000 ha pa → Full replant 2022

Sime Darby Plantation

16% yield improvement = feed 15 million people without any extra land