Greenhouse Gas Emission Reduction via Composting
Sime Darby’s Perspective
Sustainability Journey

1985
Introduced Zero burning

1990
EMS – ISO 14001

1992
Elected to UNEP Global 500 Roll of Honour for commercialisation of zero burning practice

1994
Pioneered the Zero Burning Policy in the 80’s

2002
First GlobalGAP certification

2004
Achieved RSPO certification

2008
POME utilisation as compost

2010
First certification of SCCS and ISCC

2011
World’s largest producer of CSPO

2012
Embarked on carbon inventory

2014
Embarked on High Carbon Stock (HCS) Study, first Sustainability Report

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Key attributes of Sustainability at Sime Darby

- Pioneered the Zero Burning Policy in the 80’s
- One of the founding members of RSPO
- The largest producer of CSPO – Malaysia 100% & Indonesia 96% certified
- Zero Deforestation of primary & virgin forest
- No New Peat Development
- Enduring commitment to Environmental & Social Principles – HCV & FPIC
- Moving forward: Commitment to sustainable production, GHG reduction, ESH and CSR
Carbon Footprint Overview

Initiated in 2011 using 2009 data as baseline.

- Greenhouse Gas Protocol – Corporate Accounting and Reporting Standard, 2004, a globally accepted standard on carbon emission reporting, with support from consultants Pricewaterhouse Coopers.(PwC)

## Emissions by Intensity tCO2e/mt of products

<table>
<thead>
<tr>
<th>Country(2)</th>
<th>FFB (Ton)</th>
<th>CPO (Ton)</th>
<th>Refined products (Ton)</th>
<th>Fresh Latex (Ton)</th>
<th>Dry Rubber (Ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>0.23</td>
<td>1.06</td>
<td>0.09</td>
<td>0.29</td>
<td>0.26</td>
</tr>
</tbody>
</table>

An average of 1.06 tons of carbon dioxide equivalent is emitted to produce a ton of CPO.

Our Climate Change target is to reduce the carbon emission equivalent, CO2e from 2009 baseline by at least 40% by 2020

Note:
(1) Validated by PwC - Plantation Division Global Rollout Report v2.0, dated June 2012
(2) 2009 Baseline data excludes emission from Vietnam, South Africa, China and Liberia. Complete list of data will be made available in 2010 inventory.
Reporting Carbon Emissions

In 2012, we embarked on a two-phase plan to identify, monitor and reduce our carbon emissions throughout our operations. We developed a carbon monitoring tool that enabled us to calculate our carbon emissions on a periodic basis, and identify hotspots that would enable us to reduce those emissions.
Delivering Sustainable Futures - Sime Darby Plantation’s Carbon Reduction Master-Plan

The Carbon Emission Reduction initiatives falls broadly on 3 approaches:

Carbon Avoidance & Entrapment

Carbon Saving through Energy Efficiency

Renewable Energy/New Product Development/ low carbon alternatives

Our Climate Change target is to reduce the carbon emission equivalent, CO$_2$e from 2009 baseline by at least 40% by 2020
Case Study: Carbon Reduction Initiatives

Sime Darby Plantation has embarked on a plan to cut its carbon emissions by 40% by 2020.

- The major contributor of Greenhouse Gas (GHG) emissions in upstream production of crude palm oil (CPO) is methane. The release of methane occurs mainly at palm oil mill effluent treatment plants.
- Methane abatement can be implemented either through **biogas trapping** during anaerobic digestion of POME or avoidance through aerobic processes, as in **composting**.
- Both are proven to play significant role in meeting the desired target.

*A comprehensive master plan outlining emission reduction strategies within a definite period will allow the management to focus on precise areas and plan the resources to meet the desired target.*
Carbon Emission Reduction Strategy

Methane Entrapment - Biogas

- Trapping biogas for power generation or combustion is an efficient way of avoiding methane release into the atmosphere.

- Where possible, electricity generated through biogas is fed back to the electricity grid, for which the company earns revenue.

- Other possibilities include co-firing with other mill waste such as fibre and shells to increase energy self-sufficiency, and flaring to reduce methane release.

- Today, 11 biogas plants are in progress. Target is to build biogas plants in all mills by 2020.
Composting Project - Methane Avoidance

**CONVENTIONAL SYSTEM**

POME FROM MILL → COOLING POND → MIXING POND → ANAEROBIC POND → AEROBIC POND → TO RIVER

CH4 & CO2 EMISSION

CO2 & ~CH4 EMISSION

**COMPOSTING SYSTEM – WITH NO METHANE GENERATION**

POME FROM MILL → COOLING POND → COMPOSTING WINDROWS (EFB) → COMPOST → TO ESTATE

EFB → SHREDDER

EFB TO ESTATE
### Composting /ISCC certified Mills & Downstream OUs in Sime Darby

#### Perak & Kedah

<table>
<thead>
<tr>
<th>Mill</th>
<th>Annual Output (MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seri Intan</td>
<td>43000-44,000</td>
</tr>
<tr>
<td>Selaba</td>
<td>30000-32,000</td>
</tr>
<tr>
<td>Flemington</td>
<td>57,000-59,000</td>
</tr>
<tr>
<td>Chersonese</td>
<td>42000-44,000</td>
</tr>
<tr>
<td>Elphil</td>
<td>27000-29000</td>
</tr>
<tr>
<td>Sg. Dingin</td>
<td>56,000-58000</td>
</tr>
</tbody>
</table>

#### Ng Sembilan & Melaka

<table>
<thead>
<tr>
<th>Mill</th>
<th>Annual Output (MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sua Betong</td>
<td>56,000-58,000</td>
</tr>
<tr>
<td>Kok Foh</td>
<td>33000-35,000</td>
</tr>
<tr>
<td>Tanah Merah</td>
<td>27,000-29,000</td>
</tr>
<tr>
<td>Labu</td>
<td></td>
</tr>
<tr>
<td>Kempas</td>
<td>51,000-53,000</td>
</tr>
</tbody>
</table>

#### Sarawak

<table>
<thead>
<tr>
<th>Mill</th>
<th>Annual Output (MT)</th>
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</thead>
<tbody>
<tr>
<td>Lavang</td>
<td>45,500-47,500</td>
</tr>
<tr>
<td>Derawan</td>
<td></td>
</tr>
<tr>
<td>Rajawali</td>
<td></td>
</tr>
<tr>
<td>Pekaka</td>
<td>44,500-46,500</td>
</tr>
</tbody>
</table>

#### Pahang

<table>
<thead>
<tr>
<th>Mill</th>
<th>Annual Output (MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerdu</td>
<td>38000-41,000</td>
</tr>
<tr>
<td>Jabor</td>
<td>23000-25,000</td>
</tr>
</tbody>
</table>

#### Johor

<table>
<thead>
<tr>
<th>Mill</th>
<th>Annual Output (MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hadapan</td>
<td>43,000-44,500</td>
</tr>
<tr>
<td>Ulu Remis</td>
<td>45,000-47,000</td>
</tr>
<tr>
<td>Bukit Benur</td>
<td></td>
</tr>
<tr>
<td>Gunung Mas</td>
<td>56,000-58,000</td>
</tr>
</tbody>
</table>

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Notes: Sime Darby has 22 closed system composting projects with capability process up to 500,000 mt of EFB. 7 out of 11 ISCC mills are with compost plants.
TYPICAL COMPOST PROCESS FLOW

- EFB from Oil Mill
- Shredding of EFB
- Mix Boiler ash/Decanter Cake with shredded EFB
- Building Windrows
- In-field loading
- Delivery To Estate
- Turning with Windrow Turner & Aerating
- Inoculation & POME Spraying (Compost Accelerator-Enzymes)
- Compost Application
- Sampling of compost
In order to be eligible for the ISCC certification, the biofuel produced will need to have minimum of GHG savings as the graph above.

*the savings is as to compare to the fossil fuel reference as per stated in the Renewable Energy Directive (RED)
On the reduction 50% in 2017, the maximum emission from biodiesel shall not exceed 41.9 gCO2eq/MJ (50% from 83.8 gCO2eq/MJ) which equivalent to 1550 kgCO2eq/ton biodiesel.

Emission from processing and transportation in biodiesel plant averaging around 550 kgCO2eq/ton biodiesel.

Thus, max emission for oil mill in meeting the 50% reduction of GHG should be < 1000 kgCO2eq/ton CPO.
GHG emissions - Current to Target

- **13,670** kg CO2eq/ton PME ≈ **45** g CO2eq/MJ
- **15,500** kg CO2eq/ton PME ≈ **41.9** g CO2eq/MJ

**GHG Emission**

- **Current**
  - **122.35 kg CO2eq/ton FFB**
  - **1000 kg CO2eq/ton CPO** ≈ **27** g CO2eq/MJ

- **Target**
  - **1670 kc CO2eq/ton PME** ≈ **45** g CO2eq/MJ
  - **1550 kc CO2eq/ton PME** ≈ **41.9** g CO2eq/MJ

**Fossil fuel reference (83.8 g CO2eq/MJ)**

**Maximum emission to qualify for 50% savings (41.9 g CO2eq/MJ)**

**Maximum emission to qualify for 35% savings (54.5 g CO2eq/MJ)**

**Estate**

**Oil Mill**

**Biodiesel**
Emission based on POME Utilization at Composting
Versus
POME:FFB Ratio Generated

<table>
<thead>
<tr>
<th>POME:FFB Ratio</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>1278</td>
<td>1221</td>
<td>1164</td>
<td>1107</td>
<td>1049</td>
<td>992</td>
</tr>
<tr>
<td>0.7</td>
<td>1202</td>
<td>1152</td>
<td>1102</td>
<td>1052</td>
<td>1002</td>
<td>952</td>
</tr>
<tr>
<td>0.6</td>
<td>1127</td>
<td>1084</td>
<td>1041</td>
<td>998</td>
<td>955</td>
<td>912</td>
</tr>
</tbody>
</table>

EFB: POME ; 1:1.5
EFB:POME , 1:2
EFB:POME 1:2.5
Essentials of Compost as GHG Emission Controller

- Compost process has the potential to play an important role to reduce methane emission from POME through the avoidance process.
- The key is increasing the uptake of POME for every ton of EFB utilized.
- On average EFB : POME ; 1:2 or 40% of POME Utilization is adequate to meet the emission reduction of 50% as required by ISCC.
- Nevertheless, the challenge is to increase the ratio to 1:2 or more.
- One of our key strategic goals of compost is meeting the ratio and a R&D initiative is in place to achieve the plan.
Sime Darby Plantation supports the goal of developing a **sustainable** palm oil and rubber industry.

Having pioneered many best agro-management and sustainability practices, the Company will continue to implement green technology related projects in view of meeting our commitment to reduce the GHG emissions.

We are fully committed to balancing the needs of our people, the environment, and the business through **our conscious and responsible actions**.
Thank You