PALM WASTE TO COMPOST WITH AERATED BUNKERS

RT10 2012 Resorts World Singapore
AN EVENT BY RSPO

10 Years Of Driving Sustainability.
A Business Model For The Future.

RSPO
Roundtable on Sustainable Palm Oil

10TH ANNUAL ROUNDTABLE MEETING ON SUSTAINABLE PALM OIL
Resorts World Sentosa, Singapore • 30 October - 1 November 2012

About Carbon Conservation and Carbon Agro

2007
- $3M Rio Tinto deal protecting 13,000 Ha in Australia, runner up Banksia and UN Earth Day Awards
- MOU signed with three Governors in Indonesia to use carbon finance to avoid deforestation & Green Governors Dinner funded by ADB
- Front page of WSJ,Time Magazine, Aceh Forestry Moratorium, Sydney Morning Herald, Age

2008
- Aceh project as world first CCBA validated REDD project and largest carbon project in the world with 100M tCO2e, 750,000Ha
- Merrill Lynch purchase agreement USD$9M up to USD$420M
- CC with PT Erna Djuliawati to develop a CDM project 7 MW biomass cogeneration plant located West Kalimantan
- Environmental Finance Deal of Year, Finalist FT Sustainable Banking
- MoU with California Governor Schwarzenegger

2009
- Signed carbon deals: biomass energy, forests, agriculture
- Dorjee Sun named TIME Magazine's Environmental Hero 2009

2010
- CC and PT Socfin Indonesia to jointly develop co-composting plants under the CDM at all of its 9 crude Palm Oil Mills
- CC and Asia Pulp & Paper (APP) developing the world's first privately funded REDD-type project, the Kampar Carbon Reserve on 15,640 ha

2011
- CC and APP Indonesia develop a Sustainability Roadmap to 2020
- CA jointly developing sustainability and palm waste projects in the South East Asian and recently in the Latin American palm oil sector.

Cover of TIME Magazine

- **Finalist:**

For the Financial Times Sustainable Banking Deal of the Year Award

- **Winner:**

Environmental Finance's Carbon Finance Deal of the Year Award with Merrill Lynch for Aceh Project

WASTE 1: EMPTY FRUIT BUNCH (EFB)

Waste 1: Empty Fruit Bunch (EFB)

Empty Fruit Bunch

- **Empty Fruit Bunches**, mesocarp fibre and shell). It has high moisture content and is bulky
- An average 45TPH palm oil mill generates **215 tonnes of EFB daily.**
- Global production of FFB set to be approx **200 Million MT**
- This will result in approx **42 Million MT Of EFB**. (21% of FFB volume)
- Conventional **method of burning** these residues often create environmental problems

Waste 2: Palm Oil Mill Effluent (POME)

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Palm Oil Mill Effluent

- Global production of FFB set to be approx **200 Million MT**
- This will result in approx **120 million m3** Of POME. (approx 60%)
- Conventional **dumping/ponding** these residues often create environmental problems
- **0.60 tonnes of raw POME** is produced for every ton of fresh fruit bunches (FFB) processed
- An average 45TPH palm oil mill generates more than **550 m3 of POME daily**.

RSPO Requirements

RSPO and the UN

Principle 5: Environmental responsibility and conservation of natural resources and biodiversity	
5.3 Waste Management	• To improve the efficiency of resource utilisation • Recycling potential waste into value-added products • Highlighting potential areas of concern like management of effluent ponds
5.6 Reduce greenhouse gas emissions and pollution	• Mandating assessment and monitoring of polluting activities • Highlighting the need to monitor methane from effluent digestion

Sustainability Criteria for Biofuels for use in the EU	
Origin of Biofuels/Bioliquids	• Raw material not to be obtained from wetlands, peatlands, continuously forested areas, biodiverse areas
Art 17 Meeting Greenhouse Gas Savings	• GHG Savings to be calculated and must reach 35%, to be increased to 50% by 2017, and 60% by 2018. • If plantation/mill in operation on 23 January 2008 at the latest, the criterion of a minimum 35 % greenhouse gas saving starts to apply only from 1 April 2013.
Annex V Default Values for GHG Savings (no net carbon emissions from land use change)	• Palm oil biodiesel (process not specified): 19% • Palm oil biodiesel (process with methane capture): 56%

LOCAL LEGAL REQUIREMENTS

Regulations and Law on Waste Management Tightening

Environmental Management Act No. 23 of *1997*	• This act is an umbrella of all waste management regulations. This acts as the basis for evaluating and adapting all applicable laws and regulation containing stipulations on environment.
Government Regulation No. 82 of 2001 regarding Water Quality Management and Water Pollution control	• Contains provisions associated with water classification and its standard quality criteria.
Decree of the State Minister of Environment No. *28 of 2003 concerning Technical Guidelines on The Assessment of Land Application of POME*	• The decree specifies requirements for utilizing POME for Land Application.
Decree of the State Minister of Environment No.29 *of 2003 concerning Guidelines and Permit Procedure for utilizing POME /or Land Application in Oil Palm Plantation*	• The decree defines requirements and permits that are required for utilizing of POME for land application
Decree of the State Minister of Environment No.111 of 7003 regarding Guidelines of Requirements, Permit Procedures and Studies for Wastewater Disposal into Water or Water Resources	• *D*ecree provides guidelines and procedure to dispose wastewater into water course.
Decree of the State Minister of Environment No. *51 of 1995 concerning Liguid Waste Standards for Industrial Activities*	• This regulation specifies standards for industrial liquid wastes including POME. Palm Oil Mill owners are obligated to treat POME to ensure liquid waste does not exceed certain standard.
Decree of the Minister of Environment No. *13 of 1995 concerning quality Standards for Stationary Source Emission*	• Provides regulation to prevent occurrence of air pollution from stationary sources activity.

LOCAL LEGAL REQUIREMENTS

Regulations and Law on Waste Management Tightening

Colombia: The main regulator norm for water management is the Decree 1594 of 1984	*Which normalizes water usages and wastewater disposal through all the national territory. The decree establishes water quality standards, which are guides to be used as a basis for decision making in assignation of water uses and determination of water characteristics for each application.*
Colombia: Resolution 3957 of 2009	*To enlarge the water parameters comparison in this country. This resolution establishes the technical norm, for wastewater discharges management and control in public sewage for the capital district.*
Ecuador: the general law of environmental management	*It was created with the aim of regulate the discharge over sewer systems, criteria of water quality for several uses and the procedures for measuring the parameters on the water. Also the norm establishes that companies must keep a record of the generated effluents with the main operational data related to the effluents.*
Brazil: Decree 18.328 of June 8, 1997	*In the norm is established the maximum limit for industrial effluents in the federal district. Also it's stated the fines applied in the case the companies surpass the norm. Also the decree indicates the type of industry and the types of parameters, that each of them must control.*
Venezuela: The Decree 883.	*The Decree regulates the quality of water bodies and wastewater discharges. This law establishes the different types of water and the permissible parameters for water discharges in accordance to the final water use. Wastewater discharging parameters to public sewer system are contained in section V of Decree 883.*

Many ways Waste can be utilized

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Waste in the early days

Then we got smarter

Pail Points for Palm Industry

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Palm Oil Industry pain points:

1. Waste disposal can cause pollution, community issues and public pressure
2. Greater demand for fertilizer is driving prices up with “peak potash” and phosphorous costs
3. Soil security and stability is resulting in reduced response from chemical fertilizers

WASTE IS AN OPPORTUNITY

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Our Approach:

1. We looked at a range of solutions to find the most cost effective use of palm waste

2. Our focus was on economics, reliability, speed, long term suitability of the solution and handling the large volumes of EFB and POME

3. How will the solution help sustainable, integrated and intensified plantation management

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CURRENT GENERATION WASTE MANAGEMENT

1st GEN Lagoon Covers

Upfront capital is lower but…

- Does not process and reuse EFB
- Requires additional processes such as flaring, sludge digesters, high rate settling tank, decanter and boiler refinery
- Uses existing lagoons and in some cases more lagoons thus being unable to capitalize on filling in lagoons for more land over time
- Increased potential for production of odours and corrosive gases
- CDM projects that implement a lagoon cover system work in conjunction with an anaerobic digester

1st GEN Biogas Digester

Upfront capital is high and…

- Does not process and reuse EFB
- Requires additional processes such as flaring, sludge digesters, high rate settling tank, decanter and boiler refinery
- Uses existing lagoons and in some cases more lagoons thus being unable to capitalize on filling in lagoons for more land over time
- Digester sizes have different rates of biogas generation therefore utilization is restricted by the rate of production.
- Most mills could be power sufficient with fibre and shell, therefore biogas when flared does not provide the value that nutrient rich compost does

1st GEN Co-Composting – Turned Windrow

Upfront capital cost low but…

- Requires large area of land and man power (1.7Ha for a an average sized mill)
- Maximum 3:1 POME rations in dry season so therefore still need ponds and less nutrients
- 8-10 weeks to complete cycle
- Large risk that won't be able to reliably delivery compost volumes and quality
- Not suitable for high rainfall environment e.g. 2000mm/year which is opposite of oil palm
- Inability to control inner core from becoming anaerobic, therefore will still emit methane
- Smell, flies, leachate run-off

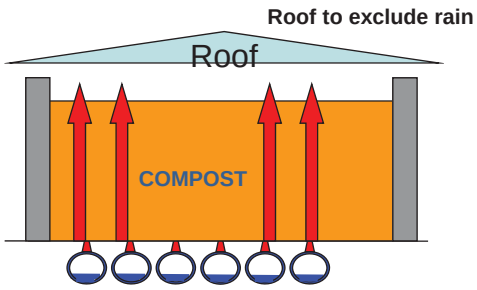
BEST SOLUTION TODAY: AERATED COMPOST BUNKERS

Aerated Bunkers of Our Client

Aerated Bunkers Optimize Nutrients

Custom Aerated Bunker Design

- Bunker design and composting process ensures optimum aerobic conditions for naturally occuring composting micro-organisms
- Compost is protected in bunkers, within concrete walls, under a roof.
- Air is forced into the compost by fans through the specifically designed air aerated floor.
- To further aid the micro organisms to compost effectively and to facilitate the addition of POME, the compost is moved regularly through the set of bunkers
- The (pipes in) floor as well as supplying air when required also drain any leachate and recycles it into the POME tanks to ensure truly zero-waste



Optimal Mixing/ Filling Bunker

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Optimum conditions reached naturally via aerobic breakdown. Temperature, Oxygen levels and moisture levels are ideal for the natural microbes to function effectively = optimal compost

Batching Bunker

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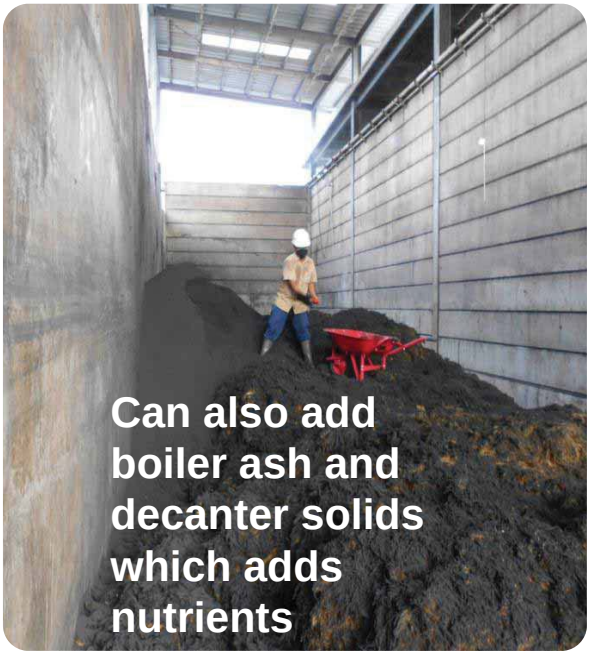


Can also add boiler ash and decanter solids which adds nutrients

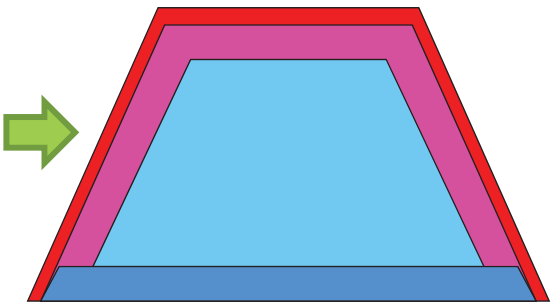
MONITORING BUNKER

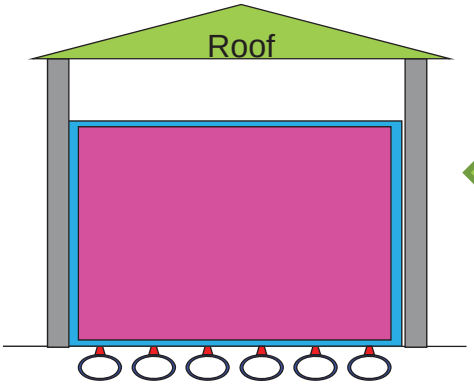
VERTICAL HEIGHT REDUCES LAND

Automated Computer Controlled Environment

Turned Windrow Composting

- Surface layer too dry or wet depending on ambient conditions
- Small volume in optimum conditions
- The compost mass will be in sub-optimal conditions, mostly due to inadequate oxygen level
- Bottom of the windrow will be anaerobic, too wet and cold as it is in contact with the floor





Zero Discharge Aerated Bunker

- Composting process is up to temp. within 24 – 36 hours compared to windrows taking up to 6 – 7 days to get started
- All of the compost mass is held at optimum conditions save for a few centimeters against the concrete

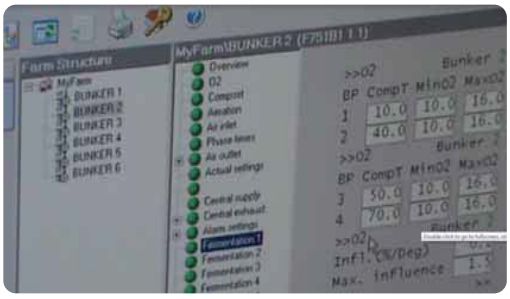
Returning Nutrient to the Plantation

NPK in Soil + Palm	NPK in FFB	NPK in EFB + POME	NPK in Compost

Software and Automated Platform

Automated Computer Controlled Environment

- 24 Hour computer controlled environment. Real time monitoring of performance of Oxygen, temperature and methane levels of compost
- The controls maintain the mass of compost in the optimum conditions for the natural micro-organisms to function effectively. NO ADDITIONAL MICRO ORGANSIMS, ENZYMES OR ADDITIVES ARE REQUIRED
- Maintenance of adequate oxygen levels within the mass of compost ensures that the process produces no methane
- Using the computer controls and records, it is possible to fine tune future batches of compost and make adjustments to the composting program to suit any seasonal variations or changes in materials



Benefits of Aeration

1. Fast: Industry leading 25-30 days compost production cycle
2. Less concrete: By building vertically with 6m stacking use 60% less area
3. Less labor required: Automated with aerated floors & machines
4. Efficient: Highest nutrients most efficiently reused of nutrients

Why Composting Is Becoming Mainstream

- Previously was no technology that reliably produced compost in an effective manner
- Now with greater need for sustainable soil management
- Greater scientific proof for nutrient improvements compared to mulching
- Greater focus on reducing emissions and greenhouse gas management

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Agronomic Advantages of Compost application

- Environmental benefits
- Yield Benefits
- Management Benefits
- Optimizing the soil health

BENEFITS OF COMPOST

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1. Maximum nutrient recycling
2. More effective slow release of nutrients
3. Less nutrient waste 4Rs, Right Product, Right Rate, Right Time & Right Place
4. Effective way to cover whole plantation
5. Waste goes from cost center to cost saver and helps with RSPO
6. Maximum yields from long term use

BENEFITS OF COMPOST

IMPROVES CHEMICAL PROPERTIES OF SOIL

- Enables soils to hold more plant nutrients
- Enhance buffering capacity of soil
- Composts contain [N,P,K, Ca, Mg and S] and essential micronutrients
- Nutrients are released slowly and steadily
- Stabilizes volatile N of raw materials thus reduce N losses
- Provides active agents e.g. growth substances for germinating plants

BENEFITS OF COMPOST

IMPROVES PHYSICAL PROPERTIES OF SOIL

- Reduce soil bulk density and improve soil structure
- Improves root penetration and turf establishment
- Increase water-holding capacity of the soil
- Increase soil stability by fungi or actinomycetes mycelia
- Improves soil aeration

BENEFITS OF COMPOST

IMPROVES BIOLOGICAL PROPERTIES OF SOIL

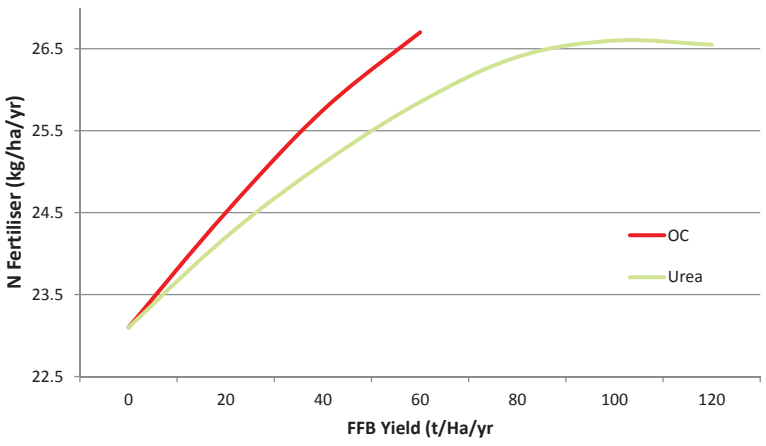
- Supplies food & growth of beneficial micro-organisms/worms
- Reduces and kills weed seeds
- Helps suppress certain plant diseases, soil-borne diseases & parasites through:
  - Competition for nutrients by beneficial microbes
  - Antibiotic production by beneficial microbes
  - Predation against pathogens by beneficial microbes
  - Activate disease-resistant genes in plants
  - High temperature from composting kills pathogens

BENEFITS OF COMPOST

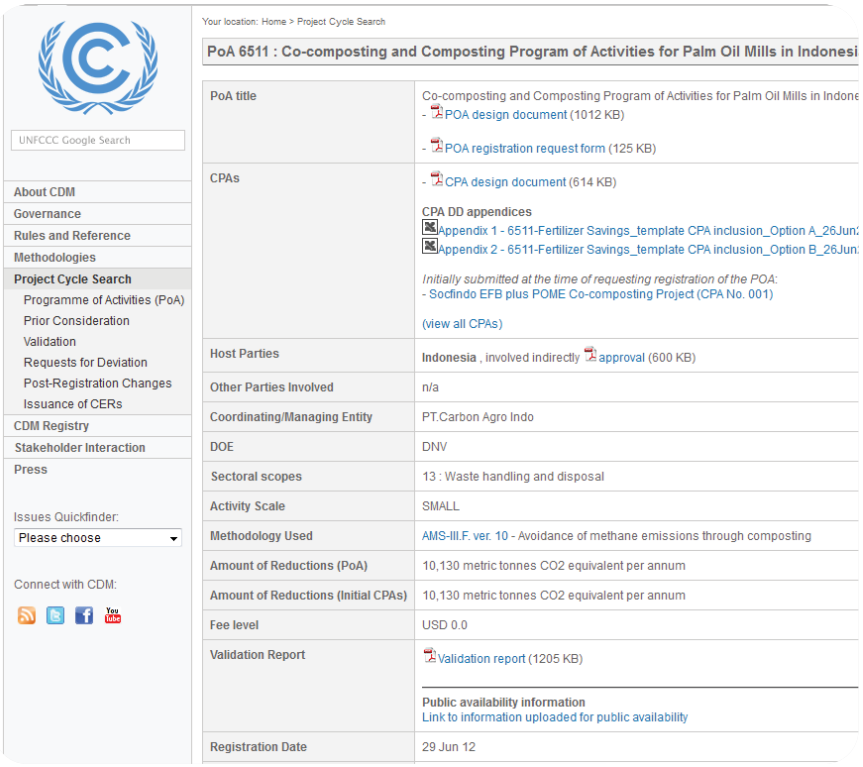
Compost Benefits

Organic compost is more efficient in increasing leaf N and P levels

Research 10-15 tons of OC can replace average rates of N and P fertilizers with yield increase up to 27%



PROGRAM OF ACTIVITIES SUCCESS JUNE 2012



UNFCCC Google Search

About CDM
Governance
Rules and Reference
Methodologies
Project Cycle Search
- Programme of Activities (PoA)
- Prior Consideration
- Validation
- Requests for Deviation
- Post-Registration Changes
- Issuance of CERs
CDM Registry
Stakeholder Interaction
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PoA 6511 : Co-composting and Composting Program of Activities for Palm Oil Mills in Indonesi

PoA title	Co-composting and Composting Program of Activities for Palm Oil Mills in Indone - POA design document (1012 KB) - POA registration request form (125 KB)
CPAs	- CPA design document (614 KB) CPA DD appendices Appendix 1 - 6511-Fertilizer Savings_template CPA inclusion_Option A_26Jun Appendix 2 - 6511-Fertilizer Savings_template CPA inclusion_Option B_26Jun *Initially submitted at the time of requesting registration of the POA:* - Socfindo EFB plus POME Co-composting Project (CPA No. 001) (view all CPAs)
Host Parties	**Indonesia** , involved indirectly approval (600 KB)
Other Parties Involved	n/a
Coordinating/Managing Entity	PT.Carbon Agro Indo
DOE	DNV
Sectoral scopes	13 : Waste handling and disposal
Activity Scale	SMALL
Methodology Used	AMS-III.F. ver. 10 - Avoidance of methane emissions through composting
Amount of Reductions (PoA)	10,130 metric tonnes CO2 equivalent per annum
Amount of Reductions (Initial CPAs)	10,130 metric tonnes CO2 equivalent per annum
Fee level	USD 0.0
Validation Report	Validation report (1205 KB) **Public availability information** Link to information uploaded for public availability
Registration Date	29 Jun 12

- **Officially registered in EB website: Project reference number is 6511**
- **The verification can be done in December 2013 (one year after registration for the 1st verification). Then the next verification (2nd, 3rd, 4th, etc.) in every December per year.**

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THANK YOU!