Comparative Life Cycle Assessment: - RSPO-certified vs non-certified

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Background

- Sustainable palm oil: Certification is the most acknowledged choice
- But what is the benefit?
  - GHG emissions
  - Biodiversity and nature conservation
  - Other impacts

- Crowdfunded project: https://lca-net.com/clubs/palm-oil/
- Launched November 2016
- Finalized August 2019
- 16 members

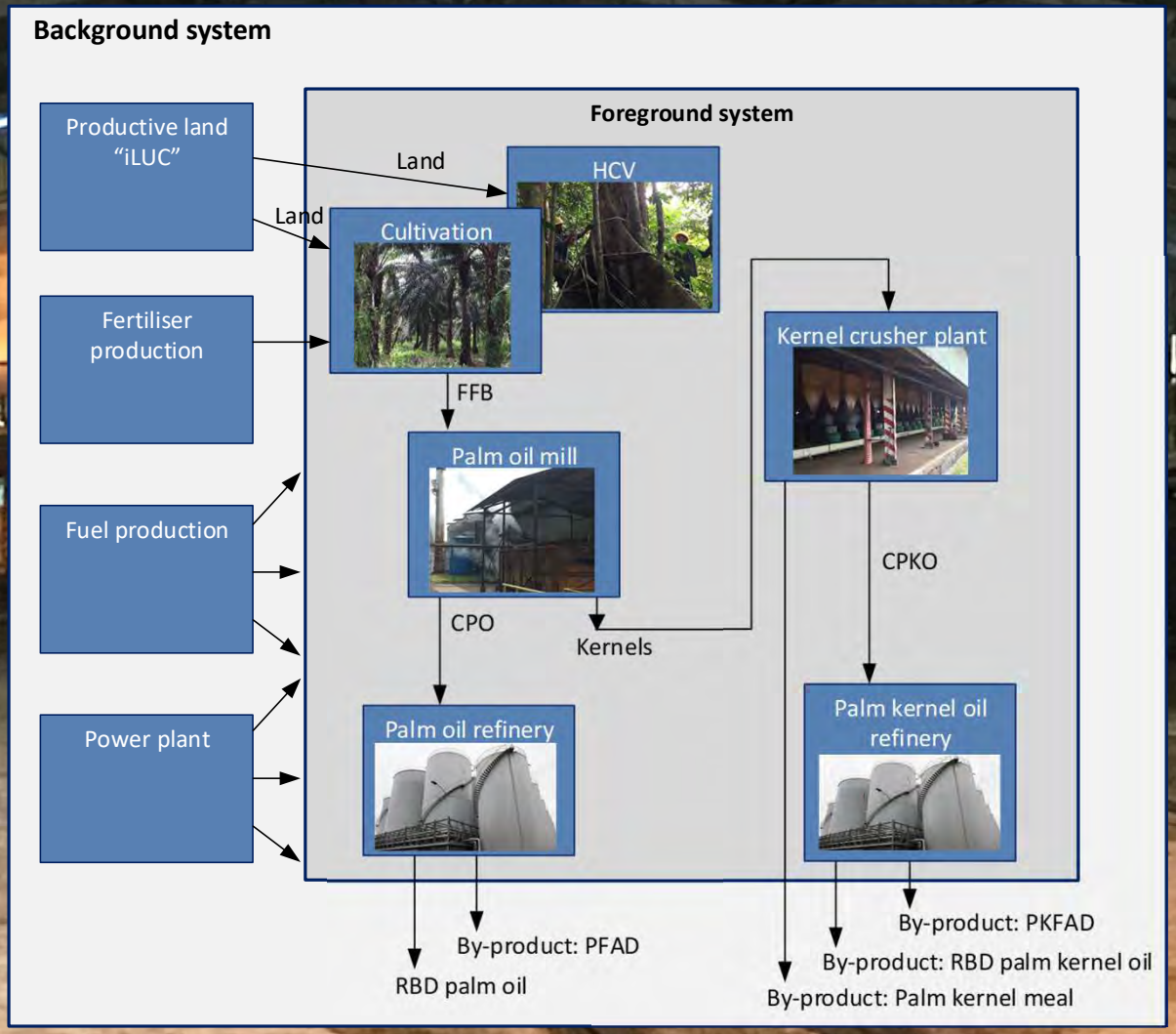
Beiersdorf, ERASM, FERRERO, sinarmas, Unilever, DUPONT, novozymes Rethink Tomorrow

Project promoted and supported by RSPO
Carried out independently of RSPO

CERTIFIED SUSTAINABLE PALM OIL RSPO

Picture: Jannick Schmidt. Sinarmas, Central Kalimantan 2018

Life cycle assessment (LCA)



Picture: Jannick Schmidt. Hanau palm oil mill, Sinarmas, Central Kalimantan 2018

Methods

- Functional unit = 1 kg refined palm oil
- Scope: 2016 and Indonesia and Malaysia
- Land use changes and nature conservation included
- Consequential and attributional LCA model
- Very detailed models
  - N-balances
  - Peat emissions
  - Oil mill boiler energy balance and stack emission
  - Palm oil mill effluent (POME) model

Picture: Jannick Schmidt. Sinarmas, Central Kalimantan 2018

Data collection

Input data Industry total		Input data RSPO certified		Input data Non-certified
Estates		**Estates**		**Estates**
Yield		Yield		Yield
Fertiliser		Fertiliser		Fertiliser
Peat		Peat		Peat
Fuels	minus	Fuels	=	Fuels
Conservation		Conservation		Conservation
Oil mills		**Oil mills**		**Oil mills**
OER		OER		OER
KER		KER		KER
Fuels		Fuels		Fuels
POME		POME		POME

- Total industry
  - Statistics and GIS
  - LCA coefficients to close gaps
- RSPO certified: Assessment reports
  - 634 estates (58% of all certified FFB)
  - 165 oil mills (58% of all certified CPO)

Picture: Jannick Schmidt. Hanau palm oil mill, Sinarmas, Central Kalimantan 2018

What do the data show?

Estates

Key performance indicators for oil palm cultivation

Flows	Unit	Total industry (ID & MY)	RSPO-certified	Non-certified
Total planted area	Million ha	14.4	2.44	12.0
Share of oil palm on peat	%	18%	11%	19%
Drainage depth (DD) of peat	cm	73	57	75
FFB yield, mature	t/ha	18.9	21.1	18.5
Fuel use	MJ/ha	2,940	2,940	2,940
Applied mineral N	kg N/ha	82	170	64
Applied organic N	kg N/ha	21	24	21
Applied mineral P_2O_5	kg P_2O_5/ha	41	103	28
Applied organic P_2O_5	kg P_2O_5/ha	28	31	27
Applied mineral K_2O	kg K_2O	156	245	138
Applied organic K_2O	kg K_2O	138	153	135

Oil mills

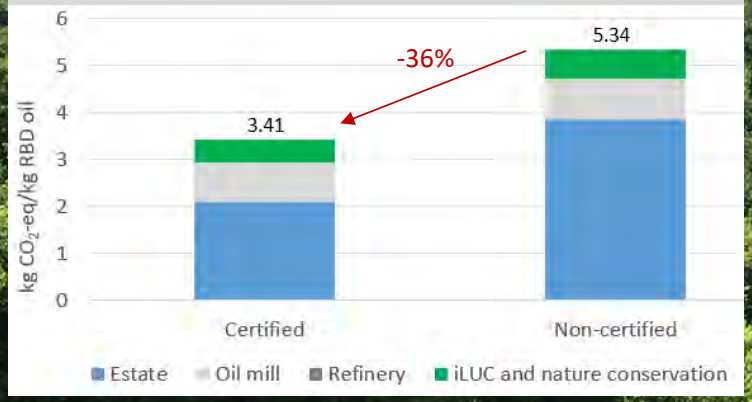
Key performance indicators for palm oil mills

Flows	Unit	Total industry (ID & MY)	RSPO certified	Non-certified
OER	%	20.2%	21.9%	19.8%
KER	%	5.4%	5.6%	5.4%
Share of POME treated with biogas capture	%	5.0%	16%	2.4%
Share of landbank in supply base set-aside as HCV	%	0.6%	3.1%	0%

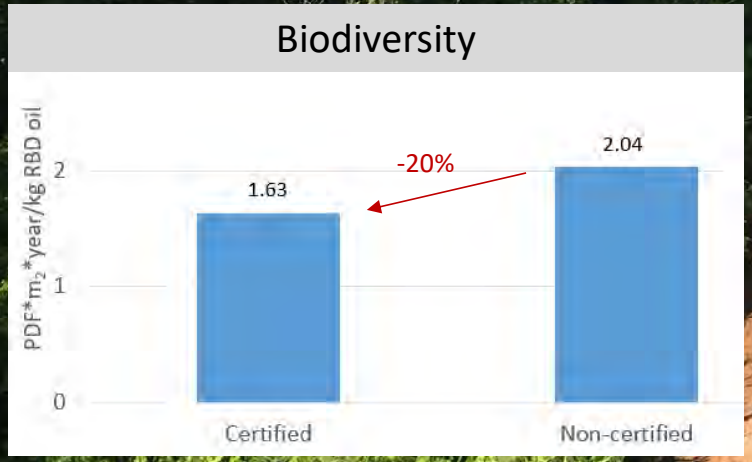
Picture: Jannick Schmidt. UIE palm oil mill, United Plantations, Peninsular Malaysia 2017

Where do the LCA results take us?

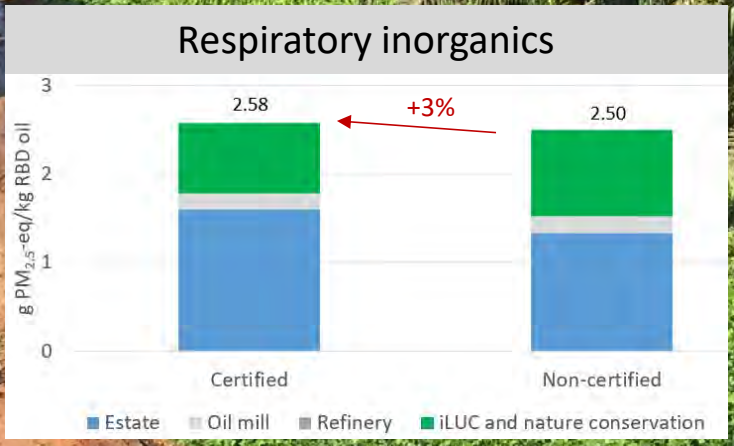
GHG emissions



Biodiversity



Respiratory inorganics



Picture: Jannick Schmidt. Nature conservation, Sungai Rungau estate, Sinarmas, Central Kalimantan 2017

The devil lies in the detail...
- GHG emissions

Low peat share
Low drainage depth

High yield

More biogas capture

Higher fertiliser

Life Cycle Stage	Contribution	Certified	Non-certified
Oil crop cultivation			
	Field emissions (related to nutrient cycle)	0.72	0.92
	Field emissions (related to peat drainage)	0.77	2.36
	Indirect Land Use Changes (iLUC)	0.49	0.62
	Material inputs: fertiliser, pesticides, capital goods etc.	0.33	0.21
	Energy	0.07	0.08
	Other (transport, waste treatment, assets and services)	0.20	0.27
	Total crop cultivation stage	**2.58**	**4.46**
Palm oil mill			
	POME treatment	1.19	1.51
	Energy inputs	-0.03	-0.06
	Other (transport, waste treatment, assets and services)	0.17	0.18
	By-product: kernel	-0.43	-0.70
	By-product: energy and EFB to field application	-0.04	-0.04
	HCV nature conservation	-0.01	0.00
	Total palm oil mill stage	**0.85**	**0.89**
Refinery			
	Materials: chemicals, water etc.	0.02	0.02
	Energy	0.03	0.03
	Other (transport, waste treatment, assets and services)	0.02	0.02
	By-products: PFAD/PKFAD	-0.08	-0.08
	Total refinery stage	**-0.01**	**-0.01**
All stages			
Total		**3.41**	**5.34**

Picture: Jannick Schmidt. Nature conservation, Hanau estate, Sinarmas, Central Kalimantan 2018

What matters? Peat and water management

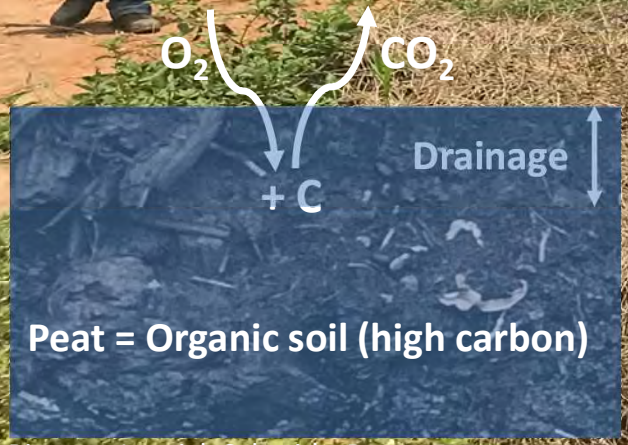
Account for 22-45% of GHG emissions
Average: 73 cm ⇒ 41 t CO_2/ha*year
Certified: 57 cm ⇒ 32 t CO_2/ha*year

Good water management
RSPO certified grower

0.3 m

Poor water management
non-certified grower

1.2 m



Picture: Jannick Schmidt. Peat water management, Central Kalimantan 2018

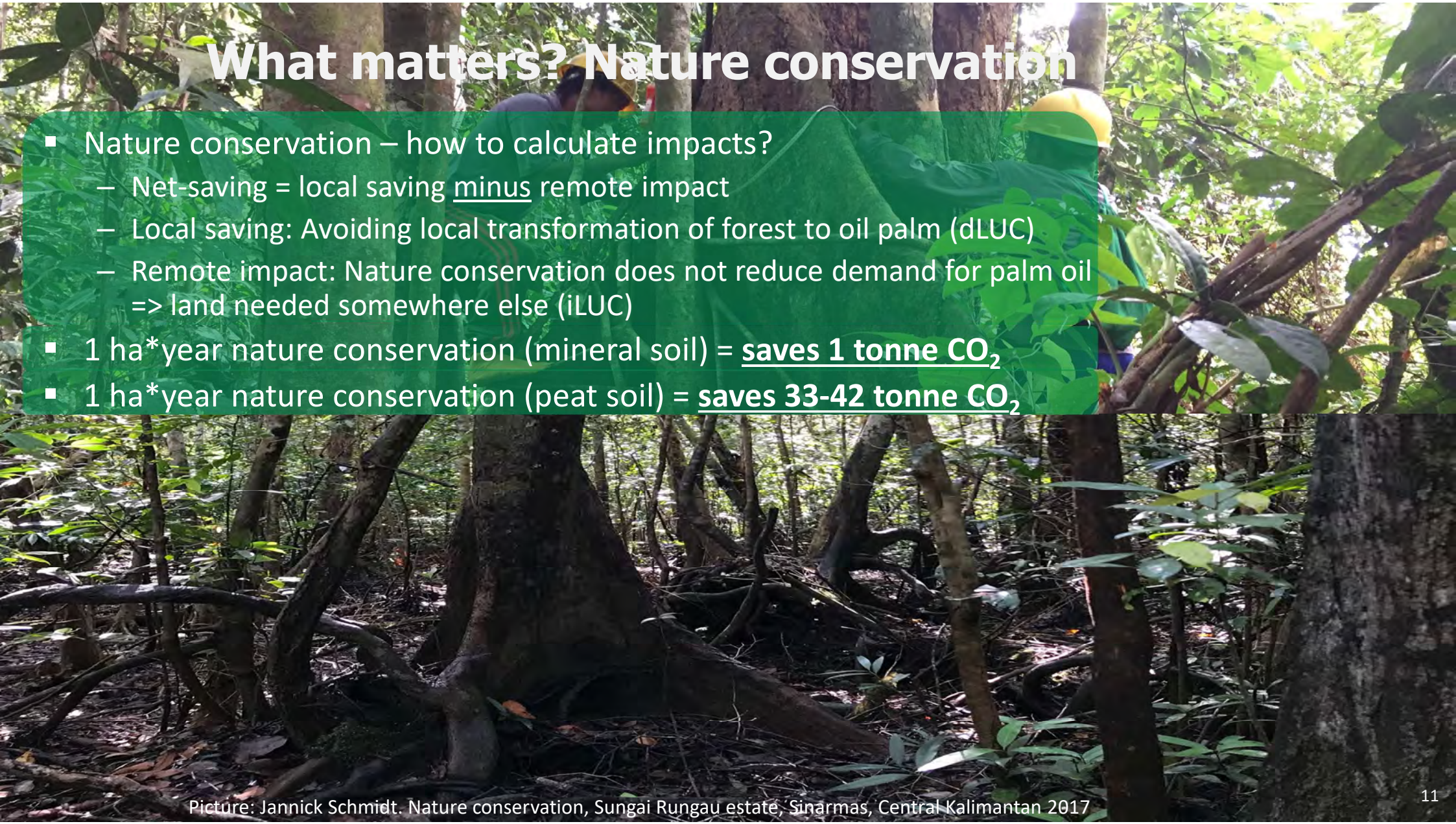
What matters? Biogas capture

- Anaerobic ponds ⇒ methane
- POME emissions account for around 1/3 of GHG emissions
- Can be more than eliminated by biogas capture

Picture: Jannick Schmidt. Biogas digester tank and POME treatment at mill, United Plantations, Peninsular Malaysia 2017

What matters? Nature conservation

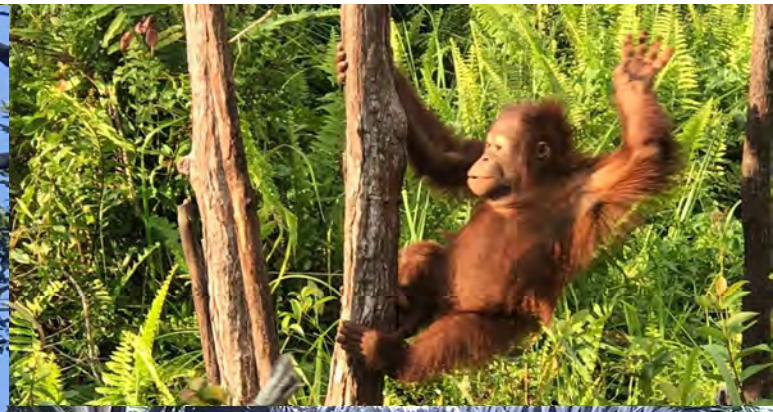
- Nature conservation – how to calculate impacts?
  - Net-saving = local saving minus remote impact
  - Local saving: Avoiding local transformation of forest to oil palm (dLUC)
  - Remote impact: Nature conservation does not reduce demand for palm oil => land needed somewhere else (iLUC)
- 1 ha*year nature conservation (mineral soil) = **saves 1 tonne CO_2**
- 1 ha*year nature conservation (peat soil) = **saves 33-42 tonne CO_2**



Picture: Jannick Schmidt. Nature conservation, Sungai Rungau estate, Sinarmas, Central Kalimantan 2017

Conclusions

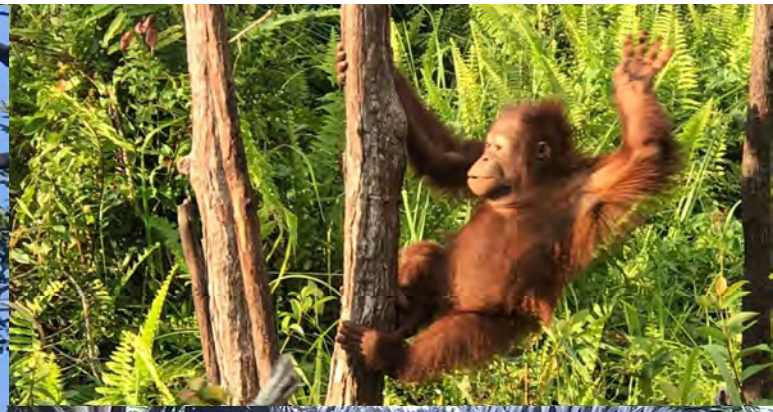
- Model
  - Detailed and compatible with SimaPro
  - Runs with >600 estates and >150 oil mills
  - Two sets of results:
    - Consequential (cause-effect)
    - Attributional (similar to PalmGHG)
- Results: RSPO certified vs. non-certified
  - 36% lower GHG emissions
  - 20% lower nature occupation
  - 3% higher respiratory inorganics
  - LCA guides what matters



Pictures: Jannick Schmidt. Tanjung Puting, Central Kalimantan 2018

Conclusions

- What can the results be used for?
  - Now the impact of certification can be measured!
  - Companies can include the benefits of committing to certified oil in their environmental accounts
  - The industry can document that palm oil can be produced more sustainable
  - Inputs for next criteria for certification
  - Now RSPO can set measurable targets for reductions in GHG emissions and biodiversity impacts



Pictures: Jannick Schmidt. Tanjung Puting, Central Kalimantan 2018

What is next?

- New crowdfunded project
  https://lca-net.com/clubs/palm-oil/
- Features
  - 2016 ⇨ Time-series
  - ID&MY ⇨ ID, MY, TH, CO, NG etc.
  - All growers ⇨ estates, smallholders
- Become a member and:
  - Shape the scope of the study
  - Get access to all data and materials

Pictures: Jannick Schmidt. Tanjung Puting, Central Kalimantan 2018

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Pictures: Jannick Schmidt. Tanjung Puting, Central Kalimantan 2018