



Malaysian Palm Oil Biomass Industry - Opportunities and Challenges -

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Integrated Service Offering for BioRenewable projects

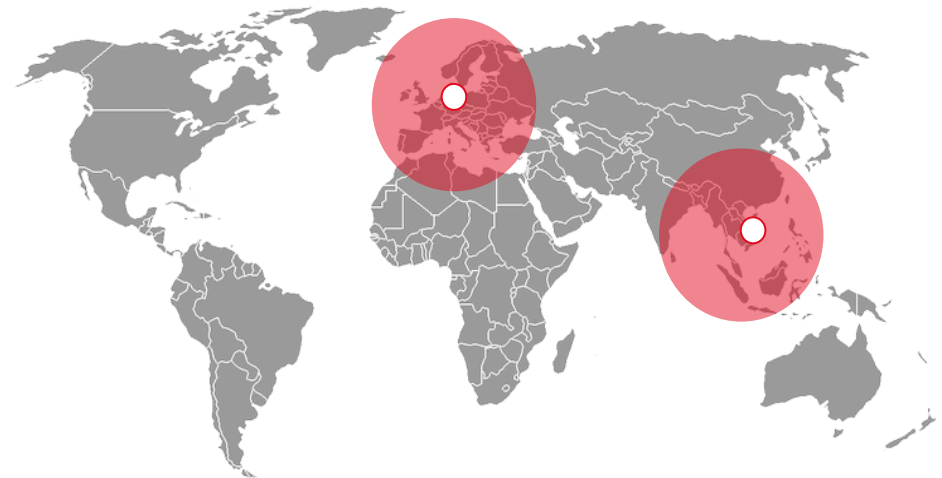
Our unique service offering

Independent, Experienced and Professional Project Management solutions

COMMERCIAL DEPLOYMENT OF BIORENEWABLE PROJECTS

- 1G and 2G Biofuel projects
- Bio-energy and CHP plants
- Waste-to-energy plants
- Feedstock aggregation
- Sustainability implementation
- Financing

FOCUS ON KEY MARKETS





Malaysia Oil Palm Biomass Supply Base

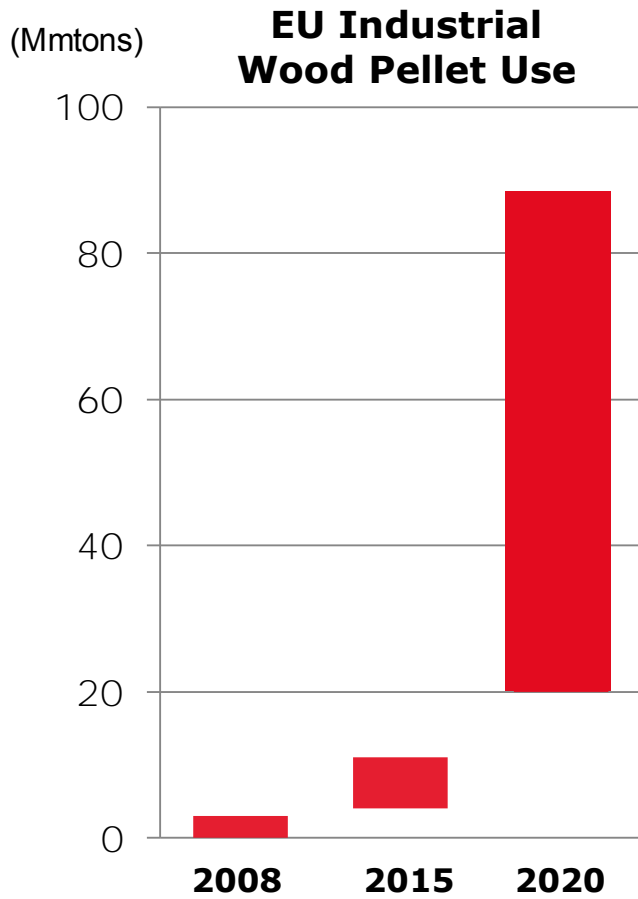
- **2011 Crude Palm Oil production** – **18.9 Mmtons**
- **Total biomass production** ~ **170.0 Mmtons**

Fraction	Yield (dw Mmtons/yr)	Current use
Empty fruit bunches	6.7	fertilizer, energy, mulching, fibers
Palm kernel shells	4.0	energy, other
Fronds	47.7	mulching, fertilizer
Trunks	13.0	mulching, fertilizer, manufacturing

Sources: MPOB, NBS2020



The EU Bioenergy market



Opportunity: Security of supply



Sourcing from Malaysia

Challenge: Product specifications

	I1 industrial	I3 industrial	PKS	EFB pellet	Rice husk pellets
Moisture (weight %)	≤ 10	≤ 10	12 - 18	10 - 12	10 – 15
Net cal value (GJ/ton)	≥ 16.5	≥ 16.5	17 - 19	17 - 20	15
Ash content (weight % dm)	≤ 1.0	≤ 3.0	2 - 8	2 - 8	8 -20
Chloride (weight % dm)	≤ 0.03	≤ 0.10	0.1		
Sulphur (weight % dm)	≤ 0.05	≤ 0.4	0.1 – 0.5		



Torrefaction

Solution: Improved feedstock properties

Biomass



Torrefied biomass



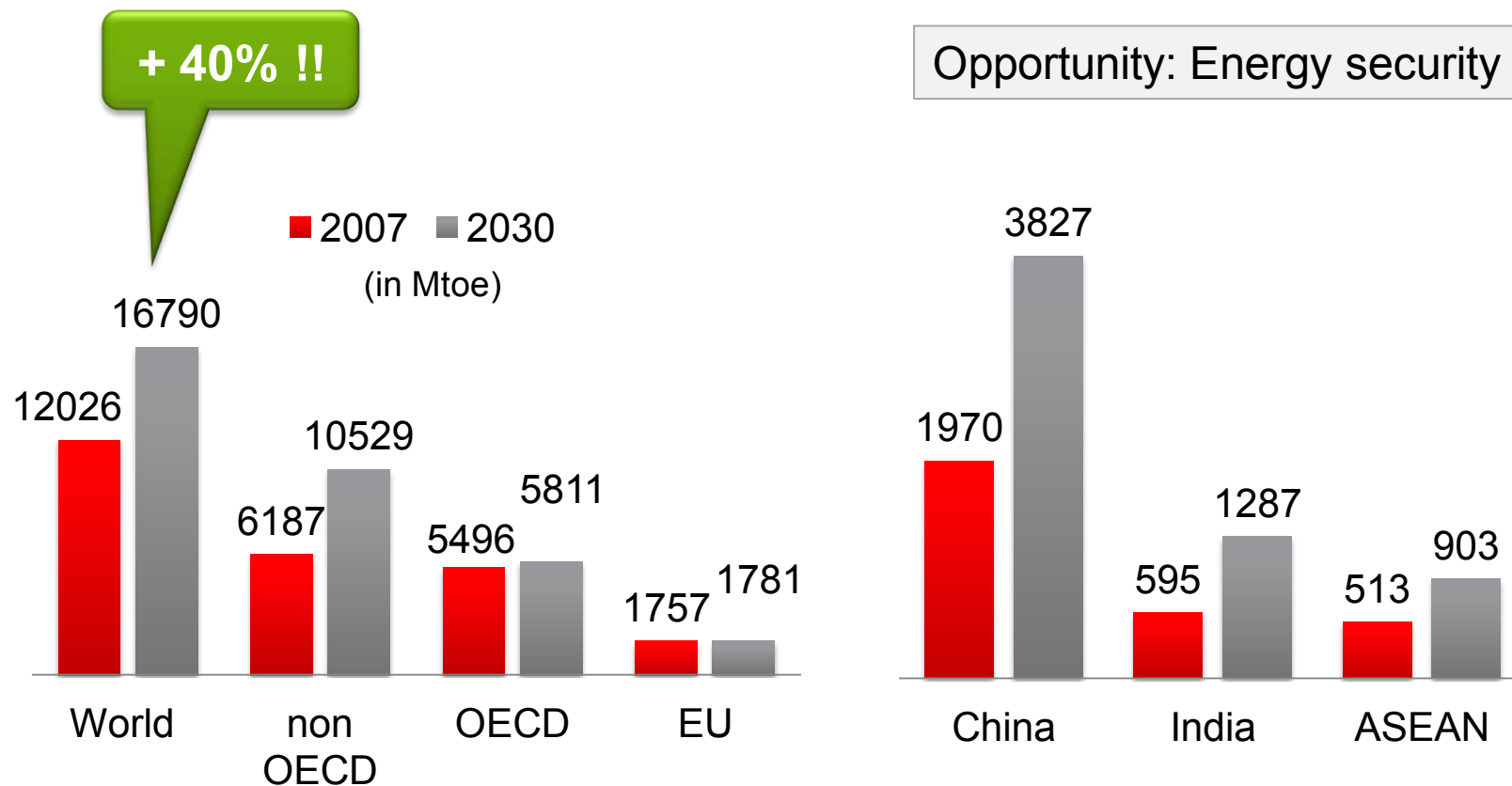
Coal



- Tough*
- Fibrous*
- Hydrophilic*
- Biodegradable*
- Heterogeneous*
- Poor energy density*
- Sustainable fuel*

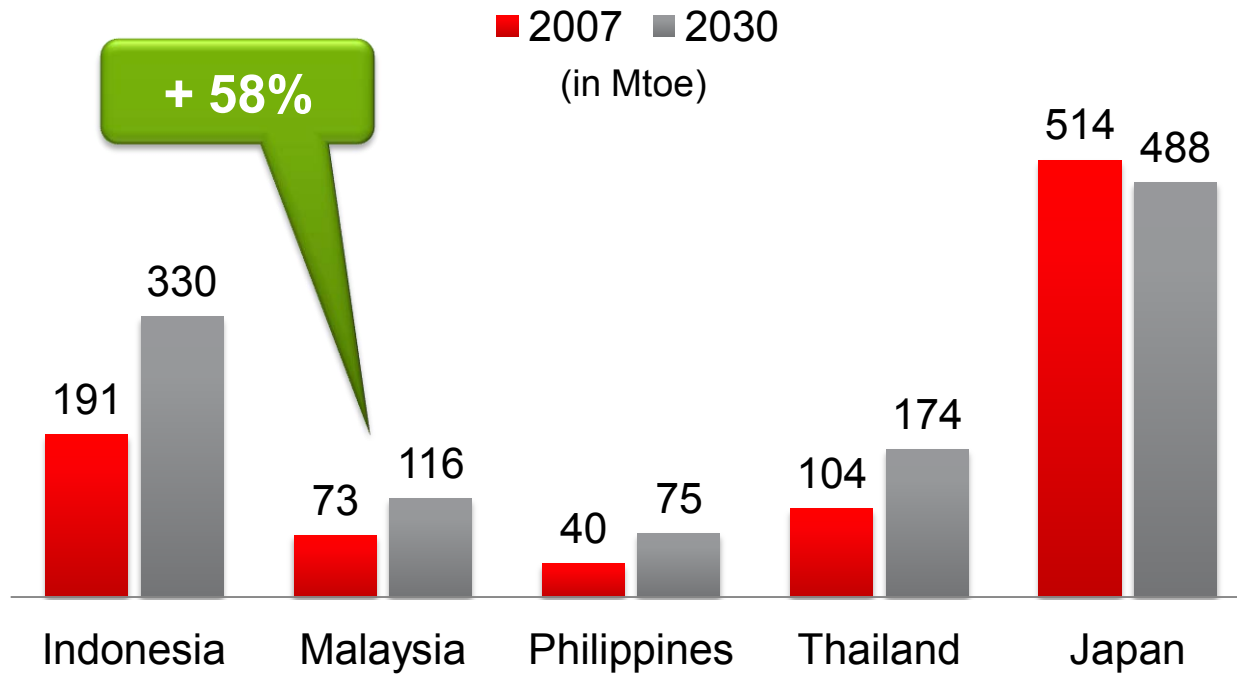
Yes	↔	No	No
Yes	↔	No	No
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Yes	↔	No	No
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The Asian Energy Market





The Asian Energy Market





The Biobased Economy Market

Opportunity: Adding value to the biomass

■ Cellulose

■ Starch

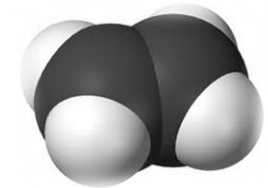
■ Minerals

■ Lignin

■ Protein



Materials



Chemicals



Pellets 2.0



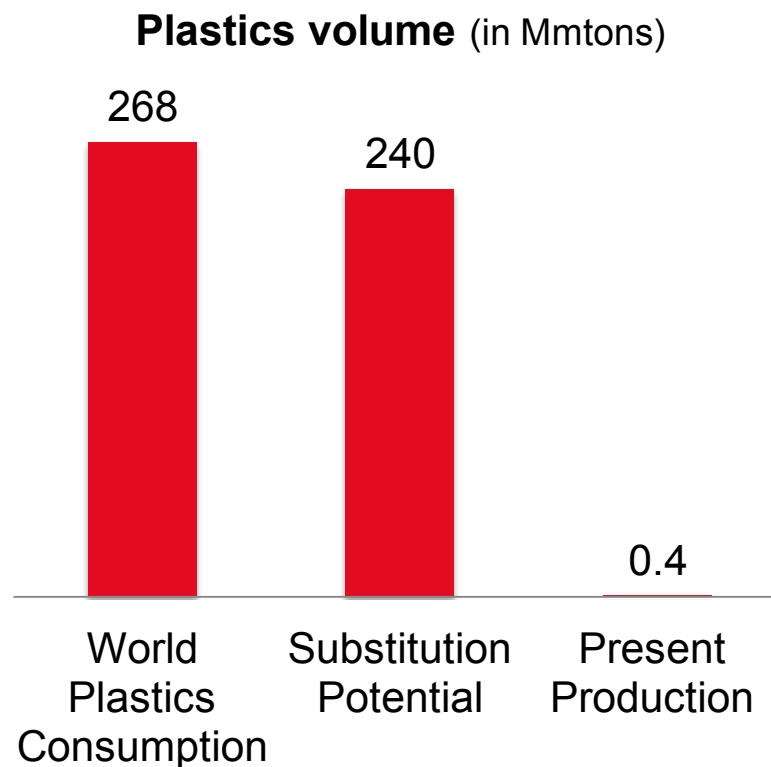
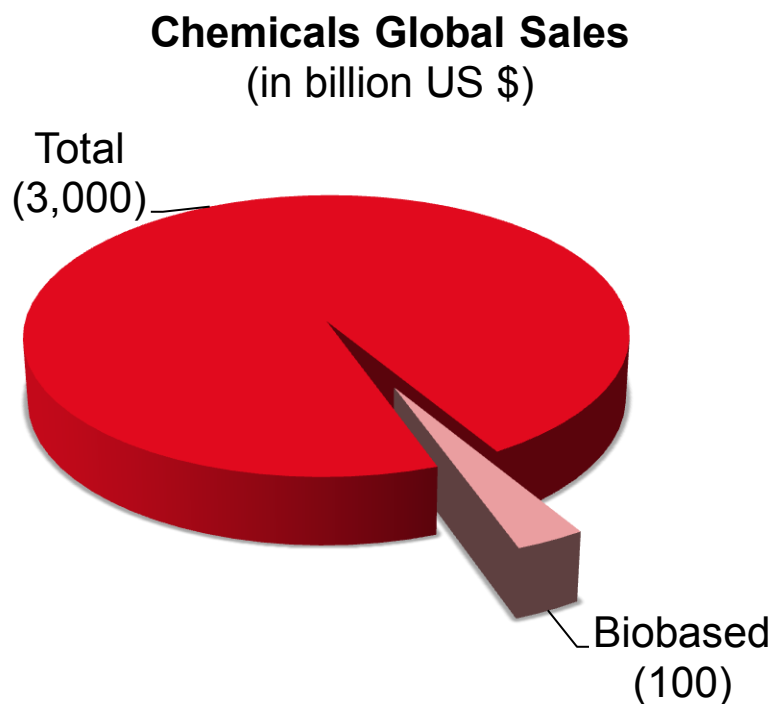
Fertilizer





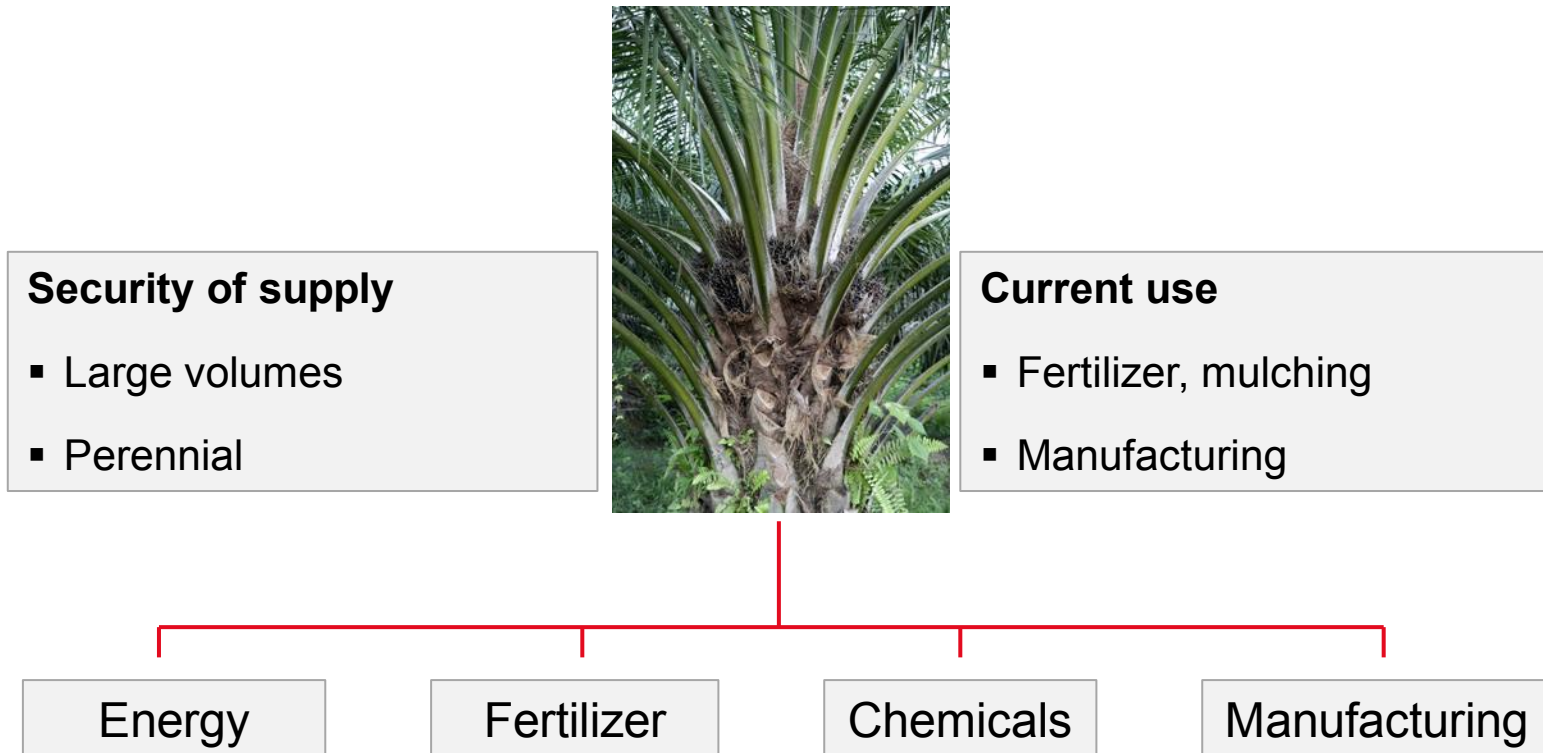
Global chemicals and plastics markets

Challenge: Capital intensive technologies



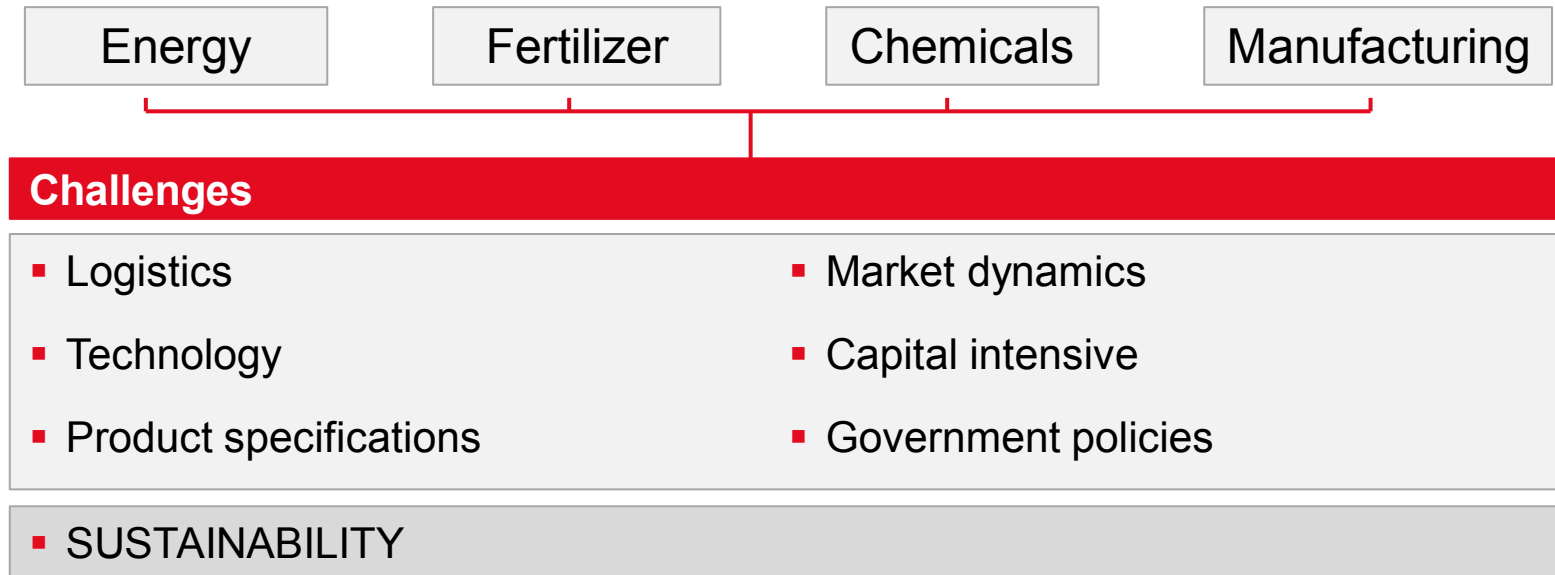


Oil Palm Biomass: Opportunities





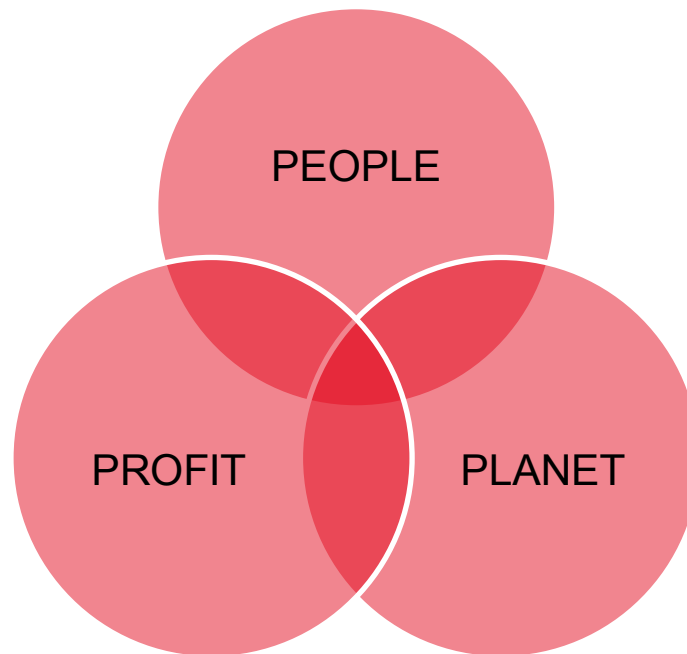
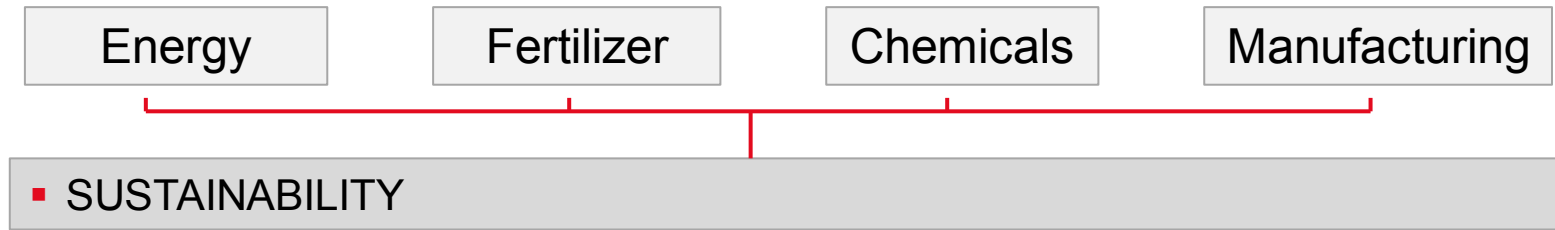
Oil Palm Biomass: Challenges



> Creating more value per hectare improves the sustainability score

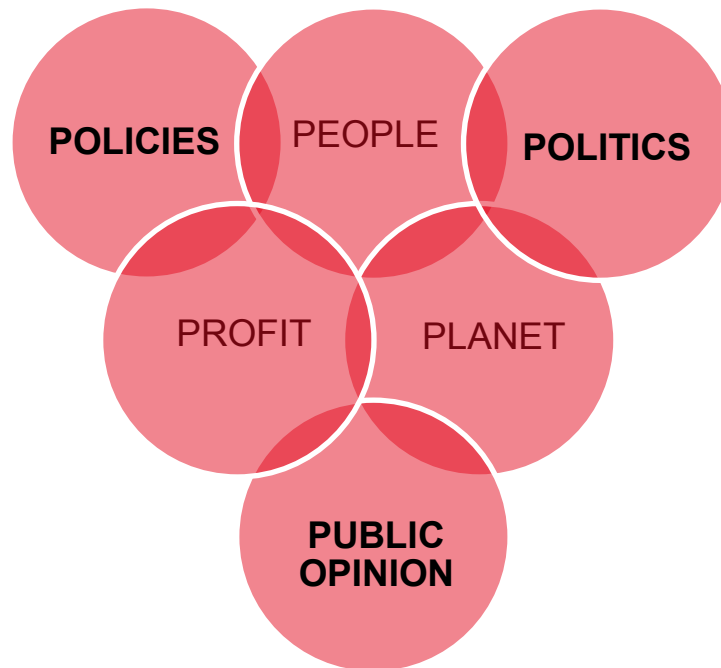
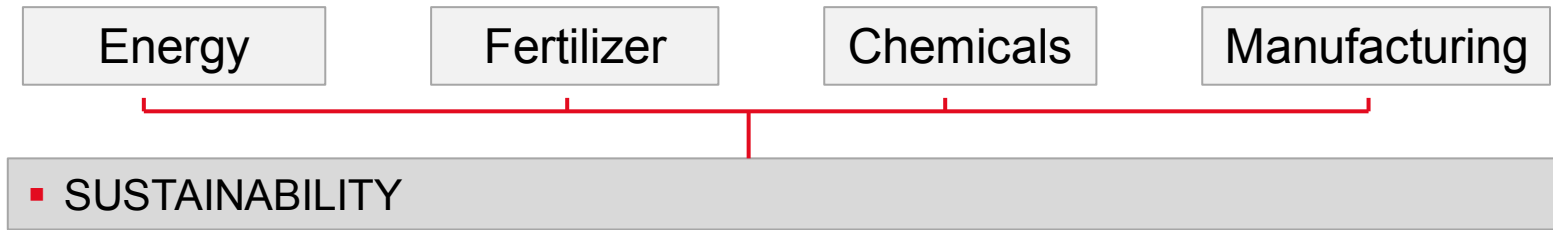


Sustainability: the 3P-principle



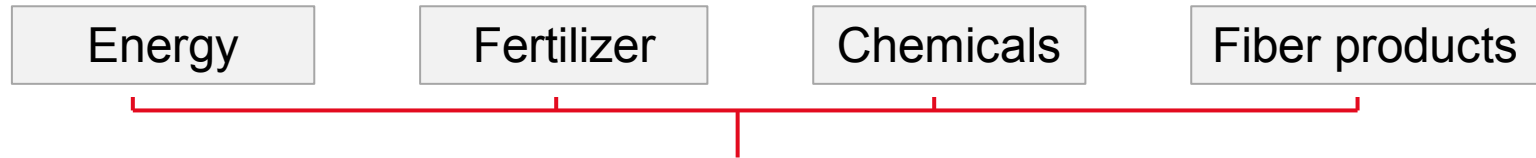


Sustainability: 3 more P's





Oil Palm Biomass: Conclusions



Solutions: Supply chain organization

- Consortia of up- and downstream players
- Collection centers and industry hubs
- Product standards



Global reach - personal touch

Thank you for your attention

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