Is palm oil cultivation possible within planetary boundary?

Yes, land saving is the missing link

23 November, Maja Slingerland

WAGENINGEN
UNIVERSITY & RESEARCH

Increasing productivity in Indonesia

Indonesia aims to increase its palm oil production from 41 Mt CPO in 2018 to 60 Mt in 2035 to supply part of the increased global demand (*Roadmap for the National Oil Palm Industry Towards 2045,* 2019).

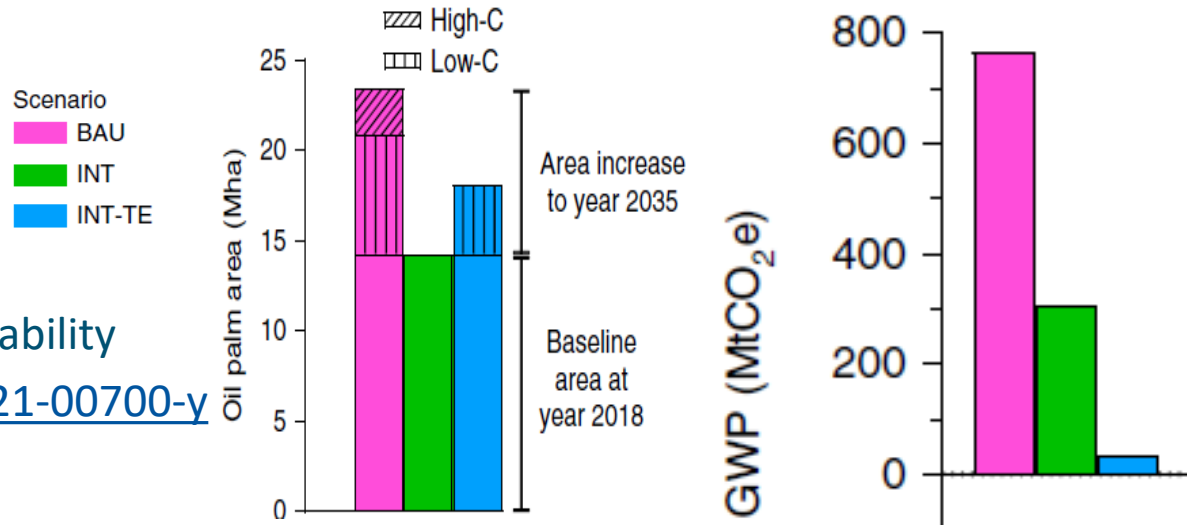
Is this possible within planetary boundaries?

To answer this question a yield gap and scenario study was conducted by researchers from Indonesia, University of Nebraska and Wageningen University (Monzon et al, 2020)

Three scenarios to reach 60 Mt CPO in 2035

BAU = Expansion proportional on peat and replacing forest as in the past
INT = Reaching max FFB yields of about 30 t ha^{-1} instead of average actual yields of 19.7 and 15.3 t ha^{-1} for large plantations and smallholders respectively
INT-TE = Reaching average FFB yields of 22,5 t ha^{-1} and expansion ONLY on low carbon areas (no peat, no forest) and not land used for food production.

In the blue scenario (INT-TE) Indonesia will produce 60 Mt CPO in 2035 while
Saving of 2.6 Mha of forest and peat land, compared to BAU
Saving of 732 MtCO2e emissions, compared to BAU



Monzon et al. 2021 Nature Sustainability
https://doi.org/10.1038/s41893-021-00700-y

WAGENINGEN
UNIVERSITY & RESEARCH

Conclusion

- Yes, Indonesia can supply increased demand within planetary boundaries through increasing yield/ha and expanding only on low carbon land

With co-benefits of

- biodiversity savings
- increased income for producer
- increased buyer acceptability.

- But implementation will be a challenge and globally these options may be different per location hence other and complementary options need also be considered such as **integrated systems.**

Integrated systems = overlapping land use

Pineapple

Banana

Peanut

Assumptions

1000 ha oil palm (1-4 YAP) host 200 crop farmers, 5 ha each.

1000 ha oil palm (>7 YAP) host 8 cattle farmers, 125 ha grazing area and 30–35 animal units each

WAGENINGEN
UNIVERSITY & RESEARCH

Badrul Azhar et al, Land Use Policy 107 (2021) 105498

Calculated impact

Palm oil (FFB) yield not negatively affected by integration!!!
Benefit in avoided deforestation (by saving land) is:

- 1–2% globally
- 10–23% for Peninsular and Borneo Malaysia
- 4% for Sime Darby plantations worldwide

(Badrul Azhar et al, Land Use Policy 107 (2021) 105498)

Additional benefits

- Decreased biodiversity & carbon loss, and GHG emissions
- Increased biodiversity in the oil palm plantations
- Income from crops when no FFB yet
- Additional income from livestock in mature plantations
- Food production in oil palm landscapes

NB when cattle is not grazed but stallfed with grass cut in plantations it can be integrated with palm from first year onwards → more land saving

WAGENINGEN
UNIVERSITY & RESEARCH

Permanent intercropping and agroforestry

Double row avenue system with black pepper or cassava

Agroforestry/home garden

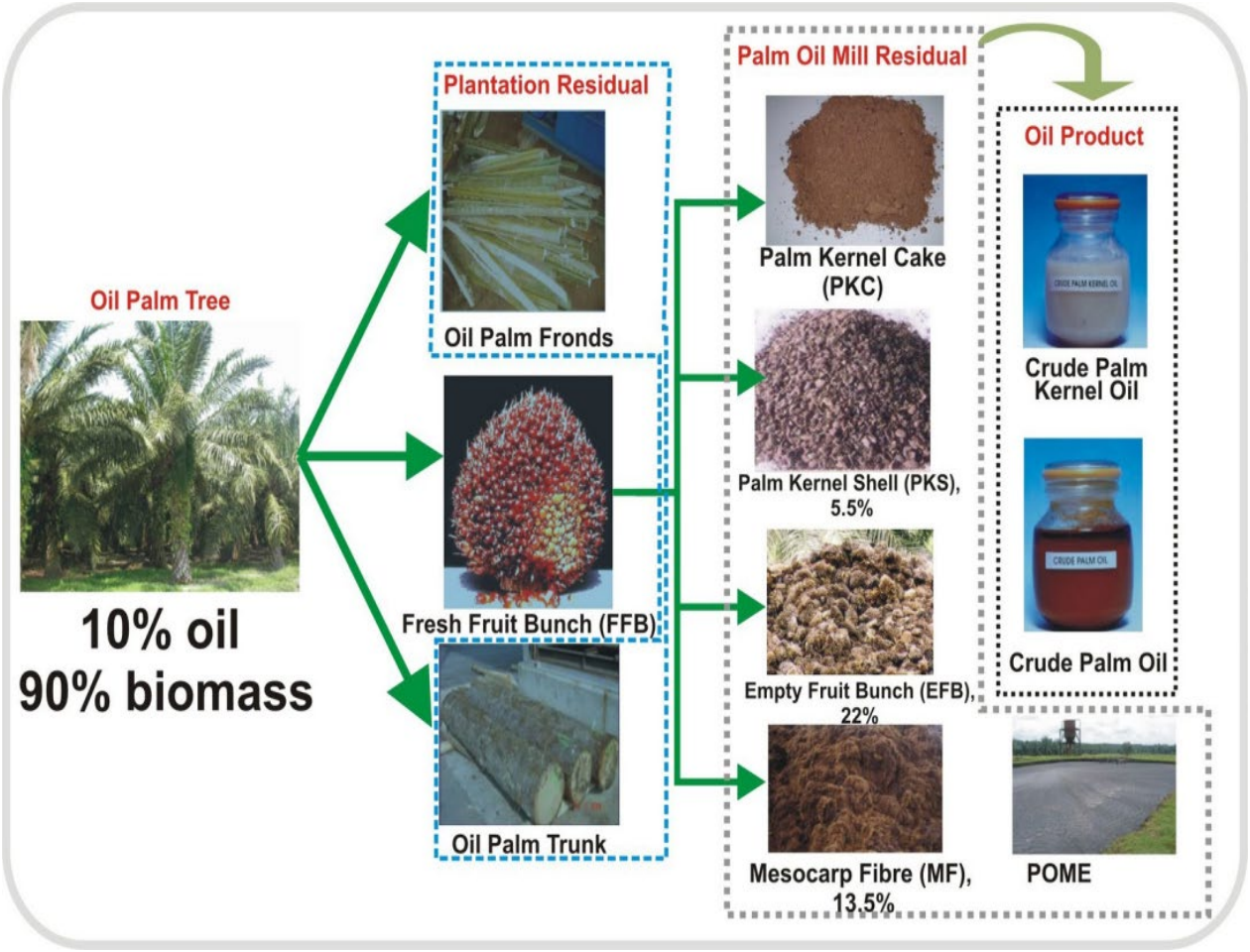
Benefits
More ecosystem services
Soil health
Income resilience
More biodiversity/ha
Contribute to food basket

Consequences

Palm oil yield/ha negatively affected compared to monoculture due to competition for light (water, nutrients) and/or less palm trees per ha.

Need more ha for same volume of oil → additional plantations needed to reach same palm oil production (on forest or peatland?!)

Adding value to oil palm residues (90%)

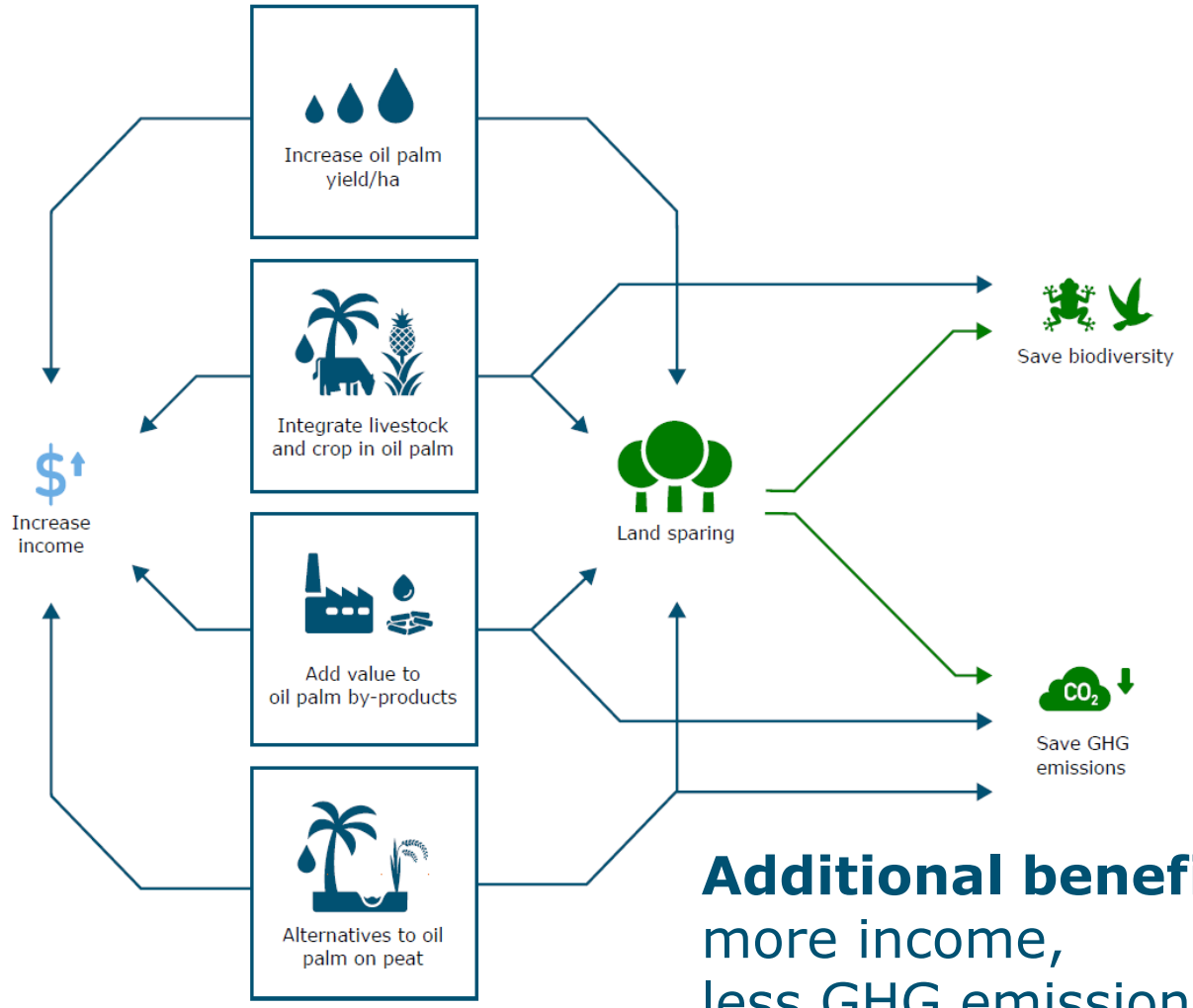


Land use, GHG emissions & biodiversity loss are all attributed to oil production.

Making more products from the other biomass decreases this attribution to oil AND **may save land**.

WAGENINGEN
UNIVERSITY & RESEARCH

Harvesting starch from trunk at replanting



- 5.3 t ha^{-1} starch in the oil palm trunks that are to be felled at replanting
- This amount of starch can save 0.8-1.6 ha of land cultivated with cassava for starch.

Additional benefits:
more income,
less GHG emissions
less biodiversity loss

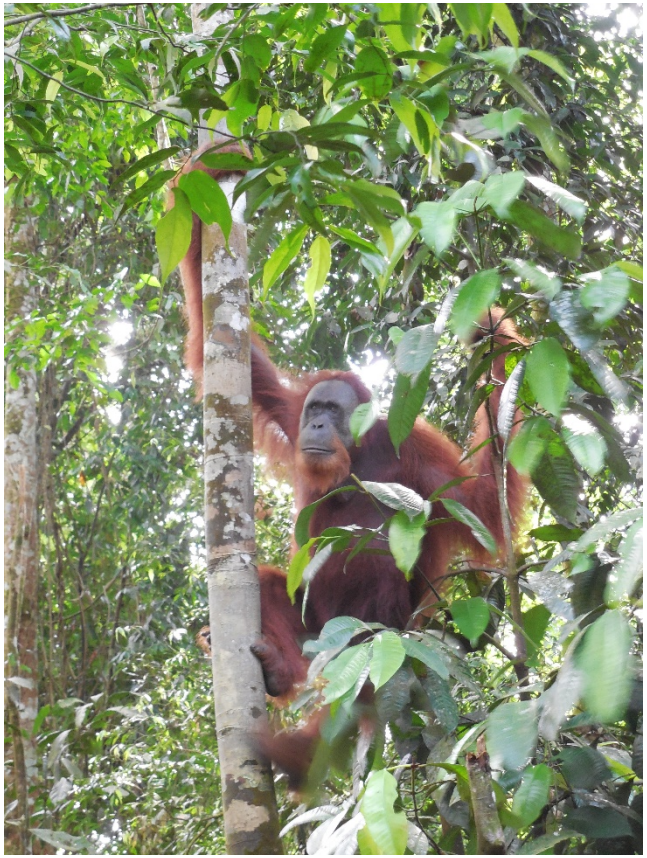
WAGENINGEN
UNIVERSITY & RESEARCH

More information:
Wolter.Elbersen@wur.nl

What would be required and from whom?

- Agricultural extension to oil palm producers on GAP to increase yield/ha and on proper integrated systems (research/gov/companies)
- Affordable fertiliser of adequate composition for oil palm cultivation on the market (gov & fertiliser industry) to prevent environmental damage & GHG emissions
- Land use planning/zoning to allow oil palm expansion only on low carbon stock areas (gov) & favour gradient with e.g. agroforestry closer to protected areas
- Acceptance of **land saving** as sustainability criterium in investment portfolios, certification and trade, because of the benefits in preventing carbon and biodiversity loss
- Not only address cultivation but also processing

The best of both worlds



WAGENINGEN
UNIVERSITY & RESEARCH

Maja.Slingerland@wur.nl

Further reading recent publications

- J.P. Monzon, M.A. Slingerland, S. Rahutomo, F. Agus, T. Oberthür, J.F. Andrade, A. Couedel, J.I. Rattalino Edreira, W. Hekman, R. van den Beuken, F. Hidayat, I. Pradiko, D. Kuntjoro, C. Donough, H. Sugianto, T. Farrell, P. Grassini, 2021. Fostering a climate-smart Green Revolution for oil palm, Nature Sustainability, https://doi.org/10.1038/s41893-021-00700-y

- Badrul Azhar, Frisco Nobilly, Alex M. Lechner, Kamil Azmi Tohiran, Thomas M. R. Maxwell, Raja Zulkifli, Mohd Fathil Kamel, Aslinda Oon, 2021. Mitigating the risks of indirect land use change (ILUC) related deforestation from industrial palm oil expansion by sharing land access with displaced crop and cattle farmers, Land Use Policy 107 (2021) 105498

- Nikmatul Khasanah, Meine van Noordwijk, Maja Slingerland, Mohammad Sofiyudin, Dienke Stomph, Adrien F. Migeon and Kurniatun Hairiah, 2020, Oil Palm Agroforestry Can Achieve Economic and Environmental Gains as Indicated by Multifunctional Land Equivalent Ratios, (*Agroecology and Ecosystem Services) Frontiers in Sustainable Food Systems* 3,122 doi: 10.3389/fsufs.2019.00122