



EXPERIMENTAL BIODIVERSITY ENRICHMENT IN AN OIL-PALM PLANTATION

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Bogor Agricultural University



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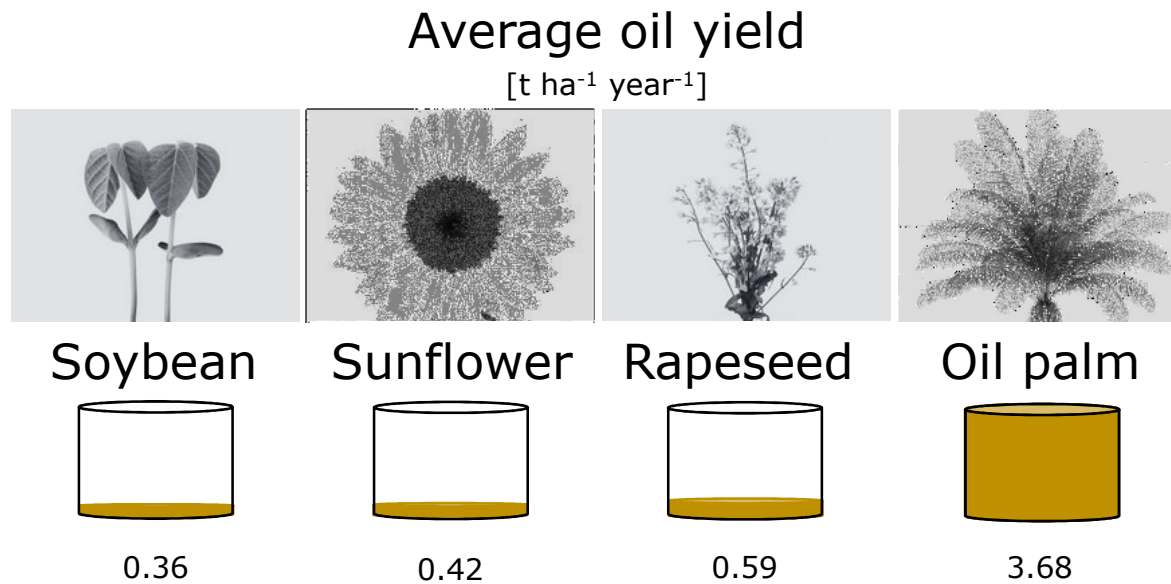
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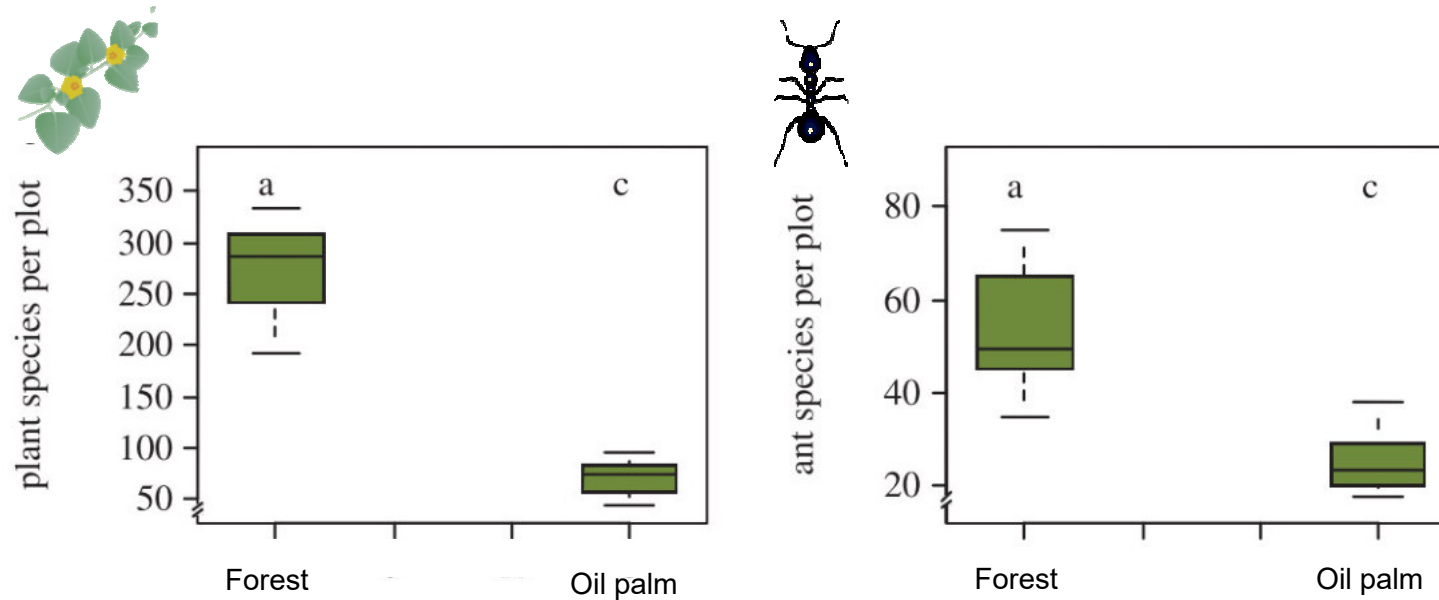
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Palm oil: High yields per hectare, low labour-intensity



Basiron (2007). *European Journal of Lipid Science and Technology*.

Biodiversity losses in oil palm plantations compared with forests



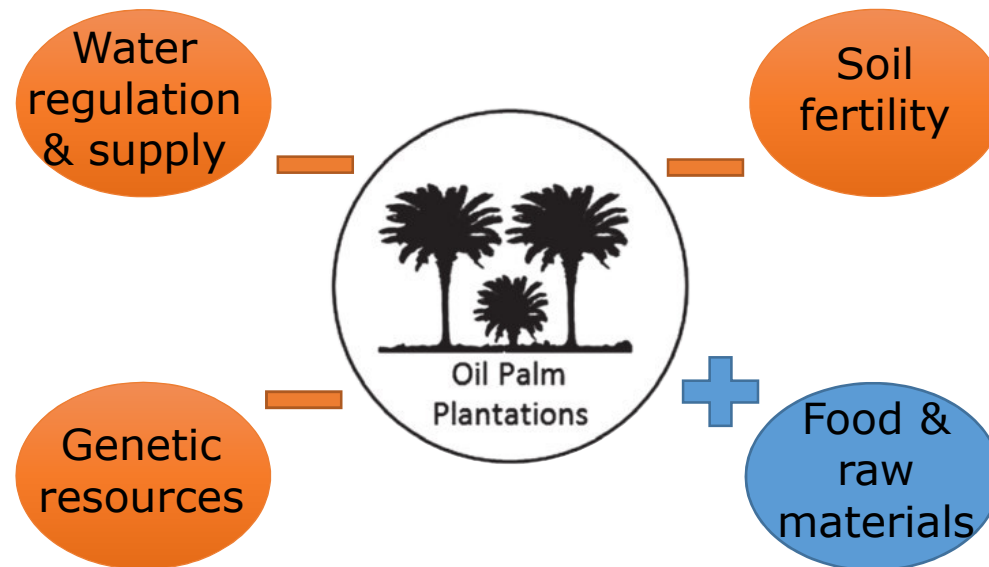
Simplified after: Drescher et al. (2016). *Philosophical Transactions of the Royal Society B*.

Symbol attribution: Courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/).



Loss of ecosystem functions

11 out of 14 ecosystem functions in forests compared with oil palm plantations decreased, 2 data deficient, 1 increased, e.g.

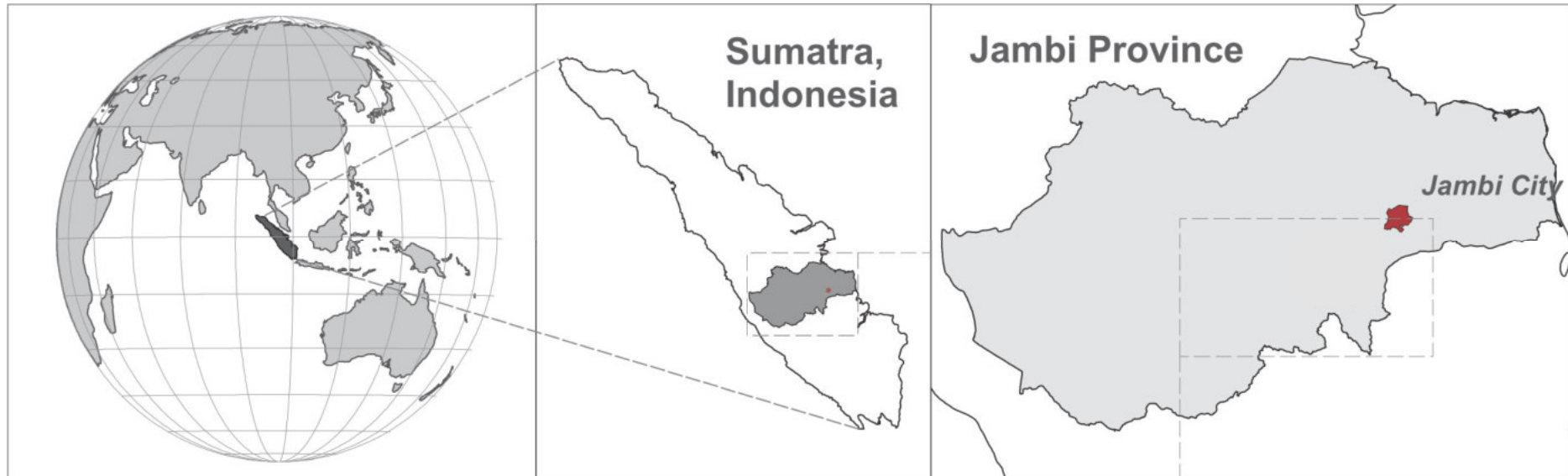


Designer landscapes may be suitable to mitigate negative consequences



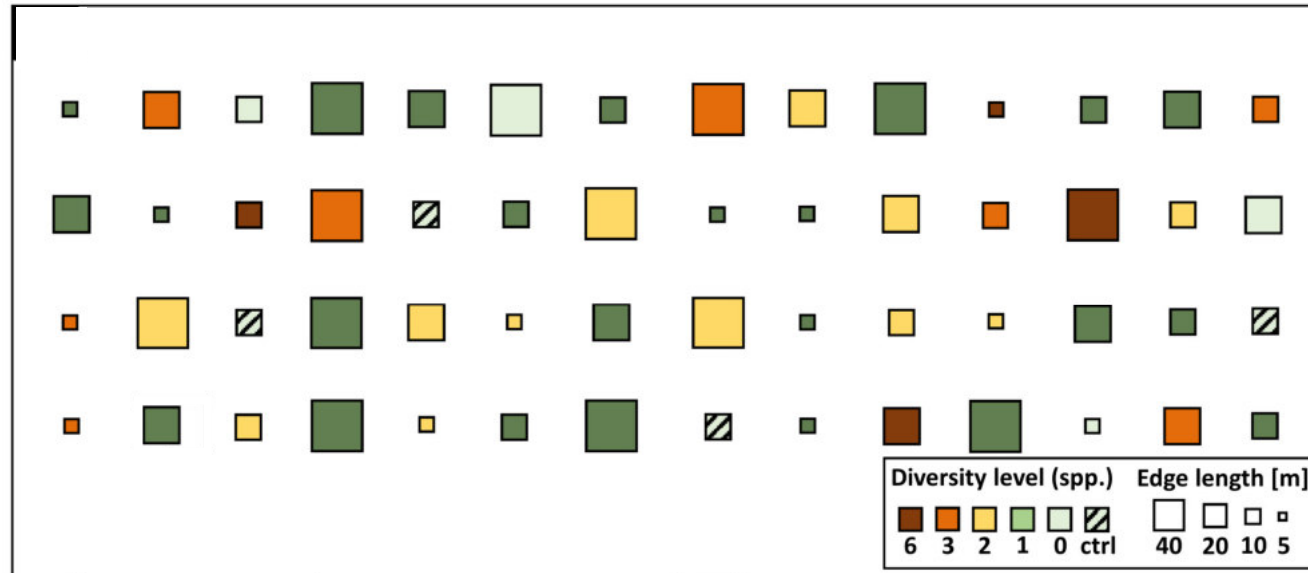


Real landscape: Jambi Province, our study area



- Monocultures dominate the landscape
- Few opportunities for landscape planning
- **Restoration measures needed**
- Area-effective to minimize economic losses

The biodiversity enrichment experiment



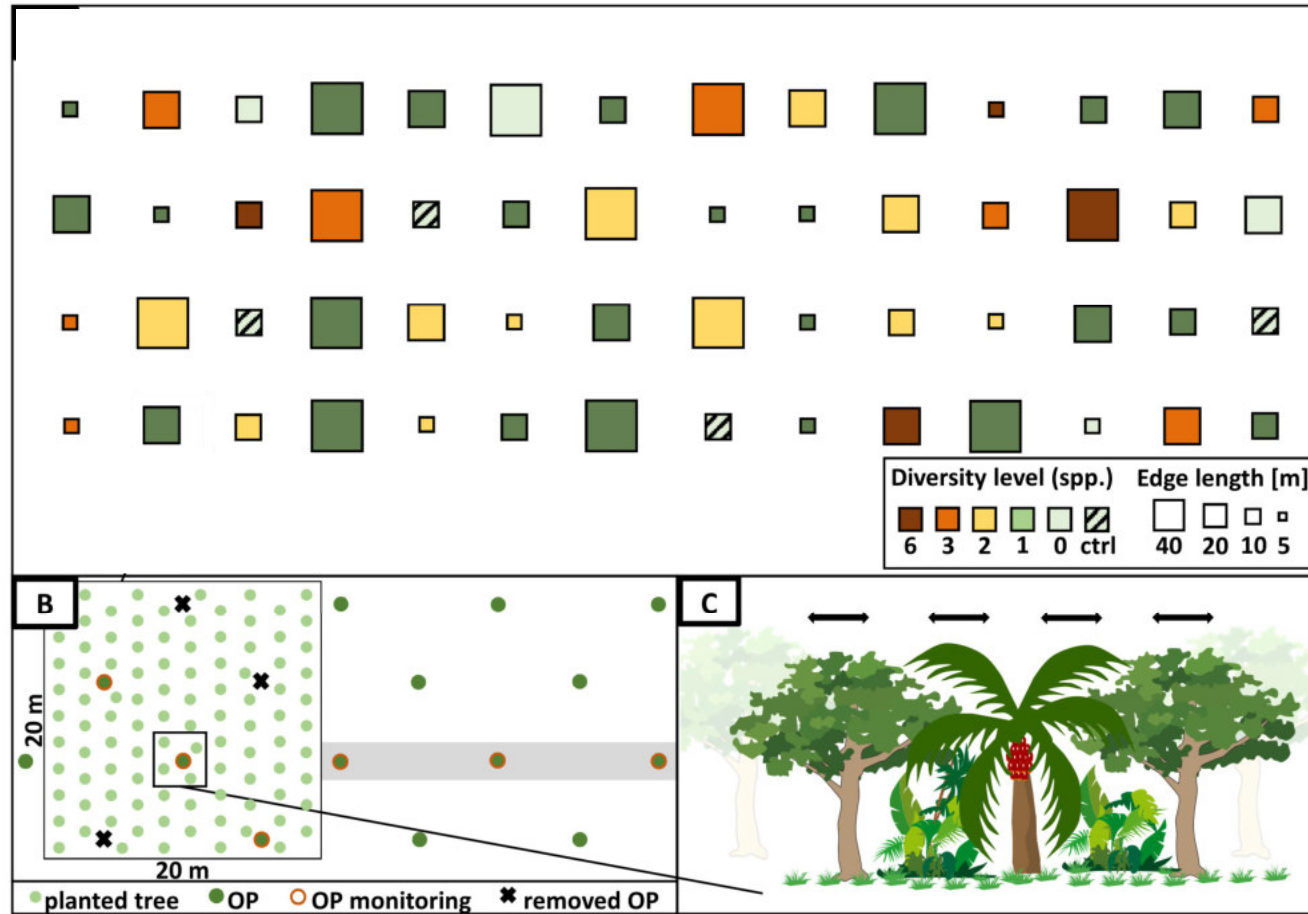
Experimental management:

no weeding (after 2 years), no fertilizer/herbicide/pesticide, oil palm thinning

56 plots:

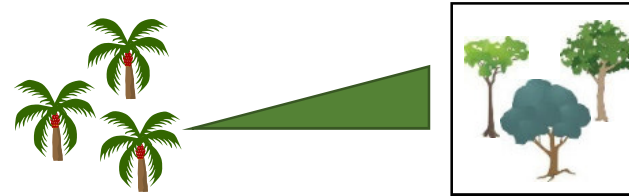
- 48 experimental management, trees planted
- 4 experimental management, no trees planted
- 4 management-as-usual, no trees planted

The biodiversity enrichment experiment



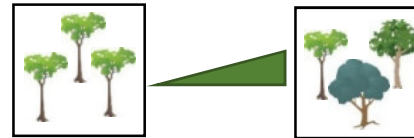
Overall aims

- 1) Tree islands increase ecosystem functioning and biodiversity

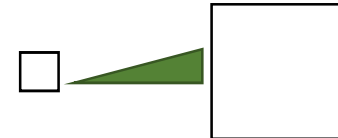


- 2) Experimental variables affect ecosystem functioning and biodiversity

a) Diversity level



b) Plot size



- 3) Planting native, multi-purpose tree species may reconcile ecological and economic functions

6354 trees
planted in Dec 2013

6 species:

3 fruit trees
(*Archidendron pauciflorum*,
Parkia speciosa,
Durio zibethinus)

2 timber trees
(*Peronema canescens*,
Shorea leprosula)

1 rubber tree
(*Dyera polyphylla*)

Feb 2018:
Tallest: 13,8 m
Largest stem: 25,8 cm diameter



Conclusions and limitations

- Trees established after the most critical initial phase – future success of the experiment likely
- Trends in biodiversity visible, clear effects need more time
- Yield effects: oil palms in polyculture may not cause economic losses under certain conditions, more research needed
- Results based on five years of a planned runtime of 12 years; long-term monitoring necessary for an overall evaluation
- Suitability of species, diversity level, species composition and plot size not yet evident
- Initial results promising to find management options that reconcile ecological and economic functions

for more information



Website: <https://www.uni-goettingen.de/de/412084.html>

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Publications:

- Grossman JJ, Vanhellefont M, Barsoum N, Bauhus J, Bruelheide H, Castagneyrol B, Cavender-Bares J, Eisenhauer N, Ferlian O, Gravel D, Hector A, Jactel H, Kreft H, Mereu S, Messier C, Muys B, Nock C, Paquette A, Parker J, Perring MP, Ponette Q, Reich PB, Schuldt A, Staab M, Weih M, Zemp DC, Scherer-Lorenzen M, Verheyen K (2018) *Synthesis and future research directions linking tree diversity to growth, survival, and damage in a global network of tree diversity experiments*. Environmental and Experimental Botany - doi: 10.1016/j.envexpbot.2017.12.015
- Gérard A, Wollni M, Hörscher D, Irawan B, Sundawati L, Teuscher M, Kreft H (2017) *Oil-palm yields in diversified plantations: Initial results from a biodiversity enrichment experiment in Sumatra, Indonesia*. Agriculture, Ecosystems and Environment 240: 253-260 - doi: <http://doi.org/10.1016/j.agee.2017.02.026>
- Teuscher M, Gérard A, Brose U, Buchori D, Clough Y, Ehrbrecht M, Hörscher D, Irawan B, Sundawati L, Wollni M, Kreft H (2016) *Experimental biodiversity enrichment in oil-palm-dominated landscapes in Indonesia*. Frontiers in Plant Science 7: 1538 - doi: 10.3389/fpls.2016.01538



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