EXPERIMENTAL BIODIVERSITY ENRICHMENT IN AN OIL-PALM PLANTATION

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

Average oil yield
[t ha\(^{-1}\) year\(^{-1}\)]

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average Oil Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean</td>
<td>0.36</td>
</tr>
<tr>
<td>Sunflower</td>
<td>0.42</td>
</tr>
<tr>
<td>Rapeseed</td>
<td>0.59</td>
</tr>
<tr>
<td>Oil palm</td>
<td>3.68</td>
</tr>
</tbody>
</table>

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 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

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

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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

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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
Publications: