Informing more sustainable development of the oil palm industry

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Outline

• Intro to oil palm
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• Oil palm management in Indonesia
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• Oil palm management in Indonesia
• Establishing new oil palm plantations in Liberia
Why so controversial?

• Hugely profitable
Why so controversial?

- Hugely profitable
- Highest yielding vegetable oil crop globally

![Bar chart showing average oil yield per hectare per year for soybean, sunflower, rapeseed, and oil palm.](source: Oil World 2013)
Why so controversial?

- Hugely profitable
- Highest yielding vegetable oil crop globally
- Palm oil can be used for many purposes
Why so controversial?

- Ecological impacts of production
Why so controversial?

• Lower levels of vegetation complexity and diversity

Foster et al. (2011) Phil. Trans. Proc. B.
Why so controversial?

• Lower levels of vegetation complexity and diversity
  
  Foster et al. (2011) Phil. Trans. Proc. B.

• Hotter, drier, and more variable microclimates
  
Why so controversial?

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Changes in management practices
Changes in management practices

- Generally, there is a positive relationship between biodiversity and productivity (i.e., yields)

Liang et al. (2016) Science

Changes in management practices

Liang et al. (2016) Science

Changes in management practices
Changes in management practices

Changes in management

Enhanced ecological complexity
Changes in management practices

- Changes in management
- Enhanced ecological complexity
- Improved delivery of ecosystem services
Changes in management practices

- Changes in management
- Enhanced ecological complexity
- Improved delivery of ecosystem services
- Higher palm oil yields
Testing strategies to improve oil palm management

1. Replanting
Testing strategies to improve oil palm management

1. Replanting
2. Application of herbicides
• Industrial oil palm plantations in Sumatra, Indonesia
Arthropods are important to ecosystem functioning.
Arthropods are important to ecosystem functioning.
Canopy
Insecticide fogging
Understory
Sticky traps
Ground Pitfall traps
Species-level spider surveys
• No significant differences in total abundance of arthropods
• Microhabitat- and taxonomic-specific trends were observed

• Short-term declines in abundance after replanting, but no long-term declines.

Understory spiders

- Short-term declines in abundance after replanting, but no long-term declines.
- Short-term declines in species richness, but no long-term declines.

• Strong differences in community composition across sites

Reduced

Normal

Enhanced
• Effects of these management practices on spiders
• No changes caused by BEFTA-UVP treatments
• Fewer spiders in all treatments over time.

Pashkevich et al. (2022) Bas. App. Eco.
• No changes caused by BEFTA-UVP treatments
• Fewer spider species in all treatments over
• No changes in abundance
• No changes species richness
• Fewer plant species and coverage in ‘Reduced’ plots

![Graph showing mean species richness with 'Enhanced', 'Normal', and 'Reduced' treatments before and after treatment.](image)

- Fewer plant species and coverage in ‘Reduced’ plots
- **No effect of treatments on ant species richness**

• Findings across BEFTA-UVP studies indicate that application of herbicides has taxonomic-specific effects on biodiversity.
- Liberia, West Africa
West Africa
The Guinean forests along the coasts of West Africa are a recognized biodiversity hotspot for other groups, and we find them an area of high rarity for ants as well. Within the region, the forests of Liberia and Sierra Leone appear to be especially undersampled and harbor a hidden treasure of small-ranged ant species.

“Missing” ant centers that are predicted to be revealed with future sampling
**West Africa**

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“Missing” ant centers that are predicted to be revealed with future sampling

Ecological impacts

- Cultivation of oil palm opens the canopy

**Canopy cover**

FO > CP***; FO > IOP***
Ecological impacts

- Cultivation of oil palm opens the canopy
- This benefits the biodiversity of certain web-building spiders (although certainly not all...)

Average web area

- IOP > CP***; FO > CP*

Total web area

- IOP > CP***; IOP > FO***
Gasteracantha curvispina
Araneidae spp.
Mangora spp.
Yan
Aby
Ed Turner
Agung Anak Ketut Aryawan
Helen Waters
Sarah Luke
Nadine Dupérré
KSDA
Jean-Pierre Caliman
Mohammad Naim
Soeprapto
Amelia Hood
Martina Harianja
University of Liberia
Anton Potapov
William Foster
Ristekdikti
Cicely Marshall
Michael Abedi-Lartey
William Draper
Donald Ginting
Marshall Guahn
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