Vascular plant diversity in an established Oil Palm Plantation

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Flora diversity in monoculture areas
Flora diversity in palm oil plantation: ways toward an “ecological intensification”? 
Objectives

• **Step 1**: To characterize the composition and distribution of vascular plants within a plantation
  - Methodology
  - Result

• **Step 2**: To identify the influencing factors: environmental variables and agricultural practices

• **Step 3**: To encompass more complex & complete dimensions of biodiversity

• **Step 4**: To integrate these results into a biodiversity assessment grid
Location

Sumatra - Industrial Plantation

5 blocks = 150 ha

Variables: soil/water + fertilization
## Material - Method

<table>
<thead>
<tr>
<th>Light</th>
<th>Seed dispersal</th>
<th>Soil properties</th>
<th>Disturbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance to closest palm</td>
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<tr>
<td>Dead palms around</td>
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<tr>
<td>Sampling height</td>
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<td>Distance to border</td>
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<tr>
<td>Distance to river</td>
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<td>Topographic situation</td>
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<td>Steepness of slope</td>
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<td>Fertilization</td>
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<tr>
<td>Frond bases abundance</td>
<td></td>
<td></td>
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<tr>
<td>Dead weeds abundance</td>
<td></td>
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</tbody>
</table>
Material - Method

1. Inner circle
2. Outer circle
3. Interval
4. Harvesting path
5. Windrow
6. Fronds pile
7. Stem basis (1-2 m)
8. Stem middle (5-6 m)
9. Under crown (9-10 m)
10. Dead palm
11. Border
12. River bank

12 stations
147 sampled sites
Results

91 species (150 ha)

• 45 Dicotyledones
• 24 Monocotyledones
• 22 Pteridophytes
Observed vs real diversity

Extrapolation: 96 to 121 species
75 – 93 % observed
Results: Distribution among stations

- Pteridophytes
- Monocotyledones
- Dicotyledones
Results: Distribution of species within stations

Simpson Index [0,1]
Drivers of the distribution of species

DCA on species incidence among collected sites

on ground

on stem
Hypothesis on environmental drivers

{inner circle; outer circle; harvesting path; border}:
« opening » gradient, light abundance, more expected vegetative reproduction

{frond pile; windrow; fb. abundant; fb. scarce; fb. absent}:
« Organic Matter OM » gradient, shade tolerant species

{river bank; dead palm}:
soil properties and water content, OM, light abundance
Originality index among stations

- circle
- nude stems
- frond bases

stations:
- border
- river bank
- harv. path
- dead palm
- outer circle
- stem middle
- under crown
- inner circle
- fronds pile
- interval
- stem basis
- windrow
Optimizing sampling effort

Species accumulation with sampling effort

Species

0 ha 50 100 150 ha

Sites
Conclusions & perspectives

• **Step 1**: To characterize the composition and distribution of vascular plants within a plantation
  - more sampling on going
  - valuing data on cover percentages

• **Step 2**: To identify the influencing factors: environmental variables and agricultural practices
  - detailed protocols to test for most influencing drivers
  - in depth study of plant physiology

• **Step 3**: To encompass more complex & complete dimensions of biodiversity:
  - the **ecological functions** of encountered species
  - the diversity and structure at the **landscape scale** (beta diversity, connectivity elements, etc.)
  - the **dynamics** (age, native/invasive...)

• **Step 4**: To integrate these results into a biodiversity assessment grid
Thank You