The CocoaSoils nutrient offtake model: preliminary results from on-farm trials

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Overview of the talk

- Introduction to CocoaSoils
- Part 1: Offtake model
- Part 2: Application in CocoaSoils Satellite Trials
- Concluding remarks
Introduction to CocoaSoils

- Implementing ISFM to improve cocoa yields
- Consortium of private partners and national and international research institutes
- Funded by Norad
- In six countries (CdI, Ghana, Nigeria, Cameroon, Indonesia, Ecuador)
- On-station and on-farm research and dissemination
Part 1: The offtake model

- Calculates nutrient requirements based on nutrient offtake and immobilisation
- Calculations based on five components:

<table>
<thead>
<tr>
<th>YIELD</th>
<th>BIOMASS ACCUMULATION</th>
<th>NUTRIENT CONCENTRATIONS</th>
<th>RECOVERY RATES</th>
<th>EXPERT OPINION</th>
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Target yield
(kg dry beans ha\(^{-1}\) year\(^{-1}\))

Tree age
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Cumulative wood DM (t ha\(^{-1}\))

Tree age

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Nitrogen concentrations (
%)

<p>| | | | | | |</p>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n_bean</td>
<td>2.2</td>
<td># In beans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n_husk</td>
<td>1.0</td>
<td># In husks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n_leaf</td>
<td>2.5</td>
<td># In leaves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n_trbr</td>
<td>0.67</td>
<td># In trunk and branches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n_root</td>
<td>0.75</td>
<td># In roots</td>
<td></td>
<td></td>
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**Recovery rates**

(kg/kg)

recovery_n = 0.75  # For nitrogen (N)
recovery_p = 0.30  # For phosphorus (P)
recovery_k = 0.80  # For potassium (K)
Expert opinion (Yara)

Requirement per additional ton above 1 t dry bean yield

- 8.8 kg P
- 58 kg K
Part 2: Satellite trial preliminary results

- ~350 farms across four countries
Satellite trials: treatments

- 21 x 21 m plots, four per farm
- Treatment layout:
  - T1: Farmer practice + insecticide application
  - T2: Farmer practice + GAP
  - T3: GAP + national fertilizer recommendations
  - T4: GAP + offtake model fertilizer recommendations
# Fertiliser recommendations

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Satellite trials: preliminary results of treatments

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Return on investment

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Concluding remarks

- Offtake model predictions outperform national recommendations
- Large variability between countries
- Large variability between farms
- Higher ROI from offtake model recommendations
  - Despite modest yield increases
- Call to prepare optimum blends for different cocoa growing regions
Acknowledgements

- NORAD (funding) & project administration (IDH)
- Company partners
  - Olam
  - Cargill
  - Nestlé
  - ICL
  - Mars
  - Mondelez International
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- National research institutes (CNRA Côte d’Ivoire, CRIG Ghana, CRIN Nigeria, IRAD Cameroon)
- International research centres
- IITA (Bernard Vanlauwe, Richard Asare)
- Wageningen team
Thank you

Questions?