Computer models, satellites & smallholders
SHAMBA

- SHAMBA philosophy: to remove scientific complexity as a barrier for smallholders
- **Accessibility**: useable by non-specialists and low data requirements
- **Accuracy**: hybrid process-empirical model, based on SALM (except fossil fuels):
  
  - Biomass + Soil Carbon + Burning Emissions +
  - Soil Emissions from Plant N + N Fertiliser Emissions
- Gives projects more analytical power
SHAMBA’s user interface...
Outputs...
What are the pros and cons?

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
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<tbody>
<tr>
<td>Higher carbon estimates + less data collection = more revenue?</td>
<td>Additional layer of analysis</td>
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<tr>
<td>Plot-level accuracy = flexibility of interventions + increased revenue?</td>
<td>Less local interaction</td>
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<tr>
<td>Cheap ex-post and ex-ante estimates = good information provision and informed decision making</td>
<td>Extra skills</td>
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<td>-Cost/benefit uncertain</td>
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Remote Sensing (RS)

• RS is already used at larger scales... but resources and resolution limit smaller scale analyses.
• We looked at carbon... but also potential for biodiversity, water ES
Remote Sensing (RS)

- WordView-2 imagery, from DigitalGlobe:
  - GPS boundaries collected in the field
  - Assessor applied dot-grid sampling to assess if each dot is canopy
  - Converted into canopy for plot, and associated with a SHAMBA CO2e estimate for relevant tree density
<table>
<thead>
<tr>
<th><strong>Pros</strong></th>
<th><strong>Cons</strong></th>
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<tr>
<td>-Good for showing change &amp; permanence, old plots</td>
<td>- Uncertainties:</td>
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<tr>
<td>-Could reduce field costs</td>
<td>- Systematic errors in GPS boundaries</td>
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<td>-Could be good for interacting with farmers and buyers</td>
<td>- Distinguishing canopy and project trees, esp. young plots</td>
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<tr>
<td>-Local knowledge could overcome errors</td>
<td>- Imagery and software relative expensive</td>
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<td>- Less local interaction</td>
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<td>- Extra skills needed</td>
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SMS-PES Accuracy results

- All tools were conservative
- SHAMBA with plot level data is significantly higher: 2 tCO2e/ha/ya on average for tested plots
Costs
Further considerations...

• Cost/income ratio
• New data management/collection to save costs?
• **Local legitimacy:** local presence and transparency
  • Agricultural extension visits may be necessary anyway
  • Complex monitoring can reduce transparency
• Learn lessons from carbon monitoring for other ES
The future

• SHAMBA is available for other organisations to take forward and integrate – UoE can help

• Remote sensing – early days, but we’ll hopefully have more guidance on this by the end of the project

• Post SMS-PES: how to strengthen and simplify broader design and monitoring processes in PES
Useful things...


• SHAMBA: https://shambatool.wordpress.com/

• ODK: https://opendatakit.org/

• DigitalGlobe Foundation: http://www.digitalglobefoundation.org/

• FragStats: http://www.umass.edu/landeco/research/fragstats/fragstats.html
Questions?