Integration of research to develop a decision support framework for the rehabilitation and sustainable intensification of cocoa production on small holder farms

Edward Kumah, Nimogon Guy-Abel Silue, Edmund Omane, Eamon Haughey, Nicholas C. Cryer*.
How does Cocoa Life work to achieve its goals?

- We are directly involved in tackling the challenges within the cocoa supply chain
- Investing in cocoa farmers and their communities
- Holistic and farmer centric approach works with communities to help them set their own tailored action plans that will deliver the most value for them around these five outcomes:
  - **Farming** – helping farmers improve yields and earn higher incomes
  - **Community** – enabling cocoa farming families to create the kind of communities they and their children want to live in
  - **Livelihoods** – improving business skills and helping to develop additional sources of income to lift people out of poverty
  - **Youth** – making cocoa farming a more attractive profession for young people
  - **Environment** – protecting the landscape in which cocoa is grown to maintain ecosystems and farming land for future generations
Integration of research to develop a decision support framework for the rehabilitation and sustainable intensification of cocoa production on small holder farms

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Pathway to increased farm performance

Needs assessment
- Yield history
- Climate and location
- Current practice
- Planting material

Plan
- New knowledge
- Economics
- Inputs

Execution
- Targeted Extension support
Needs assessment

- Yield history
  - Current farm income
  - Status of orchard
- Planting material
  - Potential yield
  - Age of planting
- Climate and location
  - Limitations to yield
- Current practise
  - Farmer knowledge
  - Labour
  - Access to inputs
Intervention plan – understanding what will happen and the impact on the farmer

• Partnership with the farmer to develop a multi-year fully integrated plan to create a highly profitably farm

• New knowledge and Training needs identified.

• Full Economic understanding
  – Cost of materials, labour, all inputs
  – When will the cost fall
  – What benefit, and when realised.

• Inputs are defined based on proven effectiveness.

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Path to excellence

2016 Next Generation Cocoa Research Symposium
Execution – how will the plan be done

• The plan is a multi-year commitment.
  – Targeted interventions based on farm needs – not ‘one size fits all’ support.
    • Training
    • Extension service required
  – Regular milestones and review
The model

Currently being evaluated across West Africa.
Ghana project area

- In general farms have low organic matter, insufficient nitrogen, and low P and Mg.
- We need to apply fertilisers to meet the individual needs of each farm.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Lower threshold (L.T.)</th>
<th>Upper threshold (U.T.)</th>
<th>Farms below L.T. (%)</th>
<th>Farms above U.T. (%)</th>
<th>Farms within range (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (H₂O)</td>
<td>-</td>
<td>5.1</td>
<td>7.0</td>
<td>18.5</td>
<td>3.3</td>
<td>78.3</td>
</tr>
<tr>
<td>C (organic)</td>
<td>%</td>
<td>1.7</td>
<td>3.2</td>
<td>78.3</td>
<td>0.0</td>
<td>21.7</td>
</tr>
<tr>
<td>N (total)</td>
<td>%</td>
<td>0.2</td>
<td>0.4</td>
<td>87.0</td>
<td>0.0</td>
<td>13.0</td>
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<tr>
<td>P (avail - olsen)</td>
<td>ppm</td>
<td>12.0</td>
<td>25.0</td>
<td>41.3</td>
<td>23.9</td>
<td>34.8</td>
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<tr>
<td>K (Ac. Am. pH7)</td>
<td>me/100g</td>
<td>0.2</td>
<td>1.2</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
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<tr>
<td>Mg (Ac. Am. pH7)</td>
<td>me/100g</td>
<td>0.9</td>
<td>4.0</td>
<td>31.5</td>
<td>3.3</td>
<td>65.2</td>
</tr>
</tbody>
</table>
Needs assessment – poor soil fertility limits yield

Action plan

- Improvement of soil organic matter
- Application of inorganic fertilisers for N and K
- Knowledge and capability for disease control needs improvement.
Implementation plan – fertiliser focus

- A full budgeted plan for each intervention is created detailing the timing, exact input, and amount, and any labour required in addition to that of the farmer.

- This example is for a farm needing max fertilizer input to progress to higher yield – other factors not shown.

<table>
<thead>
<tr>
<th>Input</th>
<th>Date</th>
<th>Amount</th>
<th>Labour</th>
<th>Cost (USD)</th>
</tr>
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<tbody>
<tr>
<td>Nibrobor</td>
<td>June 16</td>
<td>50</td>
<td>1</td>
<td>178</td>
</tr>
<tr>
<td>A. Wuru</td>
<td>June 16</td>
<td>150</td>
<td>2</td>
<td>38</td>
</tr>
<tr>
<td>Tracel BZ</td>
<td>June 16</td>
<td>4 Kg</td>
<td>2</td>
<td>38</td>
</tr>
<tr>
<td>Nibrobor</td>
<td>Oct 16</td>
<td>50</td>
<td>1</td>
<td>178</td>
</tr>
<tr>
<td>A. Wuru</td>
<td>Oct 16</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic</td>
<td>April 17</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Nibrobor</td>
<td>April 17</td>
<td>50</td>
<td>1</td>
<td>178</td>
</tr>
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<td>April 17</td>
<td>4 Kg</td>
<td>2</td>
<td>38</td>
</tr>
</tbody>
</table>
Summary of soil treatment costs

Activity and cost calendar for the plant nutritional package. Costs include labour and input costs (in US $).

<table>
<thead>
<tr>
<th>Activity</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Activity total (ha⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil sampling and analysis</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>65.0</td>
</tr>
<tr>
<td>Fertilizer application (follar)</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>28.1</td>
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<tr>
<td>Fertilizer application (granular)</td>
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<td>0</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>371.7</td>
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<tr>
<td>Input costs (ha⁻¹)</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>157.8</td>
<td>0</td>
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<tr>
<td>Labour costs (ha⁻¹)</td>
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<td>0</td>
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<td>0</td>
<td>28.0</td>
<td>0</td>
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<tr>
<td>Monthly total (ha⁻¹)</td>
<td>0</td>
<td>0</td>
<td>65.0</td>
<td>214.0</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>185.8</td>
<td>0</td>
</tr>
</tbody>
</table>
Conclusion

• Decision support tool to inform farmers and allow multi-year planning to develop his farm.

  – Right advice for each farmer dependent on individual situation
  – Economically more efficient farm development
  – Foreknowledge of the farmer can support the development from within existing income.
  – Right level of interaction with extension officers for each farmer
  – Scalable system of agricultural extension
Thank you