Integrated Pest Management (IPM) in cowpea cropping systems in West Africa: From genomics to biological control agents, biopesticides, and extension

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1. The problem

- A complex of insect pests represent the major biotic constraint in the production of cowpeas.
- Effective control of this complex of pests is critical in closing the yield gap of cowpea in cropping systems in West Africa.
- How can we go from basic research to applied solutions and finally to systematic cost-effective scalable strategies?
2. Thinking towards the end goal

• Starting with the end goal:
  • Pest control solutions that can be scaled in a highly cost-effective manner
  • Solutions that are sustainable, safe for human health and the environmental, adaptable, and resilient
  • Strategies that can be distributed to other actors for distribution and scaling
  • “Catalyst Approaches”
3. Our steps

1. **Step 1:** Perform basic research on the pest biology and use of genomic tools to understand pest populations and their movement patterns

2. **Step 2:** Based on Step 1, formulate, test, and provide scientific evidence for practice solutions: Laboratory and field testing of solutions - testing of solutions with farmers and other end users

3. **Step 3:** Provide and test scalable solutions for long-term impact and for pass off for scaling groups: (i) tangible physical IPM products and (ii) educational solutions
4. Step 1

1. Long-term studies on pest populations in multi-country locations and field sites
2. In depth population biology studies on these pest populations
3. Genomics tool kit developed for all major pests of cowpea to study population dynamics and movement patterns – to inform logical release points for biocontrol release agents
5. Steps 2 & 3

1. Biocontrol pipeline developed
   1. Biocontrol agents tested
   2. Viable biocontrol agents identified
   3. Release program for long-term scaling – significant impact potential

2. Neem plus virus spray strategy
   1. Can be made from local materials
   2. Equal or more effective than second generation insecticides to realize yield gains in cowpea cropping systems
   3. IITA has worked with emerging neem industry in Benin (private sector solutions that also provides income for women and youth)

3. Educational platform for researcher to end user pass-off of research outputs – Scientific Animations Without Borders
Biocontrol Agents

Scalable, Scalable, Scalable!!!!!!!!!!!!!
# Biopesticides

- **Farmer-based interventions - Biopesticides**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; rainy season Cowpea yield kg/ha</th>
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<tbody>
<tr>
<td>Unsprayed control</td>
<td>522.95 ± 28.20&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Chemical control (Decis)</td>
<td>868.62 ± 68.09&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Neem oil</td>
<td>826.42 ± 52.80&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Jatropha oil</td>
<td>867.90 ± 28.29&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>MaviMNPV</td>
<td>875.12 ± 47.83&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Neem oil + MaviMNPV</td>
<td>1082.10 ± 58.78&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Jatropha oil + MaviMNPV</td>
<td>1096.30 ± 26.05&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
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*Farmer-based interventions - Biopesticides*

- Neem oil made in Benin
- Pod borer specific virus
Biopesticide Value Chain
(Bio-Phyto, Glazoue, Benin)

- 130 tons of neem seeds collected per year
  - 800 women

- Neem oil extraction,
  - 500 liters per week

- Bio-fertilizers
  - Useful and income-generating by-products
  - Nematicidal effect
  - Over 110 tons sold
  - Supply cannot cover demand
Viral Biopesticide

- Women and youth groups mass-produce *Maruca vitrata*, infest larvae with the virus
- Sell the dead larvae to the social enterprise for extraction, purification and use
- Training and compliance with regulatory requirements

Training session with women and youth participants

Feed the Future Innovation Lab for Collaborative Research on Grain Legumes
Farmer Interventions in IPM

• Need scalable educational strategies
• Strategies that can be passed off to partner groups
  – Easy to use and deploy
  – Expert knowledge to end user
  – Local language
  – Scalable in a highly cost-effective manner
Educational Platform

Scientific Animations Without Borders

Experts → Content → Scalable Deployment Strategies → End Users

Feed the Future Innovation Lab for Collaborative Research on Grain Legumes
Scalable Platform

- System for R4D to direct scaling
- SAWBO system used by the WHO, Ministries of Health and Agriculture, NGOs, “NGOs of one”, global TV stations, US-based programs, etc.
Conclusions

• Biocontrol pipeline for cowpea – that can be used for other pest problems – e.g., FAW
• Biocontrol agents – sustainable
• Farmer interventions – women and youth
• Scalable Educational System
Thanks

• Feed the Future Innovation Lab for Collaborative Research on Grain Legumes and USAID for their support

• Other Legume Innovation Lab programs for their collaborative efforts in diverse country locations