Uptake of augmentative biological control solutions by extension services in Africa and Asia

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October 24, 2017

Annual Biocontrol Industry Meeting, Basel, Switzerland
National Plantwise partners working in extension service

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CABI

• **not-for-profit** intergovernmental organisation, established by a United Nations-level agreement

• owned by **48 member countries**, which have an equal role in the organisation’s governance, policies and strategic direction

• **over 450 staff worldwide** in 12 centres

• addresses issues of global concern such as **food security** and **food safety**, through research and international development cooperation

• major publisher of scientific information – books, ebooks, full text electronic resources, compendia and online information resources
Plantwise - CABI's flagship programme

- Plantwise is a global initiative aiming to work together with national and international plant health stakeholders to increase food security and food safety, and improve rural livelihoods by reducing crop losses.

- Key components of Plantwise:
  - National networks of plant clinics, owned by the national extension service, to give regular advice to farmers and facilitate pest surveillance.
  - A knowledge bank to support extension workers and farmers with information tools on pest diagnosis, management and distribution.
  - Innovative linkages between key stakeholders in a plant health system.
Plantwise’s beneficiaries

● Plantwise serves smallholder farmers, who can be separated into 3 categories based on their degree of commercial activity:

● **Business-oriented**: Often grow fruit, vegetables and other high-value products for supply into formal supply chains. Required to tackle increasingly high hurdles of food safety standards and demands for traceability.

● **Transitional**: Family farms whose production is locally-oriented and undercapitalized, with poor integration into agribusiness. Typically earn 40-60% of income from off-farm activities.

● **Subsistence**: Marginalised and disadvantaged. Maintain precarious farm livelihoods and weak links to markets and finance.

● Of the 450m smallholder farmers in non-OECD countries, the first category accounts for around 100m with about twice that number in the transitional group (Lowder S.K. et al, 2014)
Countries Plantwise operates in

**The Americas**
- Barbados
- Bolivia
- Brazil
- Costa Rica
- Grenada
- Honduras
- Jamaica
- Nicaragua
- Peru
- Trinidad & Tobago

**Africa**
- Burkina Faso
- DR Congo
- Ethiopia
- Ghana
- Kenya
- Malawi
- Mozambique
- Rwanda
- Sierra Leone
- Tanzania
- Uganda
- Zambia

**Asia**
- Afghanistan
- Bangladesh
- Cambodia
- China
- India
- Indonesia
- Myanmar
- Nepal
- Pakistan
- Sri Lanka
- Thailand
- Vietnam
Scale of the programme

- **2,300 plant clinics established**
- **6,800 plant doctors trained**
- **9.8 million farmers reached**
Plantwise impact

79% of farmers report yields increased after using advice from plant clinics.

70% of farmers report incomes increased after using advice from plant clinics.

Farmers’ reported use of pesticides decreased by 30%.

25% of Plantwise plant doctors are female.
Value of plant clinic information to farmers

- Based on a survey of farmers in Changping district, China
- Results indicate that the advice received via plant clinics is the most highly valued compared to other information sources
Plantwise approach and tools

*Plant clinics are channels for the 2-way flow of information to and from farmers*

Diagnosis and recommendation

Farmer interviews and data collection

Extension materials and other support tools

Intelligence on pests causing problems
Recent Plantwise study to assess the contribution of the extension service to the uptake of biological control

- Baseline study in 6 low- to lower-middle-income countries analysing extension material developed within the Plantwise programme and advice given by extension workers relating to the **management of insect pests using microbial and macrobial biocontrol products** (over a one-year time period, 1 July 2015 - 30 June 2016)
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- Pest Management Decision Guides (PMDGs) - extension material produced by national extension partners in Plantwise
- They contain practical advice following the principles of Integrated Pest Management
- A total of 113 PMDGs were analysed
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- A total of 16,930 plant clinic queries were analysed.
Recent Plantwise study to assess the contribution of the extension service to the uptake of biological control

- Baseline study in 6 low- to lower-middle-income countries analysing extension material developed within the Plantwise programme and advice given by extension workers relating to the **management of insect pests using microbial and macrobial biocontrol products** (over a one-year time period, 1 July 2015 - 30 June 2016)

- We focussed on the following research questions:
  - What kind of pest problems are farmers bringing to the plant clinics?
  - Which macrobial and microbial biocontrol products are registered nationally?
  - Do these registered biocontrol products make it into the extension material available to the plant doctors?
  - Where extension material does include biocontrol products, how frequently are plant doctors recommending these products to farmers?
Pest problems brought to plant clinics

**Ghana** (n=7,162)
- Other problems: 47%
- Insects and mites: 53%
  - Cocoa stem borer: 11%
  - Termite: 11%
  - Cocoa stink bug: 13%
  - Other insects and mites: 65%

**India** (n=4,011)
- Other problems: 44%
- Insects and mites: 56%
  - Rice leaf folder: 8%
  - Legume pod borers: 9%
  - Thrips: 13%

**Kenya** (n=11,043)
- Other problems: 64%
- Insects and mites: 36%
  - Maize stalk borers: 11%
  - Thrips: 5%
  - Aphids: 24%

**Pakistan** (n=20,948)
- Other problems: 72%
- Insects and mites: 28%
  - Jassids: 11%
  - Whiteflies: 14%
  - Armyworms: 15%
  - Other insects and mites: 60%
Number of registered macrobial and microbial biocontrol products for insect pests

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of registered biocontrol products for insect pests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>2</td>
</tr>
<tr>
<td>Kenya</td>
<td>19</td>
</tr>
<tr>
<td>Zambia</td>
<td>2</td>
</tr>
<tr>
<td>India</td>
<td>9</td>
</tr>
<tr>
<td>Nepal</td>
<td>3</td>
</tr>
<tr>
<td>Pakistan</td>
<td>2</td>
</tr>
</tbody>
</table>

- India and Kenya have adapted their registration process for biocontrol products and so more products are available (e.g. Bt, Beauveria, Metarhizium, Lecanicillium, etc.)
- Registration of macrobial BCAs is required only in Kenya, where 12 species of macrobial BCAs are registered
- In the other 5 countries, macrobials are available (1-8 species) but not registered
## Biocontrol product recommendations for insect pests in extension material

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of PMDGs available in 2016</th>
<th>Number of national PMDGs on insect pests</th>
<th>Number (and %) of PMDGs on insect pests containing biocontrol product recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>30</td>
<td>15</td>
<td>5 (33.3%)</td>
</tr>
<tr>
<td>Kenya</td>
<td>68</td>
<td>28</td>
<td>8 (28.6%)</td>
</tr>
<tr>
<td>Zambia</td>
<td>58</td>
<td>23</td>
<td>3 (13.0%)</td>
</tr>
<tr>
<td>India</td>
<td>25</td>
<td>18</td>
<td>11 (61.1%)</td>
</tr>
<tr>
<td>Nepal</td>
<td>24</td>
<td>14</td>
<td>8 (57.1%)</td>
</tr>
<tr>
<td>Pakistan</td>
<td>50</td>
<td>15</td>
<td>4 (26.7%)</td>
</tr>
</tbody>
</table>
## Recommendation by plant doctors of biocontrol products when included in PMDGs

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of opportunities where a biocontrol product could have been recommended by a plant doctor*</th>
<th>Actual number of times that plant doctors recommended a biocontrol product to farmers (mean ± SE%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>259</td>
<td>0</td>
</tr>
<tr>
<td>Kenya</td>
<td>1,141</td>
<td>40 (3.5 ± 1.5%)</td>
</tr>
<tr>
<td>Zambia</td>
<td>58</td>
<td>0</td>
</tr>
<tr>
<td>India</td>
<td>581</td>
<td>108 (18.6 ± 10.9%)</td>
</tr>
<tr>
<td>Nepal</td>
<td>60</td>
<td>23 (38.3 ± 13.5%)</td>
</tr>
<tr>
<td>Pakistan</td>
<td>704</td>
<td>21 (3.0 ± 2.8%)</td>
</tr>
</tbody>
</table>

* Number of plant clinic queries for which the relevant PMDG contains a biocontrol product recommendation

** % plant clinic queries for which plant doctor recommended a biocontrol product
What have we learnt from this baseline study?

- Number of registered microbial and macrobial biocontrol products for insect pests in the study countries vary from 2-19; Kenya and India have the most products available due to their adapted registration processes.

- Results revealed that nationally registered biocontrol products are not always included in the extension material compiled by national experts in the Plantwise programme; India and Nepal are better in this respect.

- Even if biocontrol products are mentioned in the extension material used at the plant clinics, they are only sometimes (or never – in Ghana and Zambia) recommended to farmers by extension workers.

Why is the uptake of biocontrol products rather limited in low- to lower-middle income countries?

**Knowledge**
- Extension officers have a lack of knowledge / awareness about biocontrol products and their use.

**Registration**
- Some registration pathways make the registration of biocontrol products lengthy and complicated.

**Availability / local production**
- Agro-input suppliers in rural areas often do not have biocontrol products available; local production is rather limited although major efforts are being made in Kenya and India.

**Affordability**
- Price of biocontrol products is sometimes high and only affordable for business-oriented farmers. One exception is India (support of local production and subsidy schemes).
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Barriers to uptake of biocontrol products in Malawi

- No clear standards/procedures for registration of biocontrol products
- Distribution channels for biocontrol agents are lacking
- Extension staff and farmers lack information on effective use of available biocontrol products
- Lack of facilities and equipment for rearing of biocontrol agents
- Insufficient number of staff trained in the production of biocontrol agents/products
- Lack of potential models for commercialisation of biocontrol products and a lack of market development despite potential opportunities (e.g. replacement of HHP in tobacco, a key cash crop)
Barriers to uptake of biocontrol products in Uganda

- Market dominated by chemical pesticides; biocontrol product range on the market is small
- Use of biocontrol products mostly restricted to business-oriented farmers (flower producers and organic producers)
- Few input dealers market biocontrol products
- Farmers interested in quick-fix and ‘one fix for all problems’ solutions
- Awareness of biocontrol products is limited and confidence in product efficacy is low
- Many farmers use self-produced products, e.g. botanicals
How can Plantwise facilitate improved uptake?

- Extension services have the potential to contribute significantly to the uptake of biocontrol products

- Plantwise should aim to facilitate:
  - Encouraging national partners to include all biocontrol products available at a national level in PMDGs
  - Increasing extension workers’ awareness of biocontrol options to increase likelihood of them recommending these products to farmers
  - Training extension workers on correct application of biocontrol products to ensure maximum efficacy
How can Plantwise facilitate improved uptake?

- Plantwise could extend its work with stakeholders:
  - *Governments*: Develop subsidy schemes for biocontrol products and an adapted registration pathway
  - *Trade sector actors*: Facilitate access of contracted farmers to biocontrol products
  - *Manufacturers and suppliers*: Facilitate farmer access to affordable and available biocontrol products through better linkages among stakeholders
How can CABI facilitate improved uptake?

- Create a database to facilitate the identification, sourcing and application of macrobial and microbial products for particular crop pest problems in a given country.
- Develop a mobile app and/or website for use on smartphones, tablets and desktop computers to put information about biological pest management products, and their correct use, at the fingertips of farmers and extension workers.