CABI'S EXPERIENCES OF TRANSBOUNDARY PLANT PEST MANAGEMENT: STRENGTHENING PLANT HEALTH SYSTEMS AND THE IMPORTANCE OF ADVISORY SERVICES

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ABSTRACT

Five hundred (500) million smallholder farmers in developing countries in Asia, Africa and Latin America are at risk from environmental shocks, crop pests and other threats to food and nutrition security and food safety. There is continuous emergence and rapid spread of new invasive species (e.g. fall armyworm, tomato leaf miner) and ongoing transboundary pest threats (e.g. banana fusarium wilt, citrus greening, Asian fruit fly), driven by climate change and global movement of goods. Particularly in medium- and low-income countries, there is often no consistent mechanism for surveillance, rapid detection (including technical support for confirming causes) and response with effective solutions. Poorly planned and ill-timed reaction to new outbreaks often leads to the indiscriminate use of pesticides, in some cases highly toxic products, which poses environmental and health risks and decreases the resilience of land use systems to pests. Another attribute of medium- and low-income countries is that the opportunity to detect new pests is at the farming community level and therefore the role of public extension and community-based advisory services is instrumental. These rural advisory services play a key role in technology and management information transfer. Some of the most relevant and appropriate information isn't high-tech or innovative, but that doesn't mean the farmer knows about it. A number of complementary CABI-led programmes, such as Action on Invasives and Plantwise have established a strong foundation of experience, partnerships and infrastructure to respond to the above-mentioned threats. The Action on Invasive programme focusses on strengthening national and regional capacity to respond to emerging invasive pests. This includes identifying and managing risks before invasion occurs, and improving coordinated response to invasions through effective communication and deployment of sustainable technologies. In terms of technologies, (classical) biological control must be considered and promoted in integrated pest management approaches. Action on Invasives champions an environmentally sustainable, cross-sectoral and regional approach to dealing with transboundary plant pests. The programme is building national and regional capacities to prevent, detect and control invasive species in order to protect and restore agricultural and natural ecosystems, adapt to climate change, remove trade barriers, and reduce degradation of natural resources and vulnerable areas. Plantwise aims to provide a data-driven rapid response network connecting farmers with advisors and other support services, enabling early detection, diagnosis and management of pest problems at farm level. Over the past few years, Plantwise has built the resilience of smallholder farmers in coping with emerging plant health threats, enabling them to produce and earn more while being less dependent on high-risk pesticide-based plant protection practices. For example, in Rwanda, advisory service advice has led to a 5% reduction in the likelihood of a household falling below the poverty line of USD 1.25 per day. In Kenya, Plantwise demonstrated a benefit/cost ratio > 2.0 (internal rate of return on investment > 50%). This success has, in turn, enhanced farmers' confidence in public and private advisory services. A key focus of Plantwise is to put research into use, translating scientific knowledge into actionable best practice, delivered through simple, practical methodologies that are accessible at community levels. The efficiencies, delivered through digital development and the promotion of equity in accessing services, are additional factors that have helped to strengthen interactions between farmers and local advisory service providers.


CABI's experiences of transboundary plant pest management: Strengthening systems and the importance of advisory systems
Ulli Kuhlmann, Roger Day, Washington Otieno & Wade Jenner
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CABI
not-for-profit intergovernmental organisation, established by a United Nations-level agreement
owned by 49 member countries, which have an equal role in the organisation's governance, policies and strategic direction
over 480 staff worldwide
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
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Transboundary plant pests/ invasive alien species are a global issue impacting the lives of millions of people right now
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Transboundary plant pest and invasive species threat
Known species, new mobility
Pests and invasive species disregard national borders and are regional or global in their impact
Globalisation of trade (and tourism) accelerate mobility
Impacts of climate change
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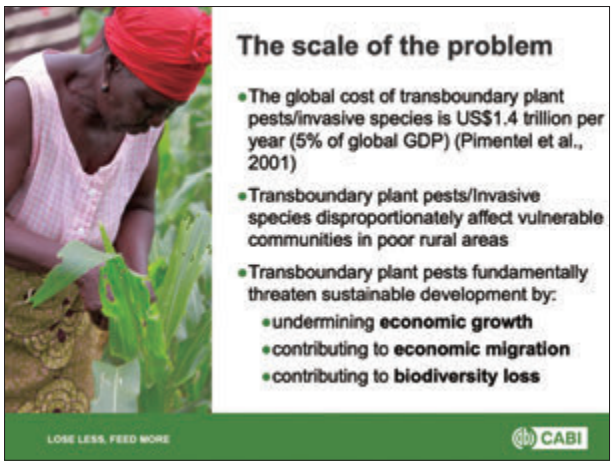
The scale of the problem
The global cost of transboundary plant pests/invasive species is US$1.4 trillion per year (5% of global GDP) (Pimentel et al., 2001)
Transboundary plant pests/Invasive species disproportionately affect vulnerable communities in poor rural areas
Transboundary plant pests fundamentally threaten sustainable development by:
undermining economic growth
contributing to economic migration
contributing to biodiversity loss
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Losses attributable to just 5 invasive species in East Africa amount to $0.9-1.1 billion/annum
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100 million women in Africa spend 20 billion hours weeding per annum
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The estimated total annual losses attributed to invasive alien species in SE Asia is on average $33.2 billion or $55 per capita
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Invasive species are a specific SDG target...

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"By 2020 introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems, and control or eradicate the priority species."

– SDG 15.8

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...but they impact almost all SDGs

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The challenges.....

- Transboundary plant pests/ invasives species have to be tackled collaboratively across the Environment, Trade and Agriculture sectors but the enabling communications, structures and evidence to prioritise action are lacking
- Concerted actions are needed at a local and national level but also at a regional one but the mechanisms for this are missing, or weak
- Effective products and technologies must be made available but this requires overcoming prohibitive regulatory setups, and lack of engagement from stakeholders
- Lack of access in developing countries/ regions to information and expertise

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Taking action

CABI's Action on Invasives programme adopts a systems-based approach to managing biological invasions:

- **Prevention**: developing and implementing biosecurity policies and raising awareness of potential threats
- **Early detection and rapid response**: developing surveillance and emergency action plans for detecting and eradicating new invasions
- **Control**: scaling up existing invasive species management solutions, embedding them in policy and making sure that rural communities have access to them

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Implementation approach of CABI's Action on Invasives programme

Each work package includes strong elements of **gender** and **youth** involvement, and **monitoring and evaluation:**

Stakeholder engagement
Foster and strengthen the right partnerships at regional, national, and local levels

Community action
Facilitate scalable access for communities to new solutions to mitigate biological invasions

Knowledge and data
Dedicated knowledge tools enhanced for practical decision support

Best practice solutions
Research developed and validated in collaboration with trained in-country stakeholders

Outcome
Protect and restore ecosystems, reduce crop losses, improve health and protect trade

Impact
Protect and improve the livelihoods of 50 million poor rural families impacted by invasive species

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Invasive Species Compendium

www.cabi.org/isc

Content

- Species "portals"
- Improved mapping
- Toolbox
  - Horizon scanning
  - Pest risk analysis (PRA)
- Resources
  - Diagnostics
  - Communication materials
  - Data
- Abstracts
- News

Around 240,000 hits in one month (October 2019)!

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Invasives Species Compendium

Decision support tool use

CABI Pest Risk Analysis Tool (beta) — CPC/PRA free for 97 countries

CABI Horizon Scanning Tool — 6,600 visits 160 countries

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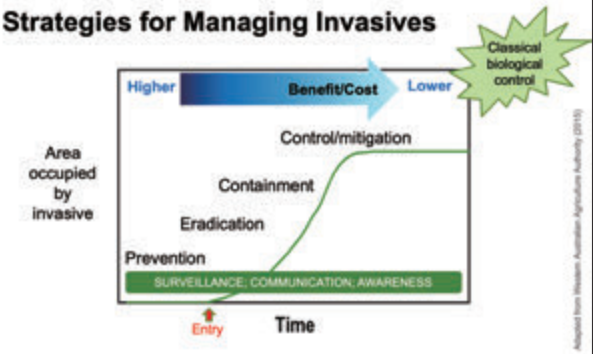
Strategies for Managing Invasives



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CABI's classical biological control database

- BIOCAT is a simple database of **all classical biological control introductions using insects to control insects** (literature to end 2010)
- Originally compiled by David and Annette Greathead; updated to 2010 by CABI with additional support from IOBC and USDA-APHIS
- Data on the agent, the target pest(s), the origins of both, the source country (district), the target country (district), the year(s) of release, whether established, degree of impact (standardised: None, partial control, substantial control, complete control), source reference(s)

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BIOCAT analysis until 2010

	BIOCAT 2010
No of introductions	6,158
No of establishments	2,007 (33%)
No of pest targets	588
No of agent species	2,171
No of countries	148
No of satisfactory controls	620 (10%)
No of different pest species controlled	172

Trends in the classical biological control of insect pests by insects: an update of the BIOCAT database

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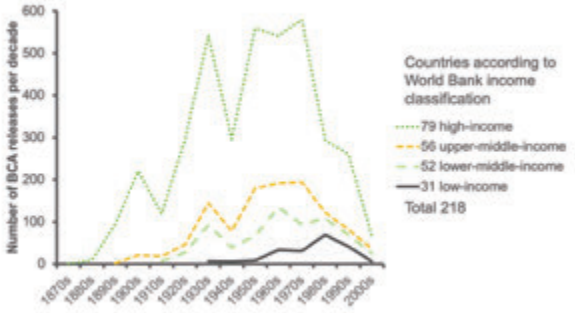
Number of insect biological control agents introduced against insect pests per decade



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Low-income country	At least two partial or better success programmes	Start year
Madagascar	Eucalyptus weevil, *Gonipterus scutellatus*	1948
	Spotted borer, *Chilo sacchariphagus*	1960
	African pink stem borer, *Sesamia calamistis*	1968
	Potato tuber moth, *Phthorimaea operculella*	1968
	Coconut hispine, *Gestroniella lugubris*	1976
Tanzania	Orthezia scale, *Orthezia insignis*	1953
	Sugarcane scale, *Aulacaspis tegalensis*	1971
	Cassava mealybug, *Phenacoccus manihoti*	1988
	Diamond back moth, *Plutella xylostella*	2001
Benin	Mango mealbug, *Rastrococcus invadens*	1988
	Larger grain borer, *Prostephanus truncatus*	1992
	Diamond back moth, *Plutella xylostella*	1996
Togo	Mango mealbug, *Rastrococcus invadens*	1987
	Larger grain borer, *Prostephanus truncatus*	1991
DR Congo	Cassava mealybug, *Phenacoccus manihoti*	1982
	Mango mealbug, *Rastrococcus invadens*	1989
Uganda	Orthezia scale, *Orthezia insignis*	?
	Woolly whitefly, *Aleurothrixus floccosus*	1996
Zimbabwe	Apple woolly aphid, *Eriosoma lanigerum*	1961
	Potato tuber moth, *Phthorimaea operculella*	1965

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BIOCAT Conclusions

- There have been some substantial successes for classical biological control of insect pests in low income countries
- Cost : benefit ratios can be significant, e.g. 170-1592 for cassava mealybug across Africa, 145 for mango mealybug in Benin
- Millions of farmers are able to continue to grow important crops because of the action of classical biological control
- However, these successes have been based on donor funding and using knowledge transfer from international experts

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The value of extension

- In developing countries, the opportunity to detect new pests is at the farming community level
- Therefore the role of extension and community based advisory service is instrumental.
- *Some of the most relevant and appropriate information isn't high tech or innovative, but that doesn't mean the farmer knows about it*
- Direct evidence linking extension and productivity increases is thin, but existing studies show positive returns

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Farmer access to extension

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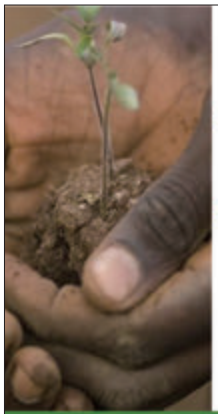

A need for CABI's Plantwise global programme

- Extension systems often suffer from **chronic understaffing, limited operational funds, and weak linkages to other players**
- Therefore, the Plantwise plan is to give farmers better access to **practical and research based knowledge at village level** to help them **enhance productivity and food safety** (in particular reduction of pesticide residues)

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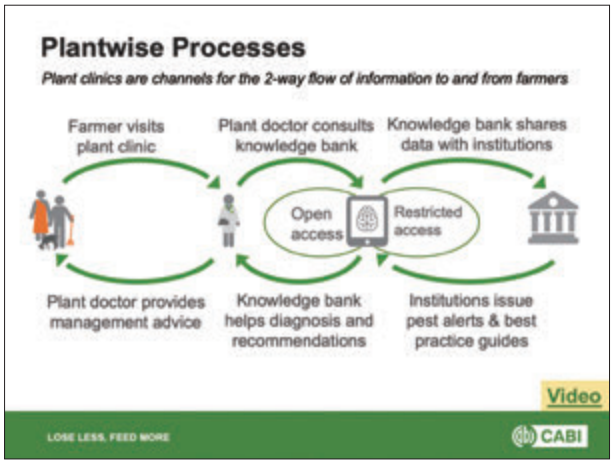
Plantwise Processes
Plant clinics are channels for the 2-way flow of information to and from farmers
Farmer visits plant clinic
Plant doctor consults knowledge bank
Knowledge bank shares data with institutions
Open access
Restricted access
Plant doctor provides management advice
Knowledge bank helps diagnosis and recommendations
Institutions issue pest alerts & best practice guides
Video
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Countries Plantwise operates in 33 countries
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
Myanmar
Nepal
Pakistan
Sri Lanka
Thailand
Vietnam
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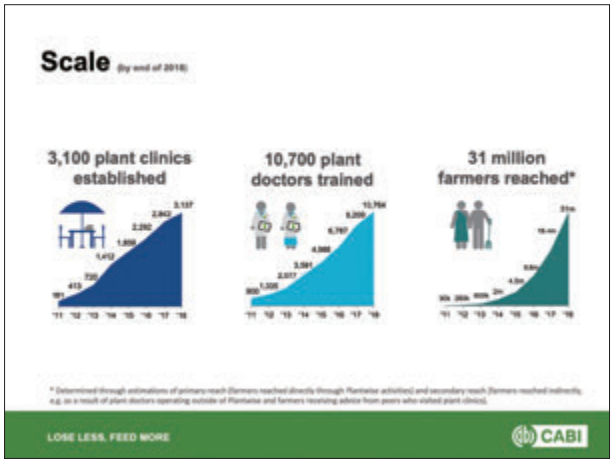
Scale
3,100 plant clinics established
10,700 plant doctors trained
31 million farmers reached*
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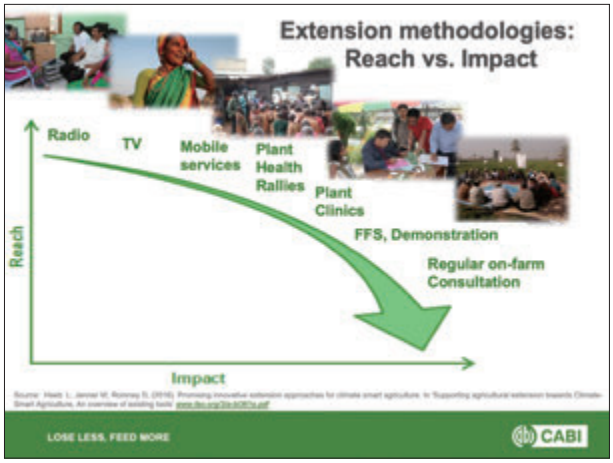
Extension methodologies: Reach vs. Impact
Radio
TV
Mobile services
Plant Health Rallies
Plant Clinics
FFS, Demonstration
Regular on-farm Consultation
Reach
Impact
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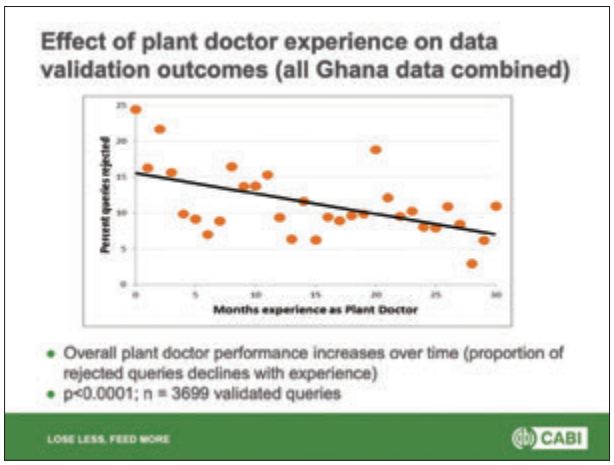
Effect of plant doctor experience on data validation outcomes (all Ghana data combined)
Percent queries rejected
Months experience as Plant Doctor
Overall plant doctor performance increases over time (proportion of rejected queries declines with experience)
p<0.0001; n = 3699 validated queries
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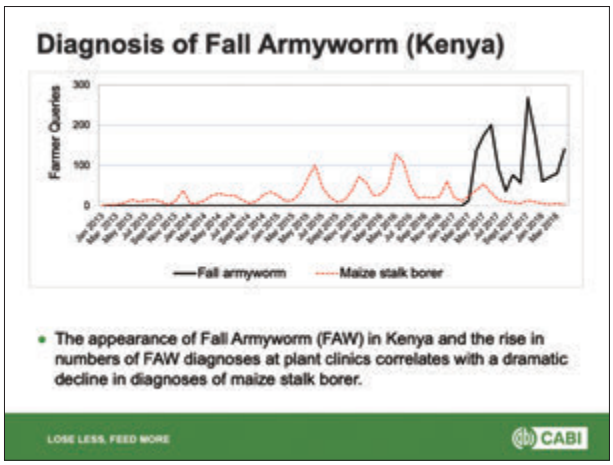
Diagnosis of Fall Armyworm (Kenya)
Farmer Queries
Fall armyworm
Maize stalk borer
The appearance of Fall Armyworm (FAW) in Kenya and the rise in numbers of FAW diagnoses at plant clinics correlates with a dramatic decline in diagnoses of maize stalk borer.
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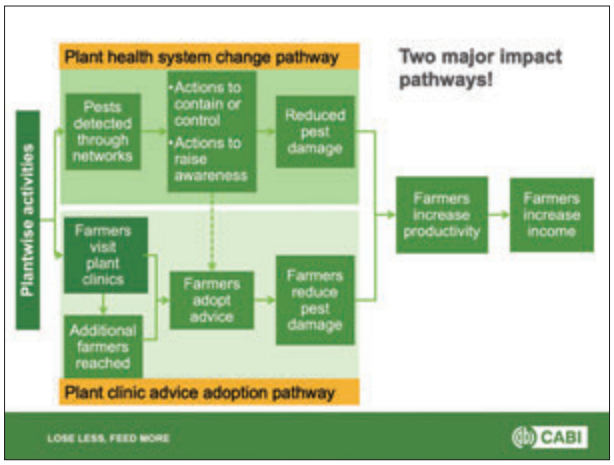
Plant health system change pathway
Two major impact pathways!
Plantwise activities
Pests detected through networks
Actions to contain or control
Actions to raise awareness
Reduced pest damage
Farmers visit plant clinics
Farmers adopt advice
Farmers reduce pest damage
Additional farmers reached
Farmers increase productivity
Farmers increase income
Plant clinic advice adoption pathway
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Impact assessment in Kenya
(through randomized controlled trial, AIR 2019)
Plantwise contributes to improvement on yields, crop-based household income and reduction in pesticide use for farmers living in plant clinic catchment areas
Plantwise interventions have led to improved institutional coordination in Kenya's plant health system, improving the likelihood of detection and responding to pest outbreaks
Plantwise improved knowledge of extension agents
Plantwise's monetary benefits outweigh the costs of implementing the programme at a ratio of 3:1 and an internal rate of return of 54%
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merci
ধন্যবাদ
zikomo
xie-xie
obrigado
efharistó
ありがとう
kiitos
thank you
gracias
zikomo
urakoze
tak
ke lumetse
asante
danke
terima kasih
dhanyawaad
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