AGRILINKS




Supporting the Management of Fall Armyworm in Africa and Asia: Best Practices and Lessons Learned

Speakers: *Robert Bertram, USAID Bureau for Resilience and Food Security*

Joseph Huesing, Huesing Agricultural & Educational Consulting LLC

Dan McGrath, Oregon State University

Prasanna Boddupalli, The International Maize and Wheat Improvement Center

Sarah Page, Catholic Relief Services

Paul Jepson, Oregon State University

Moderator: *Zachary Baquet, USAID Bureau for Resilience and Food Security*

Date: June 18, 2020

Robert Bertram, USAID Bureau for Resilience and Food Security

Rob Bertram is the Chief Scientist in USAID's Bureau for Resilience and Food Security, where he serves as a key adviser on a range of technical and program issues to advance global food security and nutrition. In this role, he leads USAID's evidence-based efforts to advance research, technology and implementation in support of the U.S. Government's global hunger and food security initiative, Feed the Future. He previously served as Director of the Office of Agricultural Research and Policy in the Bureau for Resilience and Food Security, which leads implementation of the Feed the Future research strategy and related efforts to scale innovations in global food security efforts, working with a range of partners. Prior to that, he guided USAID investments in agriculture and natural resources research for many years. Dr. Bertram's academic background in plant breeding and genetics includes degrees from University of California, Davis, the University of Minnesota and the University of Maryland. Before coming to USAID, he served with USDA's international programs as well as overseas with the Consultative Group on International Agricultural Research (CGIAR) system.

Joe Huesing, Huesing Agricultural and Educational Consulting LLC (HAEC)

Joe Huesing is an independent consulting entomologist, educator and Fall Armyworm IPM advisor. Currently he works in the area of assessing, designing and implementing IPM approaches for control of the FAW.

Dan McGrath, Oregon State University

Dan McGrath, Professor Emeritus Oregon State University, worked for three decades in Oregon's Willamette Valley where he conducted applied research and Extension programs in vegetable production, integrated pest management, and sustainable agriculture. He served as Linn County Staff Chair for fourteen years. Since his retirement in 2016, Dr. McGrath has worked across sub Saharan Africa and Asia, helping smallholder farmers to manage Fall Armyworm in maize using an integrated pest management approach.

Prasanna Boddupalli, The International Maize and Wheat Improvement Center

Dr B.M. Prasanna is the Director of CIMMYT's Global Maize Program and CGIAR Research Program MAIZE. Based in Nairobi, Kenya, Prasanna has been leading CIMMYT-led multiinstitutional efforts in fighting the challenges of devastating transboundary diseases and insect-pests on maize, including the Fall Armyworm.

Paul Jepson, Oregon State University

Dr. Paul Jepson, director, Integrated Plant Protection Center, Oregon State University provides expertise on pesticide impacts on beneficials and other non-target organisms and supervises the information technology experts who design and maintain the online interface. Paul's research interests in IPM include the study of pest and natural enemy population dynamics in agricultural systems and have focused particularly on pesticide management and side effects, biological pest control and the development of ecological risk assessment for beneficial invertebrates.

Sarah Page, Catholic Relief Services

Sarah Page is a Technical Advisor for Sustainable Livelihoods and Landscapes with Catholic Relief Services. Based in Baltimore, Sarah supports global programming at the nexus of inclusive value chains, natural resource management and land restoration. She also contributes to the agency's research and learning efforts around farmer communications, capacity building, and farmer organizational strengthening. She's worked with smallholder coffee, horticulture and basic grains farmers in East Africa, Latin America and the United States.

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Fall Armyworm

Best practices and lessons learned by USAID partners in supporting the management of Fall Armyworm

Joseph (Joe) Huesing PhD

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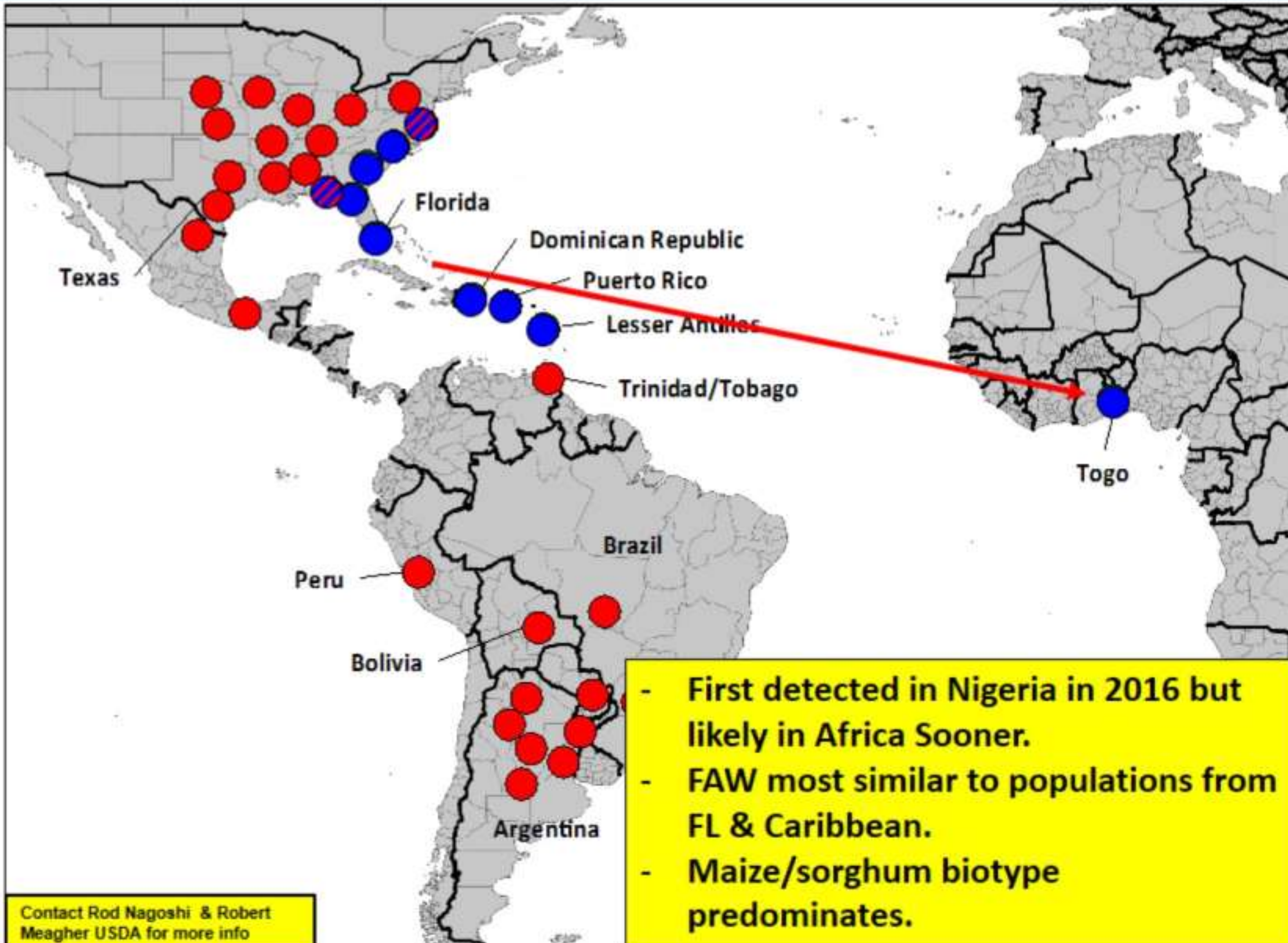
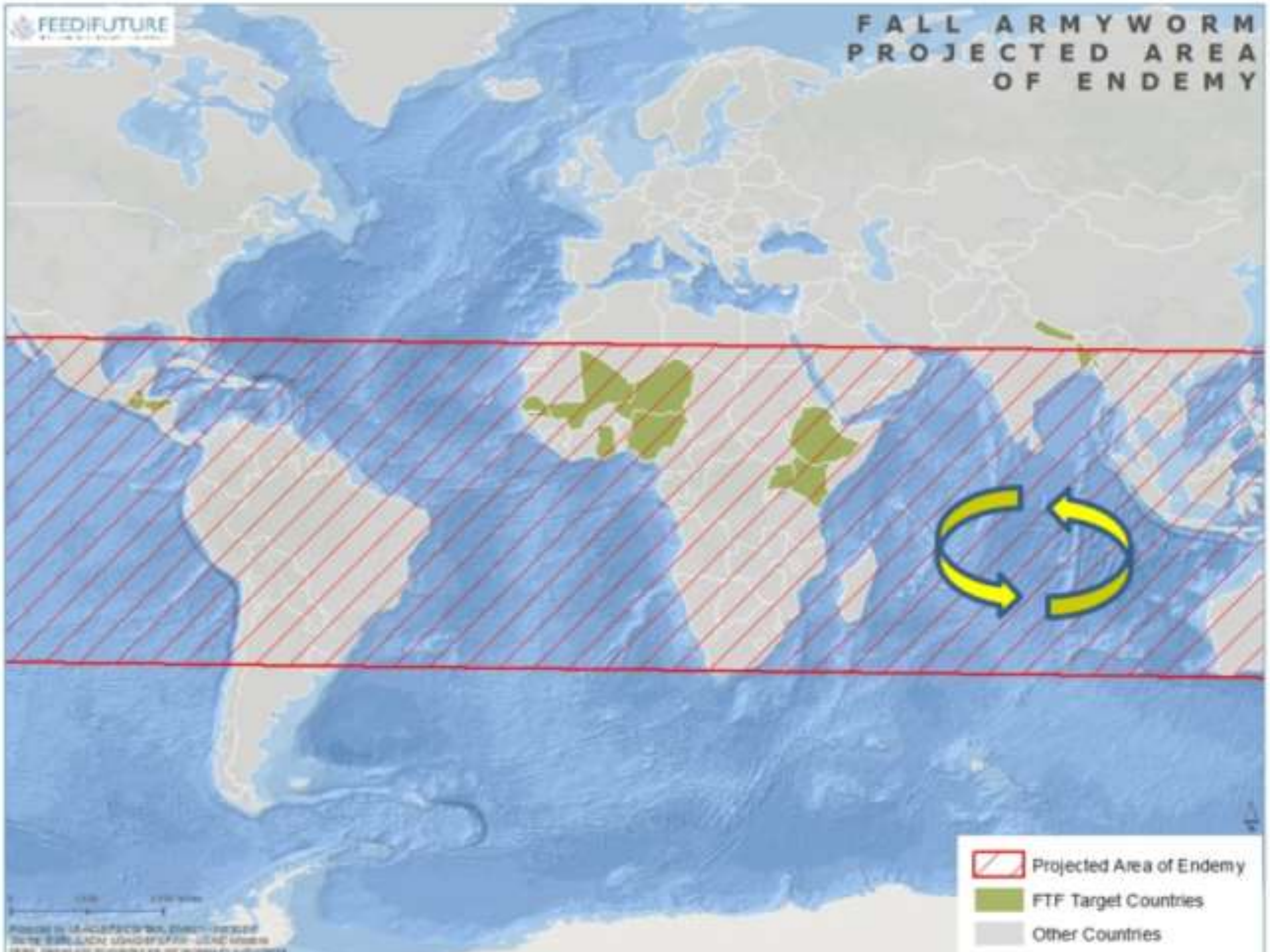
FAW SOURCE



- First detected in Nigeria in 2016 but likely in Africa Sooner.
- FAW most similar to populations from FL & Caribbean.
- Maize/sorghum biotype predominates.

Contact Rod Nagoshi & Robert Meagher USDA for more info

FAW Will Be Endemic In Much Of The Ag World



- Migration as seen w/ African Armyworm & Locusts not the main dispersal process
- FAW Endemic – must be managed every year
- Multiple overlapping generations per year
- Must be managed at the farm level – GAP/IPM critical

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What to expect?

FAW damage and yield loss are a function of:

- The maize variety
- The agronomic conditions under which the crop is grown (fertilizer, soil pH etc.)
- The stage of the maize attacked (seedling, early/late whorl, tassel & cob)
- The intensity of the attack (% infestation)
- The number of FAW generations in the season

Some Guidelines

- De Groote and co-workers (2020) - Kenya farmer survey data showed losses at 54% in 2017 and 42% in 2018.
- AATF GM MON810 Trials – 6 GM hybrids showed average 34% yield advantage.
- Babendrier et al, 2020 – Use of insecticide emamectin benzoate yields more than doubled.
- Prasanna et al., 2019 CIMMYT trials showed that under natural, low to moderate FAW damage levels, the yield loss of OPVs, FAW-tolerant hybrid maize, and FAW-susceptible hybrid maize was between 36% and 57% in the absence of chemical control.
- Overall, the data suggest low to moderate levels of FAW infestation lead to 10% - 50% yield reductions.

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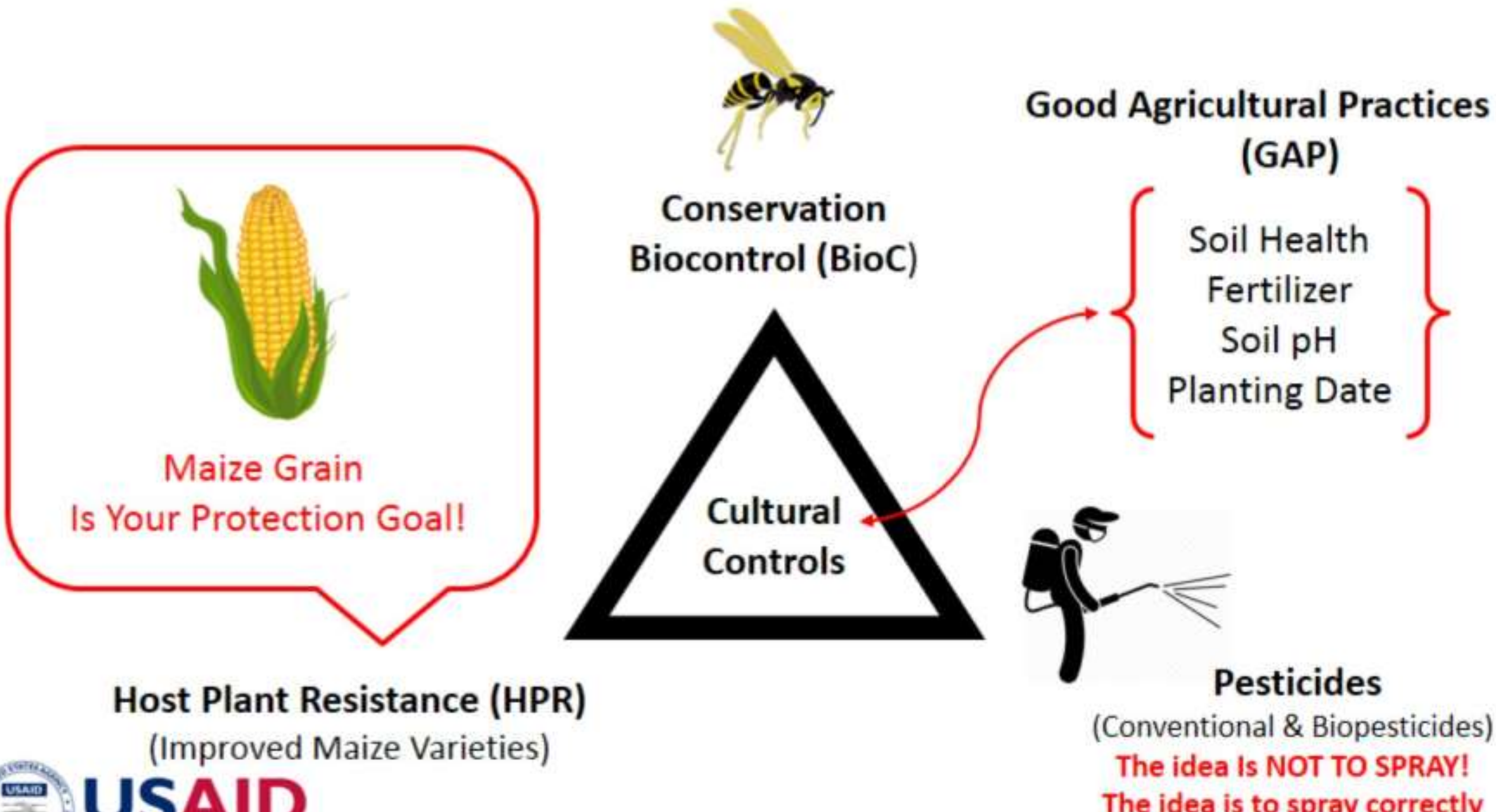
Fall Armyworm Integrated Pest Management



How Do We Make Sure The Best Science-Based Advice Is Available For Farmers?

GAP IPM Framework

- Help farmers & Ag specialists access Science-based Knowledge for management — **Knowledge**
- Develop & Validate Tools - Private/Public Sector — **Tools**
- Support policies that ensure access to and safe use of management options — **Policy**

Cost, Efficacy, Safety
Scalability, Sustainability

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Next Level Monitoring and Scouting

Dan McGrath

Fall Armyworm Two Years Later: Learning and Implications for Future Response

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PRESENTATION OVERVIEW

- **High versus low density monitoring systems**
- **Scouting as a multi-audience educational platform**
- **Efficacy testing**

High-Density Monitoring System

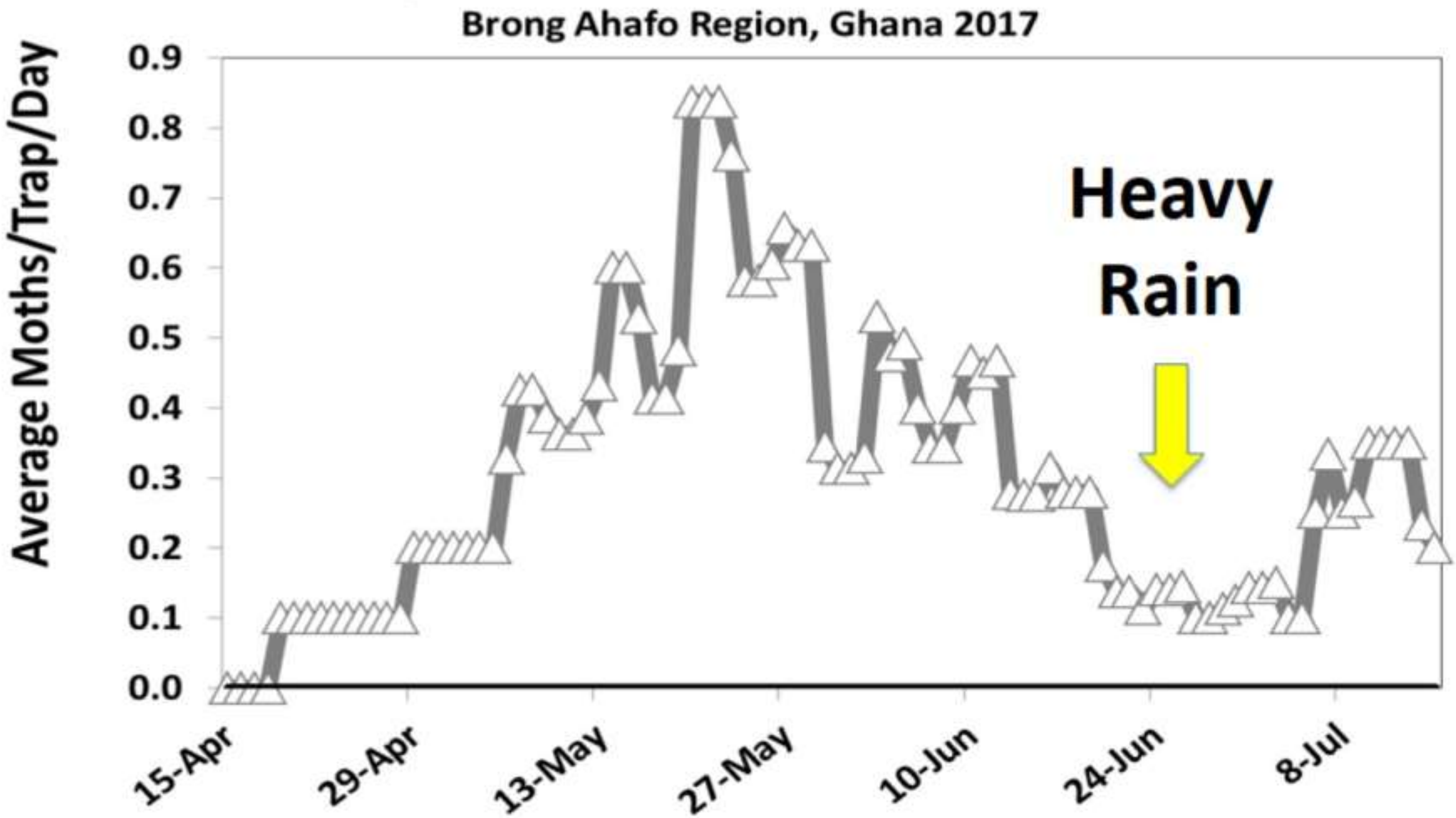
- Detect arrival (pest alert)
- Track spread, deploy resources
- Engage Community, phone

Monitoring Station as Education Platform

Demonstrate: Low-Density Networks

- Detect egg laying pressure
- Decision support (high/low)
- Promote integration

Fall Armyworm in Maize - Moth Counts



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Ten sites across 39,557 km^2

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Scouting

- Multi-audience education
- Smallholder key messages

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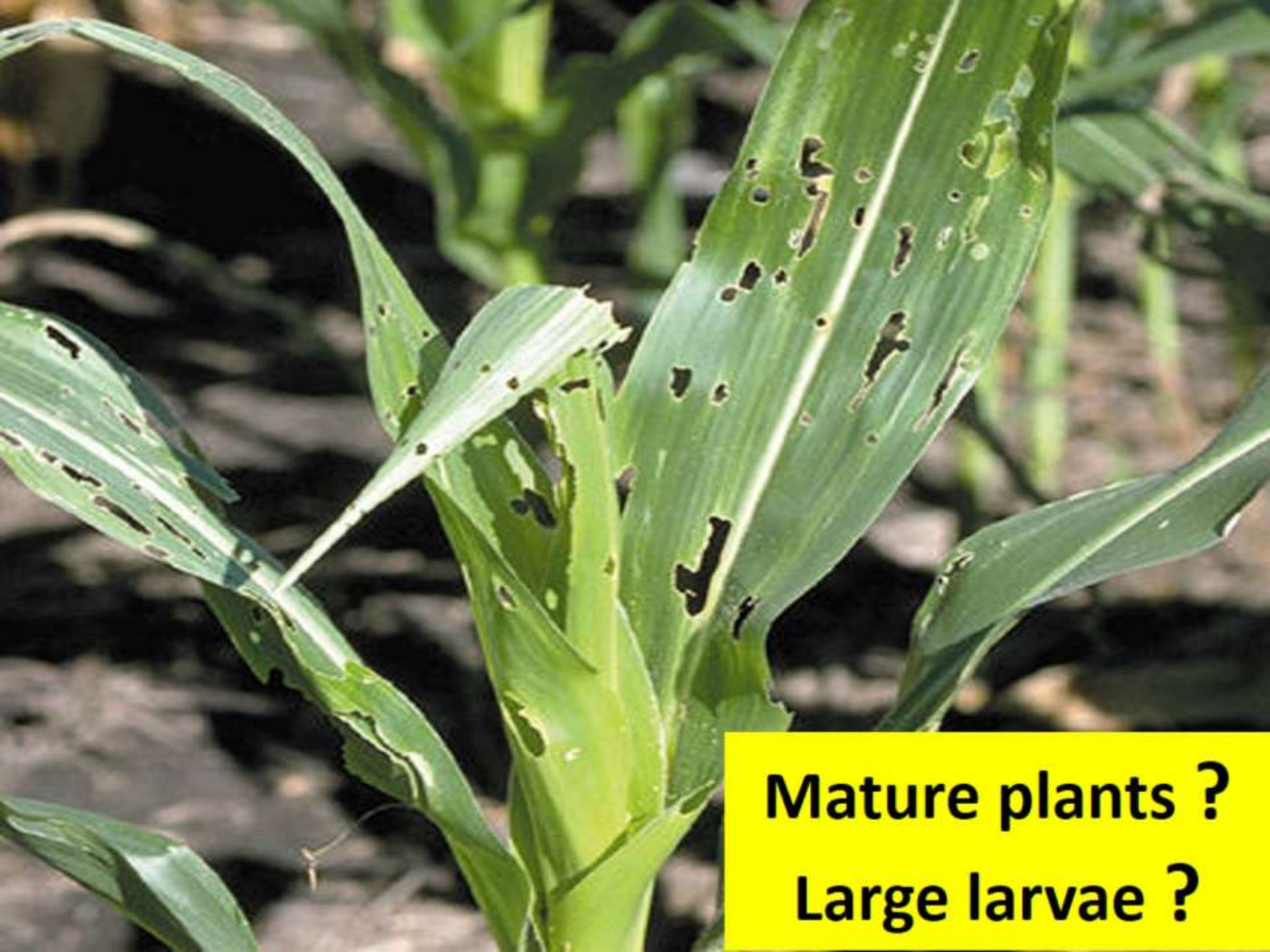
What do smallholders need to know?

- **Just because you have FAW, does not necessarily mean you need to spray.**


Mature plants ?
Large larvae ?

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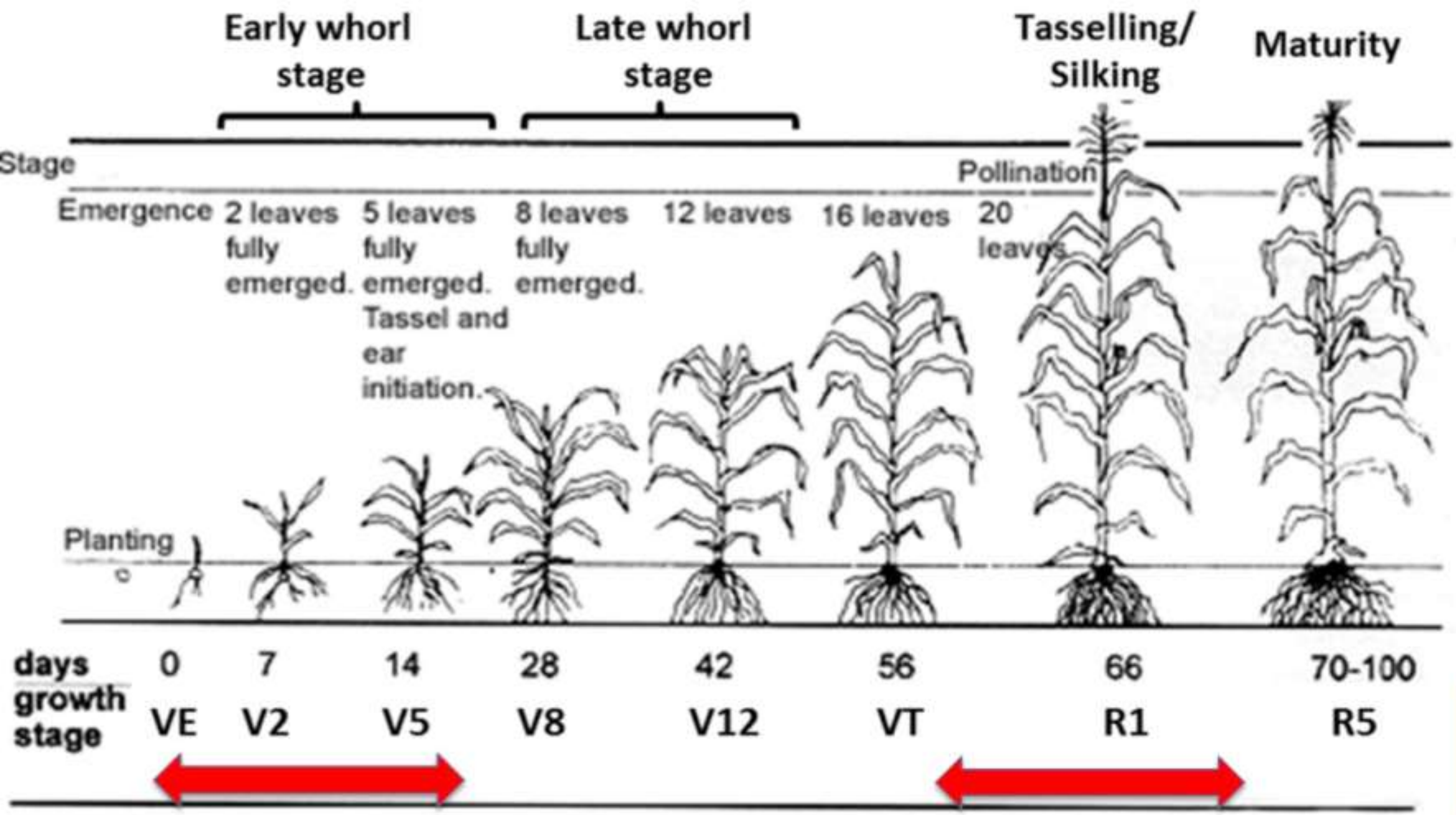

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What do smallholders need to know?

- Check seedlings.
- Control small larvae before they move into whorl.

Tassel pushes larvae out of whorl.

Where do they go?

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What do smallholders need to know?

- Check during early cob development.
- Control larvae before they penetrate the husk.

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Scouting

- Ag professional messages
- Protect crop, control cost

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Assess risk of crop loss

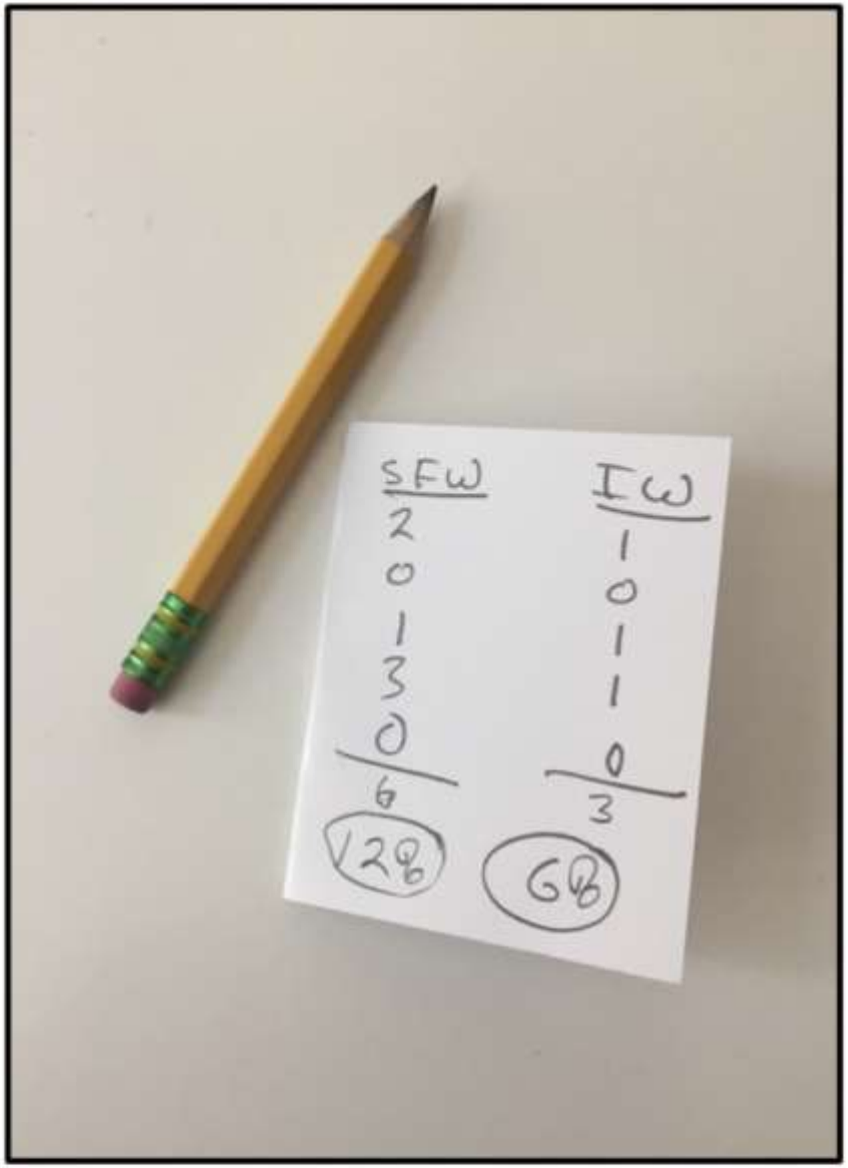
Pest Population
- Egg laying pressure
- Larval density & size

Growth Stage
- Seedling vs Mature
- Tassel & Cob

Weather
- Heavy Rain
- Dry & Warm @ Tassel

Cost-effective scouting.

Less than fifteen minutes per hectare.



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Efficacy Testing

Monitor:

- Egg laying (pest pressure)
- Maize Growth stage (vulnerability)
- Larval size (vulnerability)

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KEY RESULTS TO DATE

- **Widespread utilization** of IPM Manual for Training of Trainers
- **Key messages** reaching smallholders

WHAT IS NEEDED TODAY?

Next-level Training:

- Help missions to deploy FAW 2020 IPM Manual & Training

Decision Support:

- Help transition to cost effective monitoring systems

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Host Plant Resistance for Fall Armyworm Management

B.M. Prasanna

Director, Global Maize Program, CIMMYT & CGIAR Research Program MAIZE

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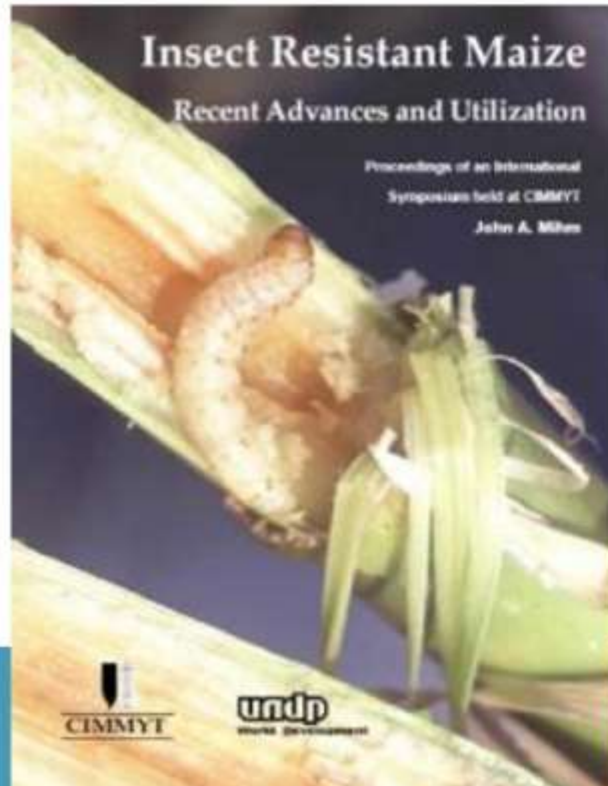
Breeding for insect resistance in maize at CIMMYT is more than four decades old…



Cuban Flints

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Source germplasm with insect resistance developed at CIMMYT-Mexico through dedicated efforts....

"We concentrate on attempting to identify and use more stable resistance to larval feeding: of the antibiosis, strong non-preference, or plant tolerance mechanisms (in order of priority), and as expressed in a no-choice situation under field conditions."

– John Mihm (1984)

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Intensive screening of tropical maize germplasm against FAW under artificial infestation since 2017…

- **3124 inbred lines and 3269 hybrids** screened so far against FAW under artificial infestation
- Identification/validation of promising FAW-tolerant inbred lines and pre-commercial hybrids
- Disseminated **key CMLs (e.g., CML71, CML125, CML330, CML338, CML370, CML574)** with native genetic resistance to FAW to partners in Africa and Asia

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FAW-susceptible
Commercial Check

FAW-tolerant
CKHFAW 180299

Important criteria:

- Foliar damage ≤5.0
- Ear damage ≤3.0
- Grain yield under FAW artificial infestation (under choice and no choice)
- Other key traits relevant for smallholders

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CIMMYT's FAW-tolerant Pre-commercial Maize Hybrids

Ongoing On-Station and On-Farm Validation Trials in Kenya

8 promising FAW-tolerant pre-commercial hybrids + 4 FAW-susceptible commercial checks

- **No-choice experiment under FAW artificial infestation at Kiboko, Kenya,** in compartmentalized nethouses
- **On-station trials under FAW natural infestation at six locations in Kenya:** Kitale, Kakamega, Katumani, Embu, Kiboko and Mtwapa
- **On-farm trials (16 sites) in Kenya** under FAW natural infestation (under farmer management conditions)

The first-generation FAW-tolerant hybrids will be announced to partners in Africa in the last quarter of 2020, based on analysis of on-station and on-farm data.

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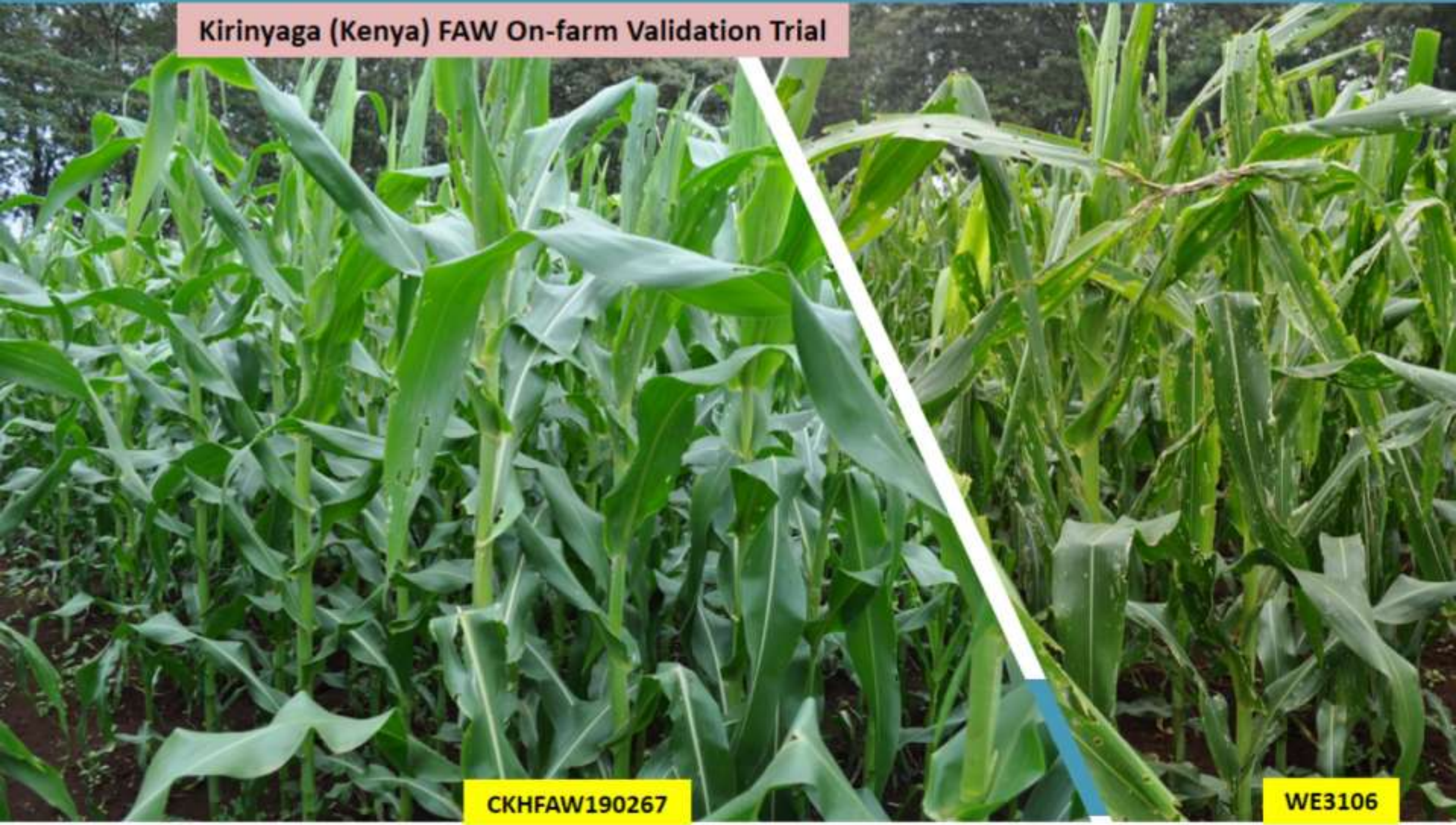

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Native Genetic Resistance: Next Steps

- Similar to the MLN success story, we need to accelerate development of elite maize varieties with climate resilience and FAW tolerance in diverse genetic backgrounds relevant for Africa and Asia using genomics-assisted breeding.
- Channelize extensive public-private partnerships for deploying elite FAW-tolerant varieties (with faster varietal turnover).
- Demonstrate the benefits of integrating native genetic resistance with other IPM tactics, especially GAP and biological control.

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Bt Maize – Important Tool in the IPM Toolbox!

- Numerous GM maize hybrids, including various combinations of *cry* and *vip* genes, commercially available in Brazil and North America
- Insect resistance management and product stewardship are important.

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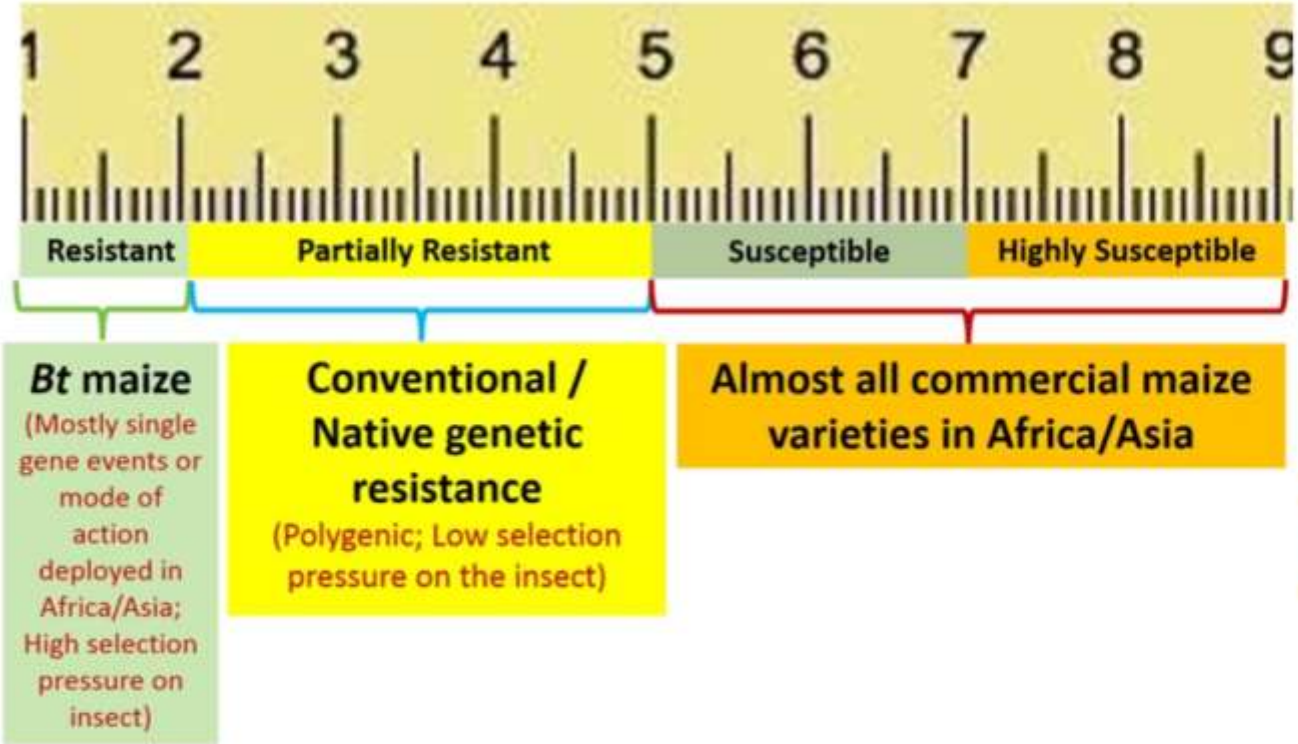
Bt Maize in Africa and Asia: Status

Africa

- **MON89034** in South Africa showing high levels of FAW control.
- **MON810:** CFTs in **TELA Project target countries in Africa** showing partial but significant control under FAW natural infestation
- A total of **49 unique CIMMYT inbred lines used so far under TELA project for *Bt* trait introgression**; of these, 38 lines were have been introgressed with **MON810**, and 29 with **MON89034**.

Asia

- *Bt* maize presently being commercialized in the Philippines (~630,000 ha) and Vietnam (~49,000 ha); approved recently in Pakistan.
- **MON89034** (*Cry1A.105 + Cry2Ab2*); Syngenta's **Bt11** (*Cry1Ab*); **MIR162** (Vip3Aa20) alone or stacked.



_Bt_-based resistance and native genetic resistance to FAW can be highly complementary...

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Thanks!

- **Partners in Africa, Asia, and the USA**
- **Funding agencies,** especially USAID (FAW Project)
- **MAIZE CRP** W1&W2 donors
- **CIMMYT colleagues** for their commitment to the Mission

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Pesticides in Fall Armyworm Management

Paul C. Jepson & Katie Murray, OIPMC, OSU, USA)
Micter Chaola (CRS, Malawi), Makhfousse Sarr (FAO, Senegal)
paul.c.jepson@gmail.com

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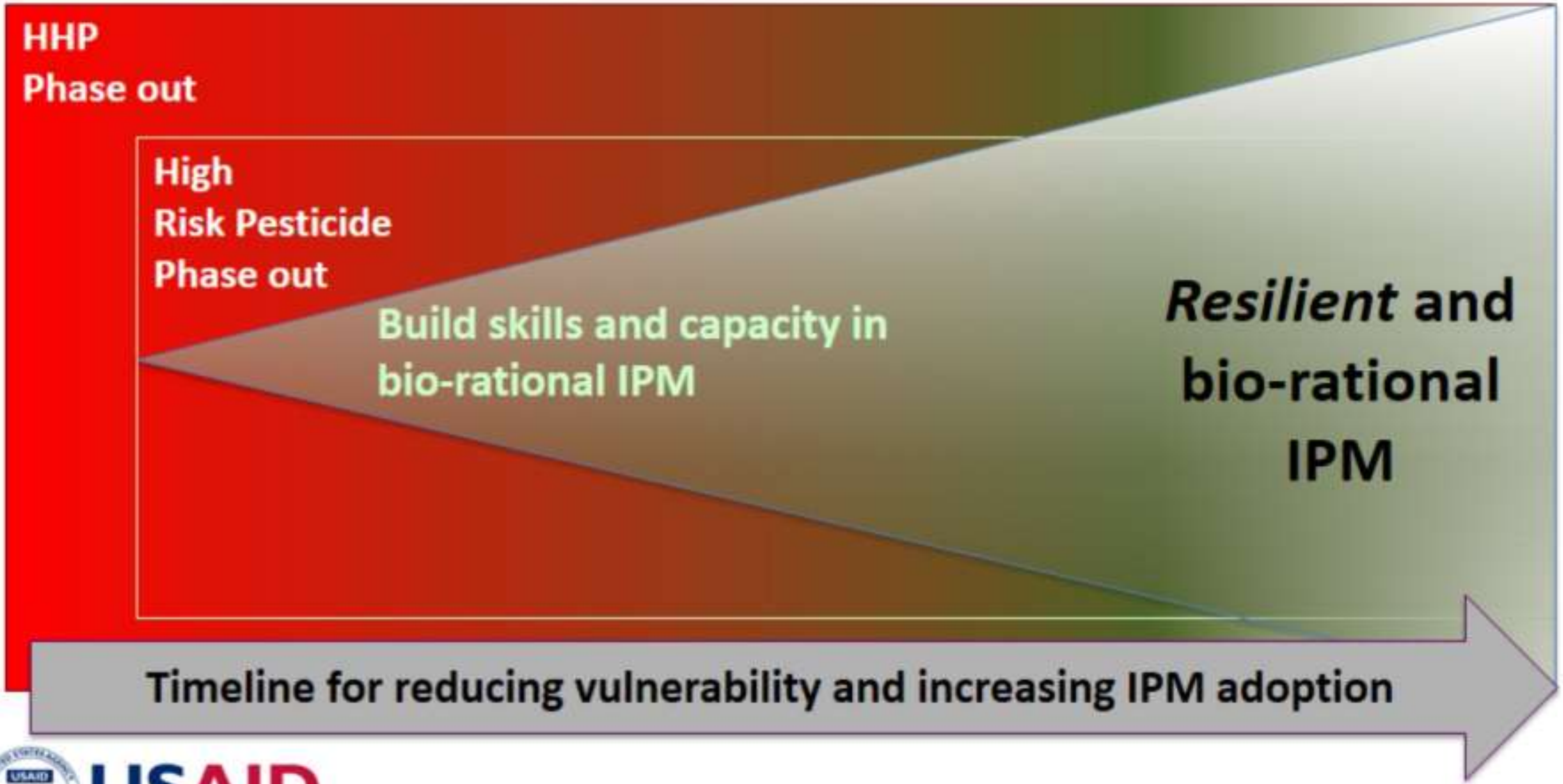
REMOVING BARRIERS TO IPM ADOPTION



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MALAWI PEST MANAGEMENT NEEDS ASSESSMENT (OSU, USAID, CRS) (MURRAY *ET AL.*, 2019)

Recommendations:

- Evaluate and register low risk pesticides
- Improve communication about IPM & pesticides
- Strengthen research and extension
- Monitor progress towards IPM adoption
- Build upon local knowledge
- Conduct country-wide pesticide risk management education
- Continue maize variety improvement

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Murray, K., Jepson, P.C., Chaola, M. (2019) Fall Armyworm Management by Maize Smallholders in Malawi: An Integrated Pest Management Strategic Plan, CIMMYT
https://repository.cimmyt.org/bitstream/handle/10883/20170/60695.pdf?sequence=1&isAllowed=y

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KENYA PEST MANAGEMENT NEEDS ASSESSMENT (OSU, USAID, RTI, FIPS)

(MURRAY *ET AL.*, 2020 IN PREP.)

Key needs:

- Farmers lack access to basic information on:
    - Pest biology and life cycle
    - Efficacious control methods and treatment timing
    - Safer use of pesticides including selection and application
- Lack of capacity among extension and spray service
- Agro-dealers lacking PPE on-site; seeking training on FAW management

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An example of pesticides favored in Malawi

THESE (profenophos & deltamethrin)

Are not compatible with

Natural enemies


Or smallholder farmers
And they are therefore not compatible with IPM

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RISK ASSESSMENT AND FIELD DATA CAN IDENTIFY THE PESTICIDES THAT MEET THE NEEDS OF AFRICAN FARMERS

At least 56 pesticides recommended against FAW in Africa

13 Highly Hazardous

32 others high environmental and/or health risk

11 lower risk

7 Potentially efficacious ***and*** lower risk

Pesticide selection process

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PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

Measuring pesticide ecological and health risks in West African agriculture to establish an enabling environment for sustainable intensification

P. C. Jepson[1], M. Guzy[1], K. Blaustein[1], M. Sow[2], M. Sarr[3], P. Mineau[4] and S. Kegley[5]

[1]Integrated Plant Protection Center, Oregon State University, Corvallis, OR 97330, USA
[2]Enda Pronat, 54 rue Carnot, BP 3370, Dakar, Senegal
[3]UN Food and Agriculture Organization, 15 rue Calmette x Assane Ndoye, BP 3300, Dakar, Senegal
[4]Pierre Mineau Consulting, 124 Creekside Drive, Salt Spring Island, British Columbia, Canada V8K 2E4
[5]Pesticide Research Institute, 1400 Shattuck Avenue no. 8, Berkeley, CA 94709, USA

THE LANCET Planetary Health

Editorial
Weighing the risks

Newsdesk
Planetary Health Research Digest

Articles
Pesticide selection

Selection of pesticides to reduce human and environmental health risks: a global guideline and minimum pesticides list

Paul C Jepson, Katie Murray, Oliver Bach, Maria A Bonilla, Lars Neumeister

Summary

Background Pesticides present widespread risks to human and environmental health, yet selection criteria for end-users that factor in differences in risk between compounds are scant. We developed a system to classify pesticide risks and hazards with respect to human and environmental health and produce a minimum (lower risk) pesticide list.

Methods We classified 659 pesticides by acute and chronic risks to human health (eg, respiratory and carcinogenic effects) and by environmental risks, including biomagnification and atmospheric ozone depletion and risks to aquatic

pesticides in current use against the fall armyworm in Africa, our guideline identified chemicals that are effective and of lower risk to human and environmental health. We argue that a minimum (lower risk) pesticides list, which meets IPM needs, could be developed from our classification system.

Lancet Planet Health 2020; 4: e56–63

Integrated Plant Protection Center, Oregon State University, Corvallis, OR, USA (P C Jepson PhD, K Murray MA); Sustainable Agriculture

Dr Paul C Jepson, Integrated Plant Protection Center, Oregon State University, Corvallis, OR 97330, USA
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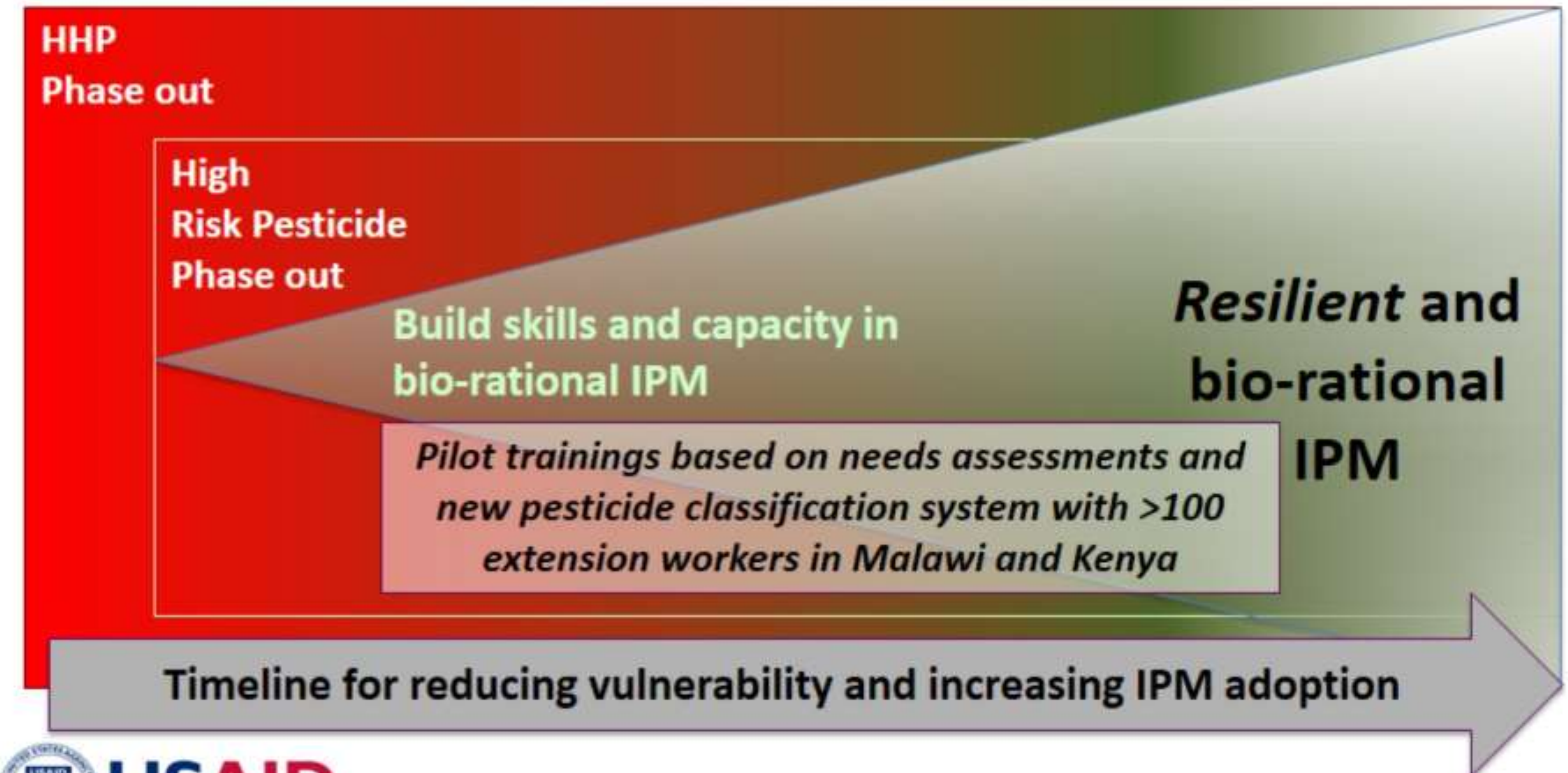
Phil Trans R Soc - Food and Environmental Security:
http://rstb.royalsocietypublishing.org/content/369/1639.toc
Lancet Planetary Health - Pesticides Minimum List: https://doi.org/10.1016/S2542-5196(19)30266-9

	LEVEL OF RISK	Unknown effect on fall armyworm	Not effective against fall armyworm	Effective against fall armyworm
1				
	LOW RISK TO HEALTH, & ENVIRONMENT ***SINGLE LAYER PROTECTIVE CLOTHING***	pyriproxifen	Bacillus thuringiensis (var Kurstaki), Beauvaria bassiana, Metarhizium anisopliae	Azadirachta indica, Bacillus thuringiensis (subsp Aizawai), chlorantraniliprole, flubendiamide, methoxyfenozide, SfNPV, pyrethrum
2				
	LOW RISK TO HEALTH, HIGH RISK TO ENVIRONMENT ***SINGLE LAYER PROTECTIVE CLOTHING***			lufenuron, novaluron, spinetoram, spinosad, tefulbenzuron, triflumuron
3				
	HIGH RISK TO HEALTH & ENVIRONMENT ***DOUBLE LAYER CLOTHING, EYE & RESPIRATORY PROTECTION, RESTRICT ENTRY TO TREATED FIELD***	cartap hydrochloride, pyradalyl	abamectin, acetamiprid, benfurcarb, carbaryl, chlorpyrifos, diazinon, dimethoate, fenitrothion, malathion, pirimiphos-methyl, profenofos, thiocarb	acephate, bifenthrin, cyhalothrin-gamma, cyhalothrin-lambda, cypermethrin, cypermethrin-alpha, cypermethrin-beta, deltamethrin, diflubenzuron, emamectin benzoate, fenvalerate, indoxacarb
4	**HIGHLY HAZARDOUS TO HEALTH &/OR ENVIRONMENT** ***DO NOT USE***	fipronil, methamidophos, monocrotophos, phorate	carbofuran, carbosulfan, dichlorvos, imidacloprid, thiamethoxam, trichlorphon	cyfluthrin-beta, cyfluthrin, methomyl

REMOVING BARRIERS TO IPM ADOPTION



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Communication Strategies and Effects on FAW Management in Uganda: A Case Study

Agrilinks Webinar

June 19, 2020

Sarah Page, Technical Advisor, CRS
Dai Peters, Independent Consultant
Austen Moore, Senior Technical Advisor, CRS

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STUDY BACKGROUND & RESEARCH QUESTIONS

Impetus

- Is information reaching all farmers?
- What two-way communication channels exist?
- Need to improve the response to FAW and adoption of management practices among different stakeholders.

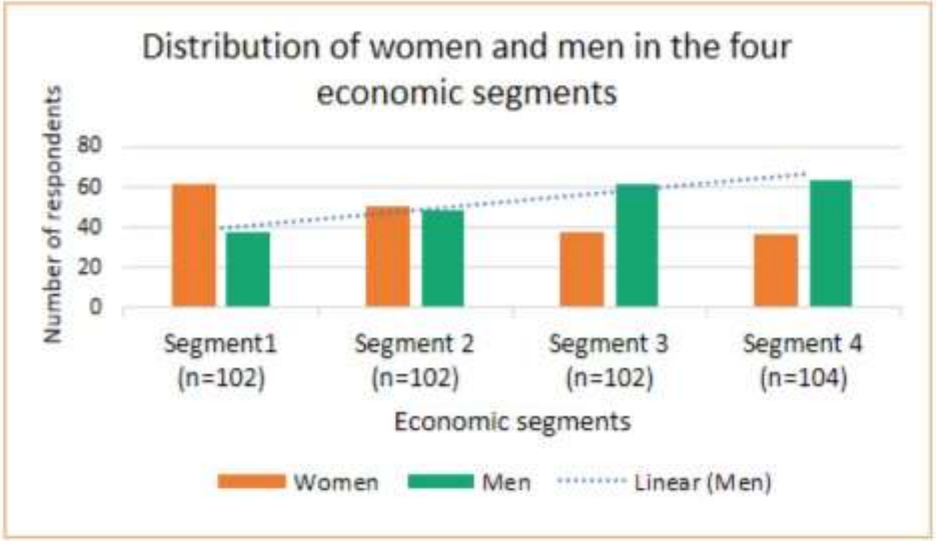
→ Case Study in Uganda

Study Questions:

1) Information sources
2) FAW management practices
3) Results of FAW management
4) Feedback loops

METHODS AND ACTIVITIES

- 409 farmer surveys, 60 qualitative farmer interviews, 16 key informant interviews, desk review



HOW FARMERS ACCESSED INFO ON FAW

- Relationship between wealth and gender and information access
- Groups were preferred venue for information sharing
- Main sources of information differed by control method
- Limited use of ICTs, especially by poorer farmers

Where did farmers learn about applying chemical pesticides?

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HOW CAN WE BETTER FACILITATE ACCESS TO INFORMATION ACROSS FARMER SEGMENTS?

- Use ICTs/social media more effectively and as a complement
- Identify ICT connectors
- Ensure inclusivity of farmer groups

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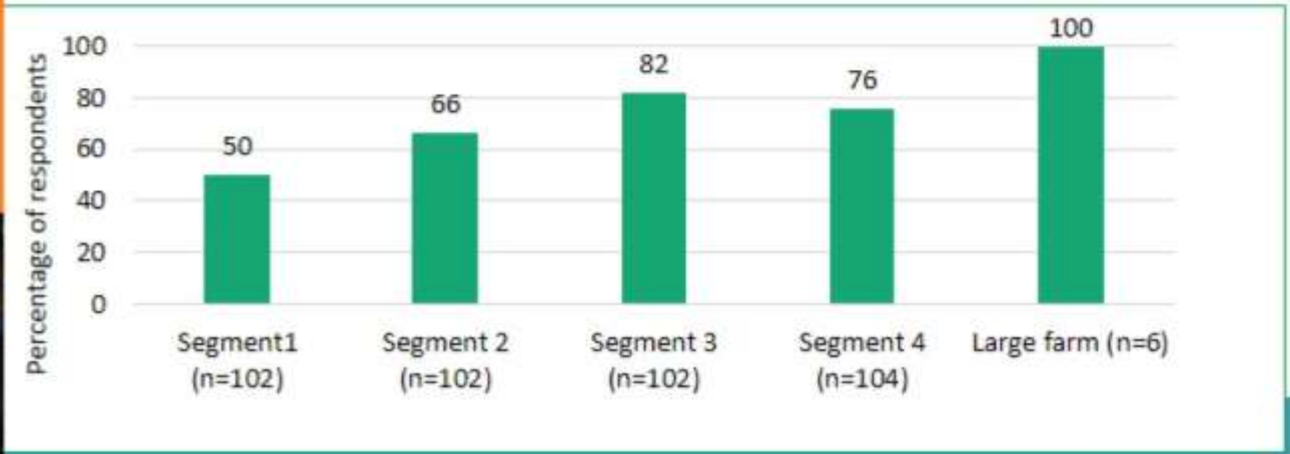
FARMER MANAGEMENT OF FAW AND RESULTS

- The information campaign was effective in changing farmer behaviors.
- There was a reduction in maize yield loss.
- Costs for different FAW control practices are prohibitive for some farmers.
- Evidence of misuse of synthetic pesticides.

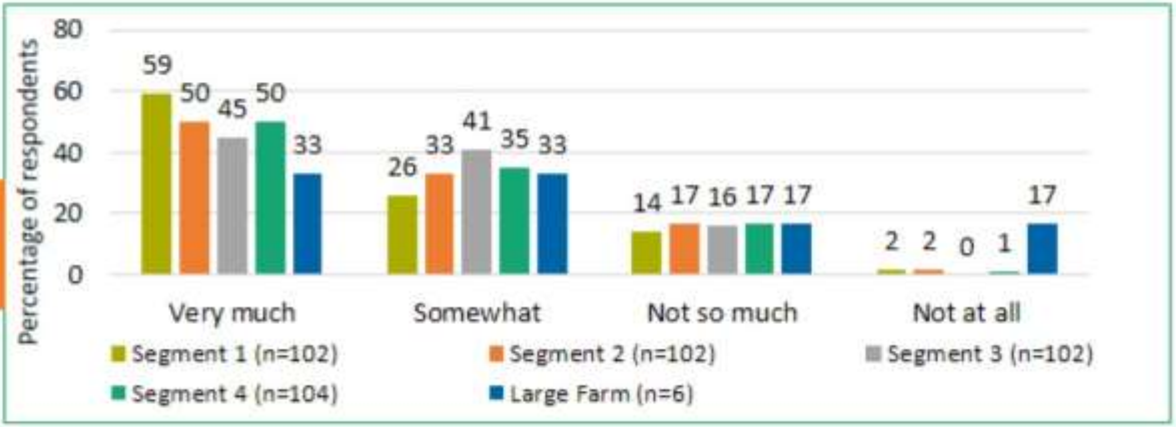
Are farmers applying synthetic pesticides to control FAW?



FARMER MANAGEMENT OF FAW AND RESULTS

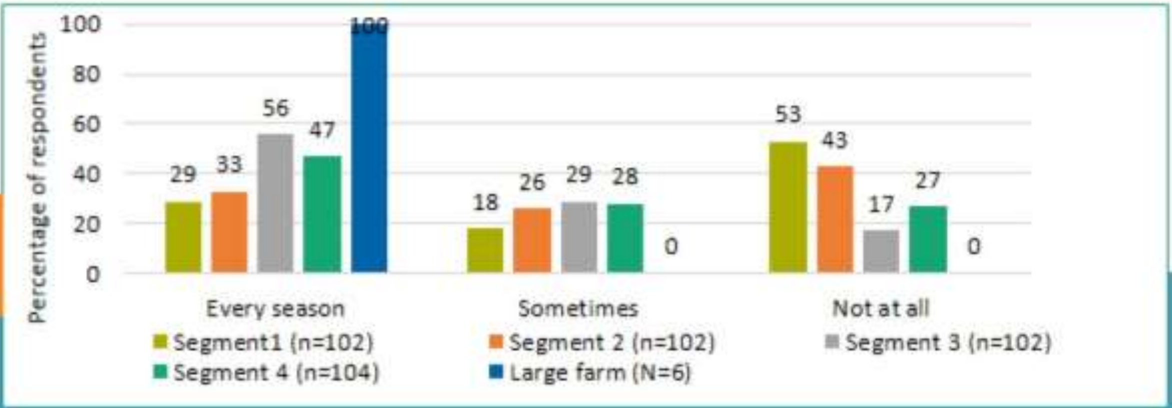
- Farmers still perceive FAW to be a threat to their maize production.

Is FAW still a threat to your maize production?



- Many farmers are not able to save to purchase synthetic pesticides.

Do you set aside money to purchase pesticides?



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HOW CAN WE SUPPORT FARMERS TO IMPROVE MANAGEMENT OF FAW?

- Provide more specific guidelines for pesticide use.
- Design information campaigns to better reflect the diversity of contexts and farmer segments.
- Address economic barriers to adoption.
- Help farmers understand costs and returns.
- Continue to train on GAPs.

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HOW FARMERS ARE PROVIDING FEEDBACK

- Little validation or documentation of farmer experimentation
- Learning and feedback mechanisms are weak
- Most feedback was delivered in person
- Limited use of ICTs to provide feedback or solicit information

HOW DO WE STRENGTHEN FARMER FEEDBACK LOOPS AND BECOME MORE DEMAND-DRIVEN?

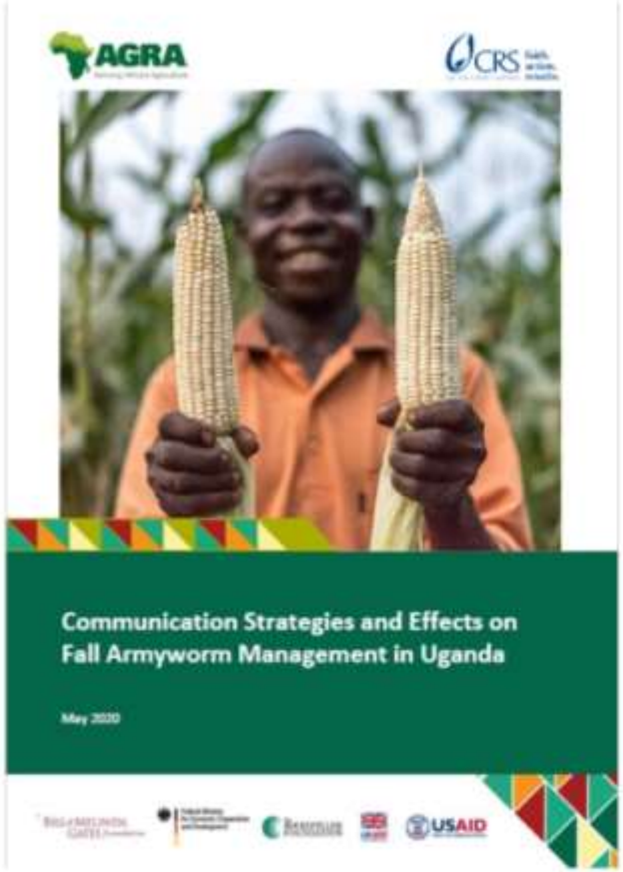
- Continue to advance research on efficacy of farmer-derived approaches
- Develop and update technical content using an iterative process
- Strengthen farmer feedback mechanisms for demand-driven extension
- Reconsider farmer group models, but emphasize:
  - Collaboration, peer-to-peer learning, and innovation
  - Inclusivity/accessibility for women and youth
  - Example: Farmer Learning Centers

KEY TAKE-AWAYS

- Pesticide use is widespread; farmers and other actors need more specific information
- ICTs offer immense opportunity to scale information dissemination, but there is still an important place for farmers groups and face-to-face interactions
- Information flows continue to be top-down
- Information campaigns should be iterative and reflect diverse contexts and realities of different farmer segments

FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

FULL REPORT AVAILABLE UPON REQUEST



Questions?

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