Global Insights on FAW Management: Experiences from USA & Brazil Webinar

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Land Area Comparison

commons.wikimedia.org:Australia

FAW is new to Australia but is not new to the Americas.

SMITH, J. E., & J. ABBOTT. 1797. The Natural History Of The Rarer Lepidopterous Insects Of Georgia. V. 2 illus. London.

GLOVER, T. 1856. Insects Frequenting The Cotton Plant. U. S. Comm. Patents Rep. 1855 (Agr.): 64-115.

WALTON, W. R., & P. LUGINBILL. 1917. The Fall Armyworm Or "Grass Worm," And Its Control. Farmers' Bull. 752. USDA, 16 p.

LUGINBILL, P. 1928. The Fall Armyworm. USDA Tech. Bull. No. 34. 92 p.

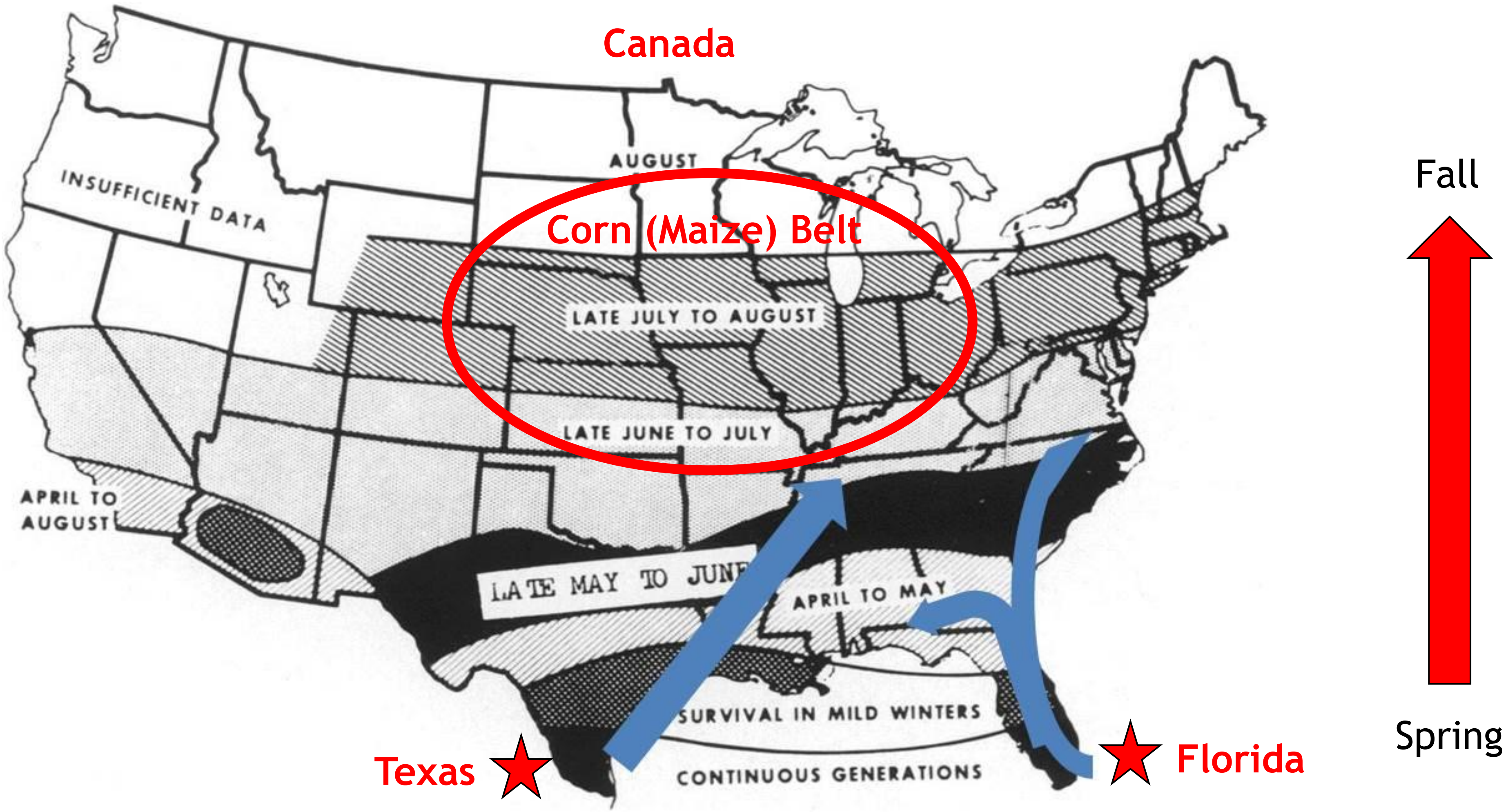
VICKERY, R. A. 1929. Studies Of The Fall Armyworm In The Gulf Coast District Of Texas. USDA Tech. Bull. No. 138. 64 p.

Sekul, A. A., & Sparks A. N. 1976. Sex Attractant Of The Fall Armyworm Moth. USDA Tech. Bull. 1542. 6 p.

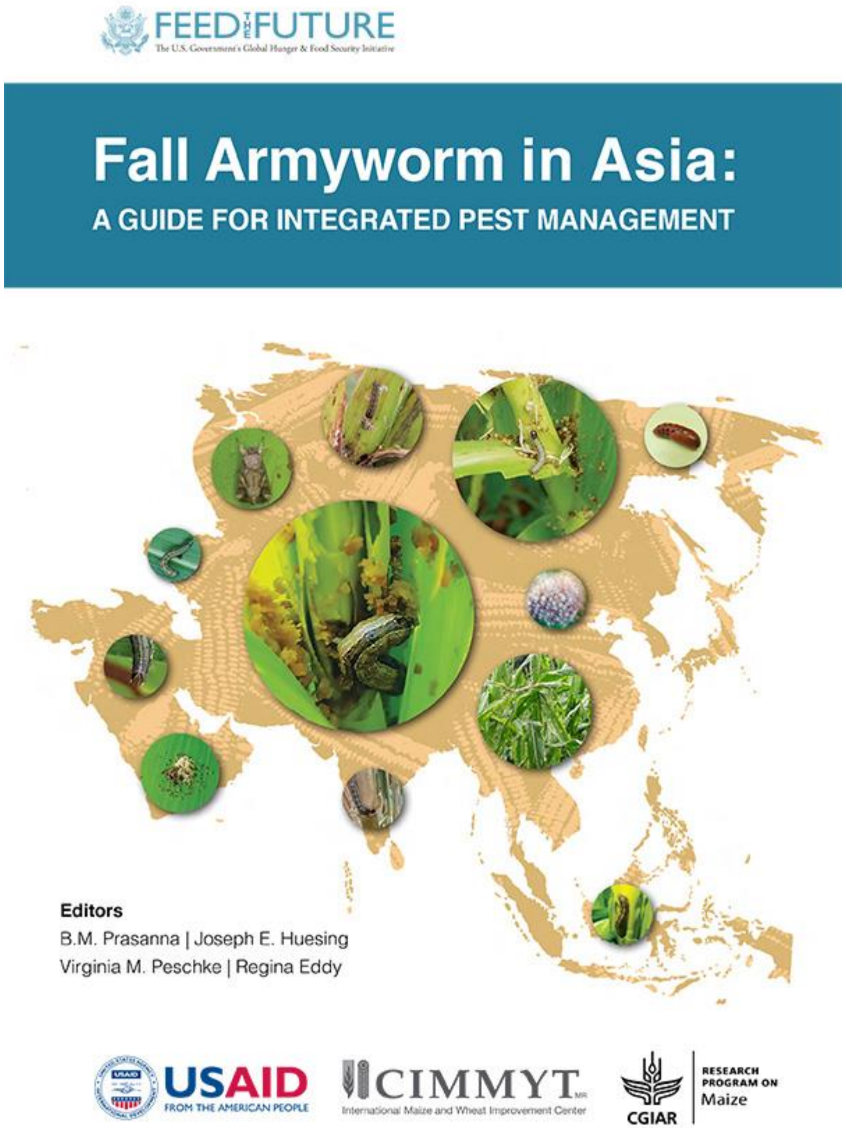
Georg Goergen, IITA

Fall Armyworm Name

University Of Kentucky – Kentucky Pest News



FAW Playbook



- The Fall Armyworm in Asia IPM Manual is based on practices used in the Americas for FAW control.
- The GAP IPM sections are largely transferable to Australia.
- Just Google: *'USAID Fall Armyworm'*.

https://repository.cimmyt.org/entities/publication/ff2b5489-1d88-4b96-94a0-143ca7af3f77

FAW Solutions Snapshot

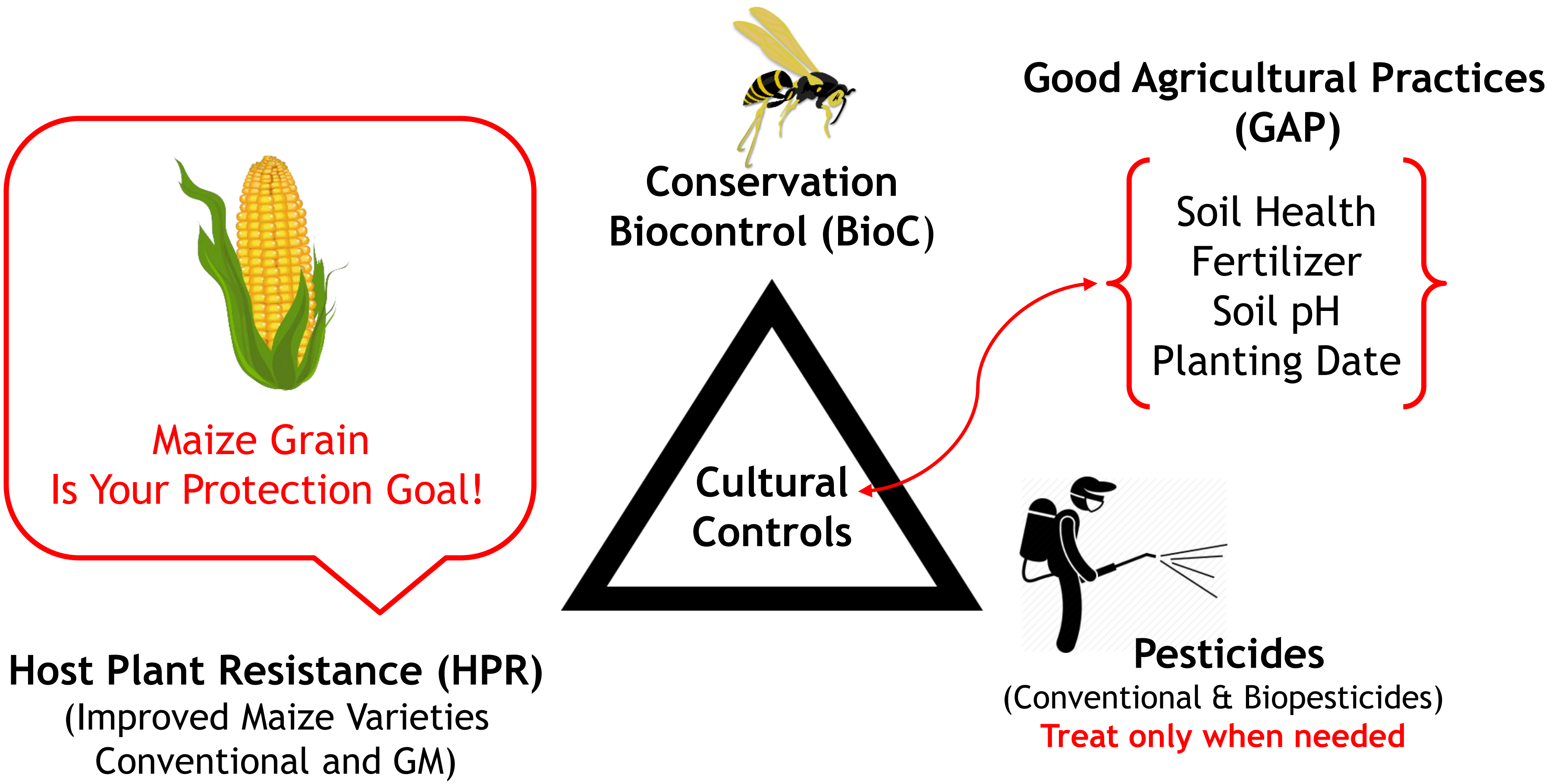
How is FAW managed in North America?

- **Knowledge - Tools - Policy**
  - **Knowledge** - Good Agricultural Practices (GAP) & Integrated Pest Management (IPM) – As with all pests, maize farmers use improved crop management practices to control FAW
  - **Tools** - These include Conventional & GM seed, and Synthetic & Biopesticides
  - **Policy** - IPM tools require an enabling policy environment!
- **EXAMPLE: GM & Conventional Seed**
  - In Brazil & U.S. ~85% farmers choose GM maize; Philippines ~ 50%
  - GM is the most efficacious, safest, proven technology for farmers
- **EXAMPLE: Pesticides (Synthetic & Biopesticides)**
  - Non-GM = FAW chemical control is more costly – labor & safety issues
  - Organic sweet corn industry in U.S. treats w/ pesticides as much as 12 – 25x season but still make considerable profits.

Fall Armyworm IPM

Good Agricultural Practices (GAP)

The GAP IPM Context



Fall Armyworm IPM
Good Agricultural Practices (GAP)
Improved Seeds and Resistant Seeds

Foliar damage rating between 3.0 and 5.0 (on 1-9 scale)

SOURCE: BM Prasanna - CIMMYT

- The maize variety matters
- North American germplasm is bred for lepidopteran, including FAW, resistance
- Outside the U.S., CIMMYT has developed FAW resistant varieties

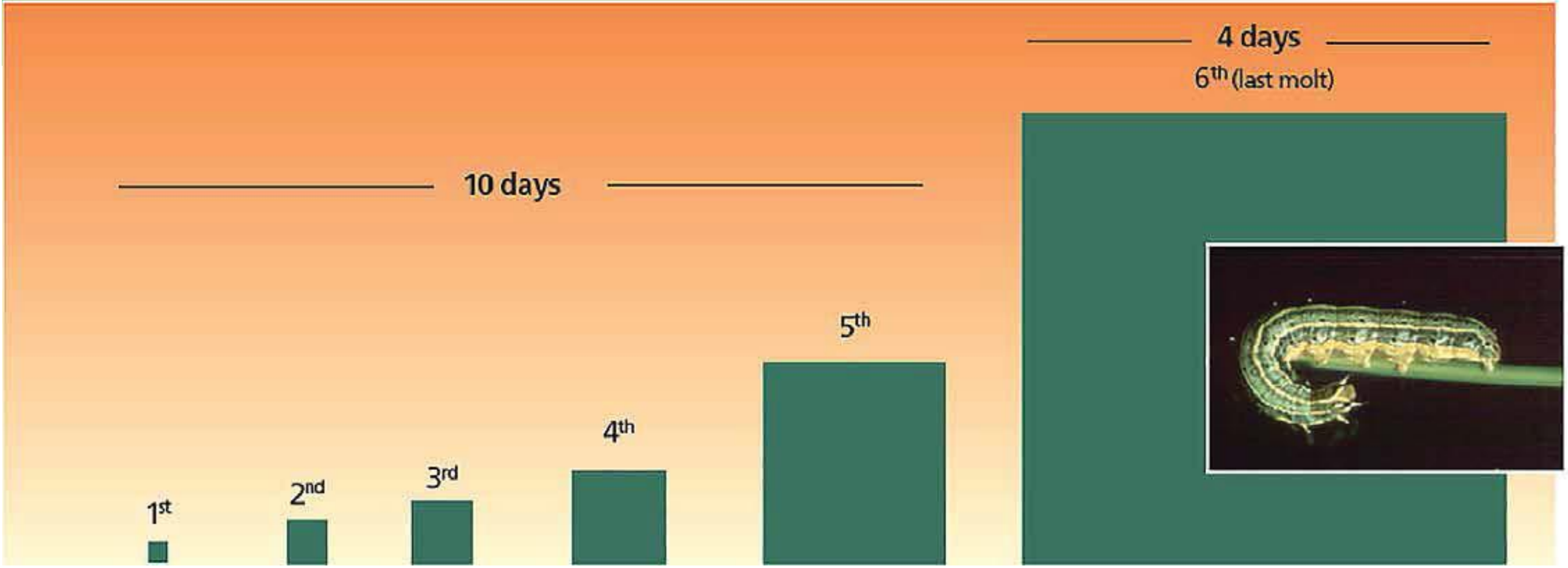
Field Scouting
Scout - Assess - Decide

Too Late!

- The approach used to control FAW in Africa & Asia is based on that used in the Americas
- Farmers must scout correctly for FAW
- Many farmers treat for FAW too late!!!
- To control FAW you must treat early!
- Detection of FAW at the earliest developmental stage is critical for economic control

Field Scouting

Why timing is important – Scout Early & Often

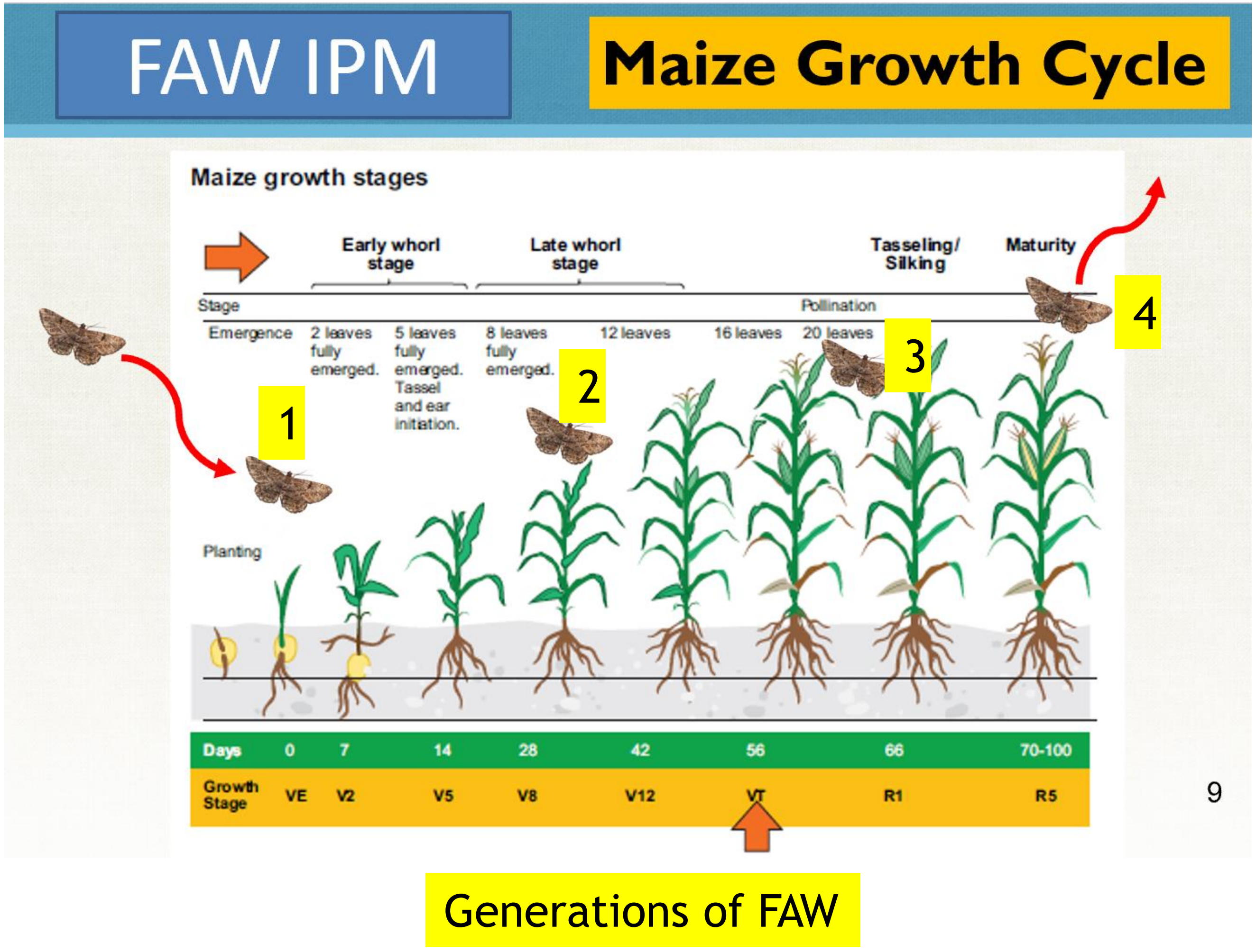


(Source: Flanders KL, Ball DM, Cobb PP, Revised May 2017, ANR-1019 Alabama Cooperative Extension System).

- Older larvae have already caused the damage
- Older larvae are harder to kill with insecticides
- Young larvae are hard to see – look for damage NOT the larvae!
- Young larvae are easier to kill with “soft insecticides

Maize Growth Stages

FAW & maize growth stages

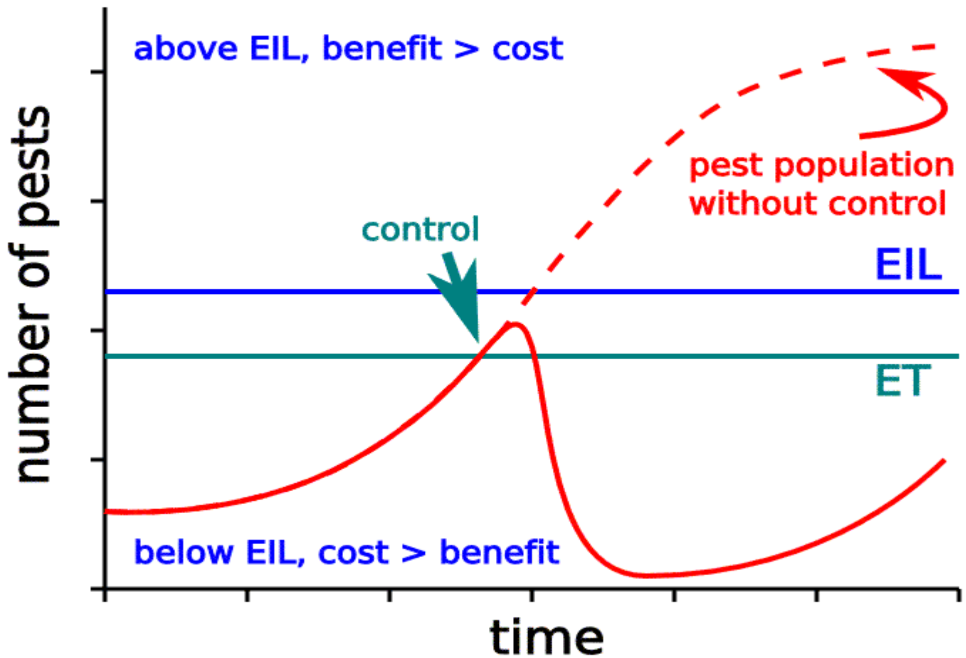


Important Points

- FAW is Endemic - Look for FAW in 'off-season' maize.
- Multiple generations of FAW in your field.
- FAW can fly 1500 km – you can't hide your maize.
- FAW damage is different at different maize stages
  - Seedling – cutworm-like
  - Tassel – poor seed set
  - Reproductive – cob damage and aflatoxin

Fall Armyworm IPM
Integrated Pest Management

Control of FAW, like other Ag pests, is dependent on the yield potential of your maize variety, the market value of your crop, and the cost and efficacy of mitigation



To Calculate the ET & EIL We Need to Know:
1) Value of the crop yield.
2) Cost of the treatment: active ingredient & labor.

Two concepts:

Economic Injury Level (EIL)

– The smallest number of insects (amount of injury) that will cause yield losses equal to the insect management costs.

Economic Threshold (ET)

– **The pest density at which action should be taken to prevent an increasing pest population from reaching the EIL.**

– The pest density or level of crop damage at which a control treatment will provide an economic return.

Fall Armyworm IPM
Profit Margins
Conventional Corn vs. Organic Corn
Minnesota – Wisconsin

- MN-WI **Organic Row Crop Producers** managed 325 acres per farm on average and generated **<u>$324.24 per acre</u> in median net farm income in 2020 and 2021.**

- **Conventional Row Crop Farms**,….more than three times as large; averaging 1,053 acres per farm **while netting <u>$144.65 per acre</u> in median farm income.**

- The 2020-2021 data - Joleen Hadrich, professor in the Department of Applied Economics at the University of Minnesota (UMN).

Source: University of Minnesota CFANS: Organic production proves profitable despite smaller sizes and inflation effects in Upper Midwest
October 26, 2022

https://cfans.umn.edu/news/organic-production-profitable#:~:text=MN%2DWI%20organic%20row%20crop%20producers%20managed%20325%20acres%20per,acre%20in%20median%20farm%20income.

Example
Field Corn In Nebraska
Economic Injury Level

Insecticide Treatment Options for Fall Armyworm in Field Corn
Updated February 14, 2017

- **An insecticide application may be economically justified when 75% of plants show leaf feeding and larvae are less than 1.25 inch long.*****
- **Treatment to control larvae inside the ears is not effective (University of Missouri).**
- **Go to https://www.greenbook.net or other resource for additional registrations.**
- **Consult product label for specific information and restrictions.**
- ***** In South Africa, Britz et al. 2020, showed 13% yield loss with 10% FAW Infestation.**
- **Hazzard & Westgate, 2024, University of Massachusetts Amherst, recommend a threshold for FAW in organic maize of 15% plants infested plants.**

Example: Field Corn In Nebraska Pesticides Options

IRAC Mode of Action Classification:

- Group 1 = Acetylcholine esterase inhibitors; 1A = Carbamates, 1B = Organophosphates
- Group 3 = Sodium channel modulators
- Group 5 = Nicotinic acetylcholine receptor agonists (allosteric), Spinosyns
- Group 28 = Ryanodine receptor modulators, Diamides

R = Restricted-Use Product

Mode Of Action	Product Name	Common Name	Rate (Formulation/Acre)	Restrictions/Comments
3 R	Ambush 2EC	permethrin	6.4-12.8 fl oz	PHI 30 days for grain or fodder (stover). Forage may be harvested on the day of application.
3 R	Arctic 3.2EC	permethrin	4-6 fl oz	PHI 30 days for harvest of grain or fodder (stover). Forage may be harvested on the day of application.
3 R	Baythroid XL, Tombstone	cyfluthrin	2.8 fl oz	*For control of 1st and 2nd instar only. PHI 21 days for grain or fodder and 0 days for green forage.
28	Belt SC	flubendiamide	2-3 fl oz	PHI 1 day for green forage and silage and 28 days for grain or stover.
3, 28 R	Besiege	lambda-cyhalothrin, chlorantraniliprole	6-10 fl oz	PHI 21 days. Do not feed treated corn fodder or silage to meat or dairy animals within 21 days after last treatment. Use higher listed rates witin the listed rate range for large larvae.
3 R	Brigade 2EC, Fanfare 2EC, Bifenture EC, Discipline 2EC, Sniper, Tundra EC	bifenthrin	2.1-6.4 fl oz	PHI 30 days. Do not graze livestock in treated area or cut treated crops for feed within 30 days of treatment.
1B, 3 R	Cobalt	chlorpyrifos and gamma cyhalothrin	13-26 fl oz	PHI 21 days for grain, ears, forage or fodder.
1B, 3 R	Cobalt Advanced	chlorpyrifos and gamma cyhalothrin	11-26 fl oz	PHI 21 days for grain, ears, forage or fodder.
28	Coragen	rynaxypry	3.5-7.5 fl oz	PHI 14 days.
3 R	Declare	gamma-cyhalothrin		
3 R	Delta Gold	deltamethrin		
3 R	Fastac EC	alpha-cypermethrin		
3 R	Hero	zeta-cypermethrin and bifenthrin		
1A R	Lannate LV	methomyl		
1A R	Lannate SP	methomyl		
28	Lumivia	chlorantriniliprole		
1B R	Methyl 4EC	methyl parathion		
3 R	Mustang Maxx, Respect	zeta-cypermethrin		
3 R	Pounce 25WP	permethrin		
28	Prevathon	chlorantraniliprole		
3 R	Proaxis	gamma-cyhalothrin		
1A	Sevin XLR Plus	carbaryl		
1B, 3 R	Stallion	chlorpyrifos and zeta-cypermethrin		
3 R	Steed	zeta-cypermethrin and bifenthrin		
5	Tracer	spinosad		
1B, 3 R	Tundra Supreme	chlorpyrifos and bifenthrin		
3 R	Warrior w/ Zeon Technology, Silencer	lambda-cyhalothrin		
3 R	Warrior II w/ Zeon Technology	lambda-cyhalothrin		

Product Name	Common Name	Rate (Formulation/Acre)
Ambush 2EC	permethrin	6.4-12.8 fl oz
Arctic 3.2EC	permethrin	4-6 fl oz
Baythroid XL, Tombstone	cyfluthrin	2.8 fl oz
Belt SC	flubendiamide	2-3 fl oz
Besiege	lambda-cyhalothrin, chlorantraniliprole	6-10 fl oz

Example: Field Corn In Nebraska Pesticides Options – Example Only!

Lannate LV	methomyl	0.75-1.50 pts
Lannate SP	methomyl	0.25-0.50 lb
Lumivia	chlorantriniliprole	0.25-0.75 mg ai/kernel

- Methomyl costs around $10 per acre for the a.i.
- Chlorantraniliprole is around $30 per acre for the a.i.
- Bt spray treatments in organic corn can be as high as $100 (including labor) per acre.

- **RECALL THAT IN NEBRASKA:**
- **Organic Row Crop Producers generated <u>$324.24 per acre</u> in median net farm income in 2020 and 2021.**
- **Conventional Row Crop Farmers generated <u>$144.65 per acre</u> in median farm income.**
- **1 hectare = 2.5 acres**

FAW IPM CESAS

Cost, Efficacy, Safety, Accessibility, Scalability

Table 1. A potential framework for considering appropriate combinations of technologies for IPM-based FAW control in maize.

				Safety		Cost of product (US$)[4] per hectare to the farmer			Accessibility		Scalability[6]
S. No.	Technology	IPM tactics	Efficacy[1]	User safety (Scale: 1-3)[2]	Environmental risk / Compatibility with biocontrol (Scale: 0-3)[3]	Purchase price to farmer (Single treatment)	Purchase price to farmer (Over a crop season)	Other costs to the farmer	Policy requirement	Infrastructure/ Supply chain (Scale 1-3)[5]	Scale: 1-3
1	FAW-resistant maize varieties (native genetic resistance)	Host plant resistance	Good	Not Applicable (N/A)	0	N/A	$42-90	N/A	Regulated	1	1
2	FAW-resistant maize varieties (transgenic)	Host plant resistance	Excellent	N/A	0	N/A	$140-206	N/A	Regulated	1	1
3	Intercropping with compatible crops	Agroecology	Fair to Good	1	0	N/A	Variable	Planting an additional crop	Some companion crops regulated	1	1
4	Push-Pull system or habitat diversification at the farm level	Agroecology	Good	1	0	N/A	Variable	Planting additional crops	Some companion crops regulated	1	2
5	Augmentative biocontrol using *Trichogramma* spp.	Biological control	Fair to Good	1	0	$3.00-3.25	$13-15	Labor	Regulated	3 (Biofactory; Logistics)	3
6	Augmentative biocontrol using *Telenomus remus*	Biological control	Fair to Good	1	0	$10-12	$46-50	Labor	Regulated	3 (Biofactory; Logistics)	3
7	*Bt* spray (Commercial)	Biopesticide	Fair to Good	1	0	$28	$110	Labor, Sprayer, PPE, Cold Chain	Regulated	2	1
8	Azadirachtin – Neem spray (Commercial)	Biopesticide	Fair to Good	1	0	$32	$96	Labor, Sprayer, PPE	Regulated	1	1

Fall Armyworm IPM
Monitoring For FAW
Regional Moth Counts

- Considerable resources are wasted on high density pheromone trapping
- Traps are expensive and must be maintained and the data have to be actioned
- High density trapping systems were put into place:
  - In the mistaken belief that early warning systems were needed & useful
  - That FAW could somehow be eradicated
- Low density systems (a few traps per country) are used in the Americas
  - Use traps to assess regional FAW pressure
  - The State of Kentucky uses two traps for the whole state!
  - One trap every 2500 km^2 (50 km apart) is adequate!
- NOTE – farmers may find some value in augmenting scouting with traps. This is a practitioner level decision NOT a country-wide policy

Fall Armyworm IPM

Monitoring For FAW

The Role of Rain

- Regional monitoring and weather forecasts are very helpful in informing FAW management decisions.
- 1st and 2nd instar FAW larvae are Very susceptible to heavy rain.
- A forecast of rain can alert farmers that they may not have to treat for FAW.

Thank You

Remember, It's About Managing The Pest!

CIMMYT

GAP IPM Context:

- Knowledge
- Tools
- Policy

Science-based Solutions Considering:

- Cost
- Efficacy
- Safety
- Accessibility
- Scalability