Summary of national FAW mitigation responses, policies and action plans

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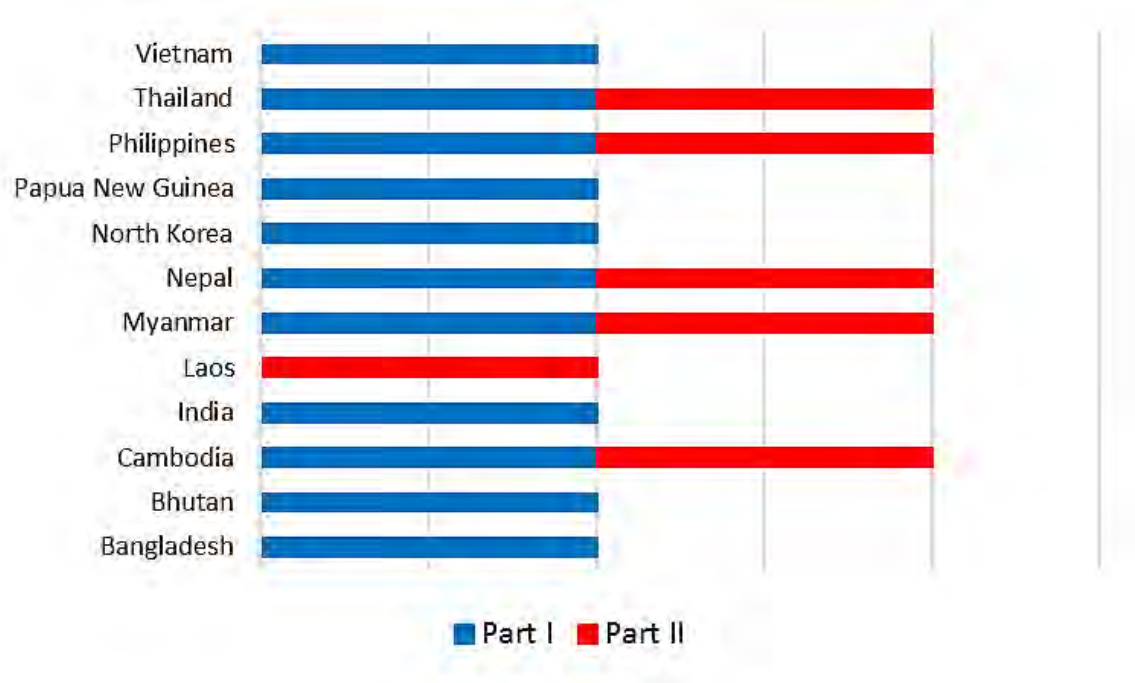
November 3, 2020

FAW survey responses

- Survey sent out in April – October 2020
  - ASEAN + China, India, Japan, Korea, PNG, Nepal, Pakistan, Bangladesh
  - 55 (mostly open-ended) questions
- (Partial) responses received from 12 countries
- Full responses from 5 countries



1. National-level coordination

- National Task Force
  - Yes: 8/12 countries; No answer: 2 countries
- Terms of reference
  - Yes: 4/12 countries
- Purpose / focus
  - Myanmar: Organize national mitigation response and develop long-term management plan

  - Thailand: Support country-level engagement and IPM capacity-building; monitor and manage FAW; improve IPM policy, tools, and knowledge transfer to farmers; Implement and/or scale-up proven effective IPM practices whilst advancing new and improved control measures over time

1. National-level coordination

- Frequency of meetings:
  - Weekly infestation reports (Vietnam, North Korea)
  - Monthly meetings (Philippines, Nepal, Thailand, Bangladesh)
  - 1-2 times/year (India, Myanmar)

- Collaboration national academia
  - Yes: 8/12 countries
- Collaboration international institutions
  - FAO (4)
  - CIMMYT (1)
  - CABI (1)
  - Australia National Museum (1)
  - Donors – JIRCAS (1), USAID (1)
  - Pesticide companies (1)

1. National-level coordination

- **Major achievements**
  - >90% IPM plans implemented (North Korea)
  - Comprehensive awareness-raising, capacity-building, area-wide pest surveillance, FAW mitigation response (multi-pronged) in 4 provinces (Vietnam)

- **State of awareness – main stakeholders**
  - Low (Bhutan, Papua New Guinea, Philippines)
  - Intermediate to high (Vietnam)

- **Communication/extension strategies**
  - Radio, TV, social media (Facebook, SMS, Line, Whatsapp), print media (e.g., newspaper), educational video, face-to-face training of ToTs, FFS
  - Formal communication plan: Vietnam, Philippines, Myanmar

2. FAW infestation / impacts

- FAW prevalence
  - 4.5% total area (Vietnam); 10-15% total area (Thailand)
  - 26.4% field-level incidence (Philippines)
- FAW-induced yield loss
  - 2% (Philippines); 2.0-4.8% (Myanmar); 6.4% (Nepal)
  - 25-40% (Thailand; some areas of Vietnam)
- Quality loss
  - 3-5% cobs with larvae (Vietnam)
  - Smaller cobs, fungal infection, lower marketability

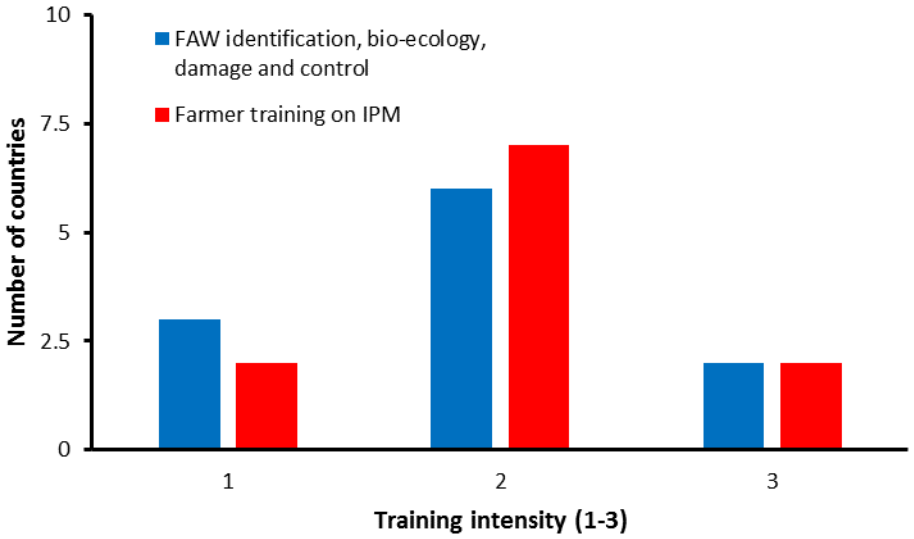
- Farm-level economics
  - Yield loss + increased pesticide expenditure (Vietnam, Myanmar)

3. Monitoring & early warning

- Key monitoring tools
  - Pheromone trapping, field scouting, FAMEWS app, online data-entry forms, national surveillance reporting
  - Ranging from none (Cambodia, PNG) to full repertoire (India)
  - GIS-based mapping: 2/12 countries
- Presence of National Focal point
  - Yes: 11/12 countries
- Policy & legal framework
  - Yes: 4/12 countries

4. Capacity for FAW management

- Local (farmer) innovations
  - Validated push-pull (Nepal); vinegar, molasses and sugar traps/sprays (Vietnam, North Korea); *Trichogramma* spp. releases (Myanmar); legume intercropping (India); beneficial fungi & stink bug releases (Lao PDR)
- Training intensity – FAW bio-ecology / management
- Level of IPM adoption
  - 0-low (most countries) to 100% (North Korea)



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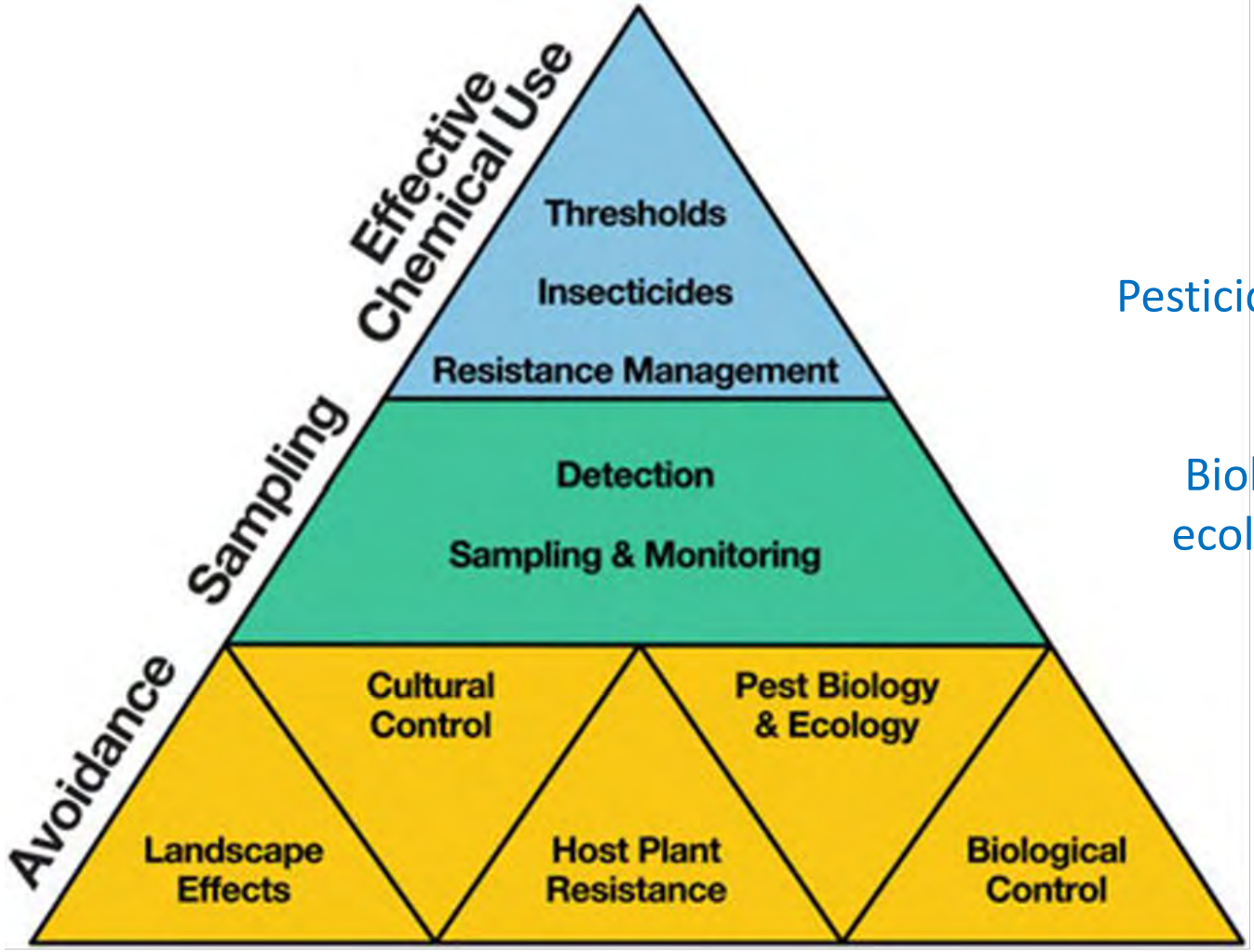


IPM Pyramid (Naranjo 2011)

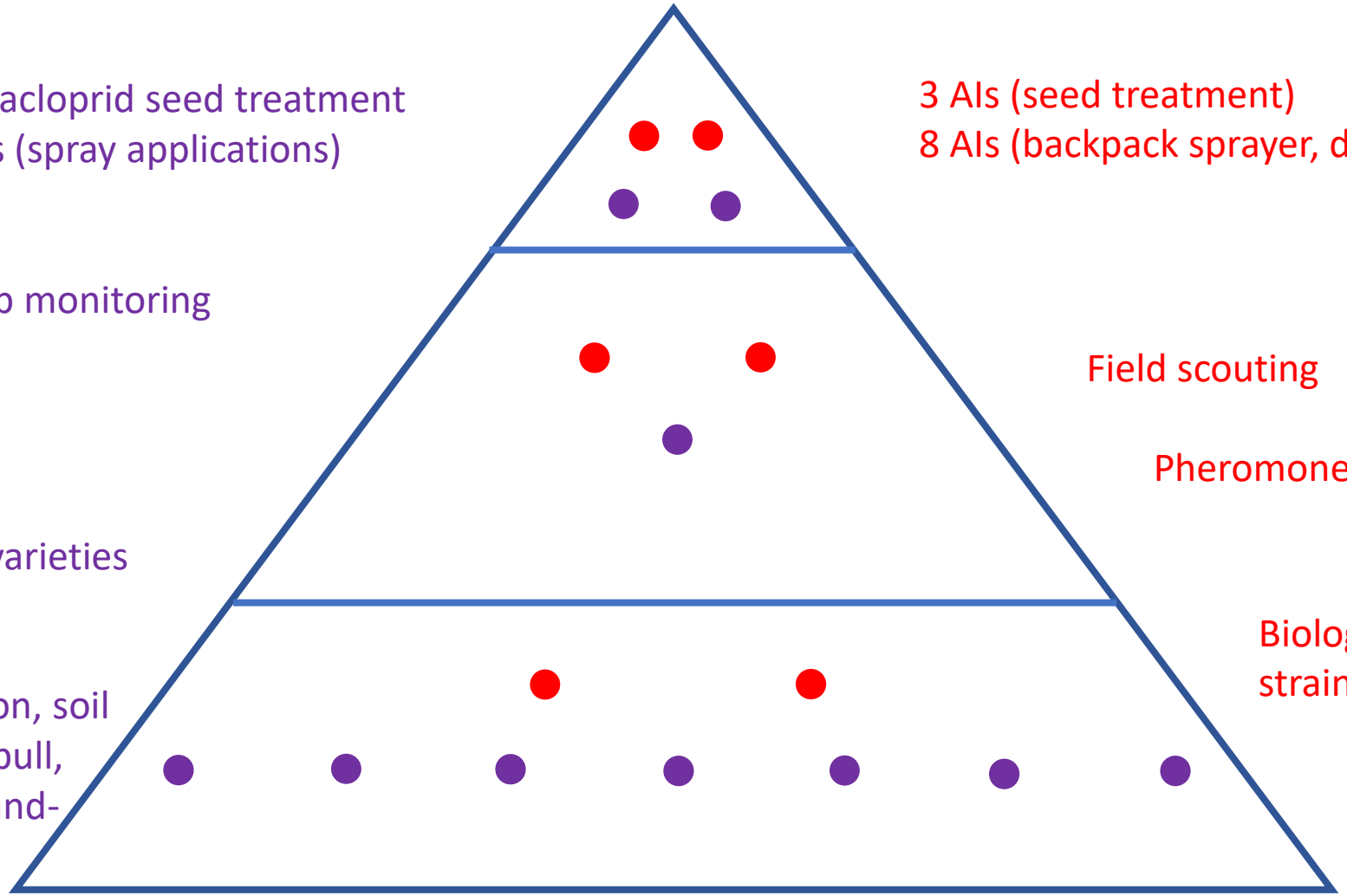
Pesticides as the **measure of last resort**

Biological control & agro-ecology as the **first line of defense**

4. Capacity for FAW management

Country A

Country B



Imidacloprid seed treatment
4 AIs (spray applications)

3 AIs (seed treatment)
8 AIs (backpack sprayer, drone)

Regular crop monitoring

Field scouting

Pheromone trapping

Quality seed / tolerant varieties
Botanical insecticides

Biological control: 2 Bt strains, earwig releases

Crop rotation, fertilization, soil moisture control, push-pull, destroy crop residue, hand-picking

Manual removal of egg masses

	Aquatic algae	Aquatic invertebrate	Fish chronic	Small mammal	Avian acute	Avian reproductive	Worm	Pollinator	Inhalation
5th percentile (g/ha)*	404·39	8·45	134·62	174·01	363·31	33·10	3·02	0·78	0·0042
1	Chloropicrin (A, T, and P)	Gamma-cyhalothrin (A)	Gamma-cyhalothrin (A)	Aldicarb (HHP)	Terbufos (HHP)	Fentin hydroxide (A and T)	Sulfoxaflor	Spinosad (P)	1,3-dichloropropene (A, T, P, and B)
2	Flufenacet (A)	Dimethoate (A, T, P, and B)	Esfenvalerate (A and P)	Bromadiolone (HHP)	Carbofuran (HHP)	Fenpropathrin (A, T, and P)	Tefluthrin (HHP)	Emamectin benzoate (A and P)	Cube extracts (B)
3	Azoxystrobin (A)	Bifenthrin (A)	Tefluthrin (HHP)	Terbufos (HHP)	Phorate (HHP)	Diquat dibromide (T and B)	Methyl isothiocyanate (A and B)	Imidacloprid (HHP)	Methyl isothiocyanate (A and B)
4	Oxyfluorofen (A and T)	Tefluthrin (HHP)	Tolfenpyrad (A)	Parathion (HHP)	Parathion (HHP)	Diquat ion (T)	Terbufos (HHP)	Clothianidin (HHP)	Terbufos (HHP)
5	Fentin hydroxide (A and T)	Methamidophos (HHP)	Lambda-cyhalothrin (A and P)	Oxamyl (HHP)	Aldicarb (HHP)	Dicofol (T and B)	Thiophanate-methyl (T)	Thiamethoxam (HHP)	Methyl bromide (HHP)
6	Pyraflufen-ethyl	Phorate (HHP)	Cyfluthrin (HHP)	Phorate (HHP)	Diazinon (A, T, P, and B)	Tetraconazole (T)	Methidathion (HHP)	Avermectin (A and P)	Chloropicrin (A, T, and B)
7	Prosulfuron (A)	Esfenvalerate (A and P)	Methidathion (HHP)	Disulfoton (HHP)	Bendiocarb (A, T, P, and B)	Parathion (HHP)	Carbendazim (HHP)	Zeta-cypermethrin (A and P)	Parathion (HHP)
8	Copper sulphate (A)	Lambda-cyhalothrin (A and P)	Terbufos (HHP)	Avermectin (A and P)	Oxamyl (HHP)	Avermectin (A and P)	Dazomet (A, T, and P)	Dinotefuran (A and P)	Chlorpyrifos (A, T, P, and B)
9	Hexazinone (A and T)	Beta-cypermethrin (A and P)	Bifenthrin (A)	Formetanate hydrochloride (A, T, and P)	Disulfoton (HHP)	Metaflumizone	Acetamiprid (A)	Cyfluthrin (HHP)	Diazinon (A, T, P, and B)
10	Thifensulfuron methyl	Fenpropathrin (A, T, and P)	Phorate (HHP)	Endosulfan (HHP)	Ethion (A, T, P, and B)	Diflubenzuron (A and T)	Endosulfan (HHP)	Fipronil (HHP)	Phorate (HHP)

2/4

5

1

1

1

1

1

1

Banned in European Union

10 most toxic active ingredients – different human / environmental toxicity models (Jepson et al., 2019)

4. Capacity for FAW management

- 'IPM recommendation' of Country X:
  - *"put tablets of chlorpyrifos, Basdine (?) and methyl parathion in whorl or mix chlorpyrifos / parathion powder with sawdust or coal powder & spread in field; apply more chemical pesticide if damage increases"*
  - Methyl parathion: extremely hazardous (Ia) & banned (globally); chlorpyrifos: moderately hazardous (II) organophosphate; linked to human vision and infant developmental disorders (Landrigan et al., 2019)

- **Insecticidal seed treatment** conflicts with multiple core IPM principles and **does not belong in the IPM toolbox**

- **So what? Who cares?** Who really benefits from these ill-guided government recommendations…

Drone-based applications

- **What to spray?**
  - A. High-risk insecticides
  - B. Biopesticides or natural enemies harmless to human / environmental health

- **When to spray?**
  - A. Following in-field monitoring
  - B. On Mondays
  - C. When neighboring farmers are absent from the field
  - D. When bored in the office & I feel like playing with toys

- **Where to spray?**
  - A. Targeted application on hotspots
  - B. Blanket applications

THE HINDU

India's Union Government has clarified that drone-spraying is illegal. "*No permission/ approval has been granted by the Central Insecticide Board for the use of drones to spray pesticides*" Dec. 30, 2019 communication from the Department of Agriculture, Cooperation and Farmers Welfare.

Biological control

- **Does IPM policy cover biological control?**
  - Yes (6/12 countries); 7/12 countries have operational rearing facilities
- **BC agents under consideration:**
  - Parasitoids: *Trichogramma*, *Telenomus* spp.
  - Predators: stinkbugs, earwigs
  - Micro-organisms: Bt strains, *Metarhizium*, *Beauveria* spp.
- South-South technology exchange & training needed

- **Key questions**
  - Pros/cons of augmentative vs. conservation BC?
  - What to rear?
  - Cost/feasibility of rearing operations?
  - Long-term sustainability?
  - Private sector linkages?

Challenges

- National coordination
  - Lack of manpower/budget/time, lack of professional surveillance system, need of training materials (e.g., digital displays)
- FAW monitoring
  - Lack of formal monitoring/early-warning system, ineffective lures, insufficient insights into FAW ecology, Covid-19 mobility restrictions, internet access limits FAMEWS operability
- FAW management
  - Insufficient resources to train farmers, local innovations await validation, farmers lag in adopting non-pesticidal approaches, insufficient insights into FAW ecology, R&D needs in biological control / biopesticides (e.g., mass-rearing), systems / area-wide approach missing

Concluding comments

- FAW-induced yield impacts moderate
- Urgent need for farmer education / awareness-raising
- Capacity-building e.g., in surveillance/early-warning, biological control
- Regional cooperation & South-South information exchange
- Critical flaws in countries' development of IPM programs
  - Pesticide-based management prevails
  - 15 different synthetic pesticides, incl. label expansion, new registration

- **Grab the bull by its horns!** -- Opportunities for policy change:
  1. Prioritize farmer agro-ecological training
  2. Fast-track registration of biologicals
  3. Formally insert biopesticides in IRM schemes
  4. Clear stance on drone-based pesticide applications
  5. Insecticidal seed treatment <> IPM