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Implementation of IPM Packages for Vegetable Crops in Developing Countries

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Feed the Future Innovation Lab for Integrated Pest Management

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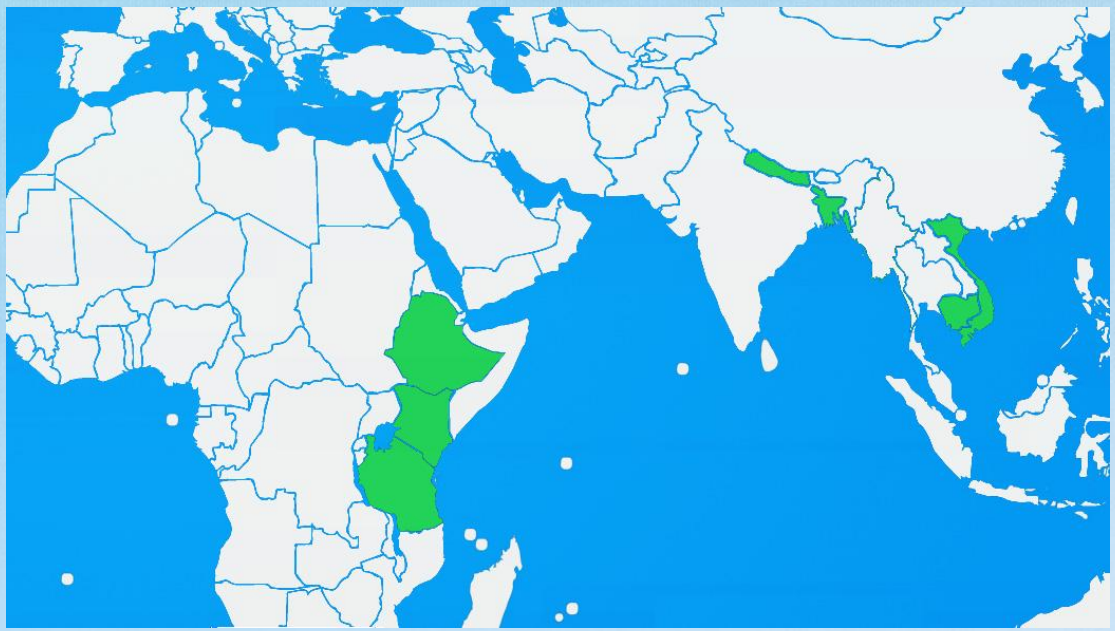
IPM Innovation Lab Host Countries

- Asia
  - Bangladesh
  - Nepal
  - Cambodia
  - Vietnam
- Africa
  - Ethiopia
  - Kenya
  - Tanzania



Major Aspects of IPM IL

- Development of IPM components and packages for selected crops.
- Monitor and develop management technologies for invasive species.
- Long-term training.
- Short-term training.

IPM Packages for Tomato

- Raising healthy seedlings
- Treating seeds or seedlings with *Trichoderma*, *Pseudomonas fluorescens,* and *Bacillus subtilis.*
- Solarizing seed beds and greenhouses.
- Using VAM, neem cake, and other organics.
- Selecting virus-resistant varieties.
- Grafting on resistant rootstock for bacterial wilt, Fusarium, and others.
- Staking and mulching.
- Yellow sticky trapping of whiteflies, leafminers, etc.
- Pheromone trapping of *Helicoverpa* and *Spodoptera.*
- Rogueing and host-free period for control of virus diseases.
- Using biopesticides such as neem.
- Using microbial pesticides, such as NPV, *Metarhizium*, and *Beauveria*.

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Coconut pith/dust use in vegetable seedling production

Trichoderma – a beneficial fungus

- **Its use became very popular in Asia.**
- **IPM Innovation Lab conducted four workshops.**
- **We are introducing this technology into the African countries.**

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Trichoderma Production in Bangladesh

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Eggplant and tomato grafting

Eggplant grafting in Bangladesh

- Eggplant yield ↑ 249% in Bangladesh.
- Income ↑ 305% in Bangladesh.
- Technology transferred to India, Nepal, Philippines, Uganda, Honduras, Senegal, and Kenya.

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Pheromones for monitoring insect pests

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Integrated Pest Management
IPM CRSP
Collaborative Research Support Program

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Area-wide management of melon fly using pheromone and other traps in Bangladesh

Cuelure trap
Mashed sweet melon trap

NPVs for *Spodoptera* & *Helicoverpa*

Production of Parasitoids and Predators

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Neem Products

Neem Tree

Neem Flowers

Neem Insecticide

Neem seed extract production

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Tuta absoluta

South American tomato leafminer.
Introduced to Spain in 2006.
Spread throughout Europe, most of West and East Africa and recently to India, Nepal and Bangladesh.

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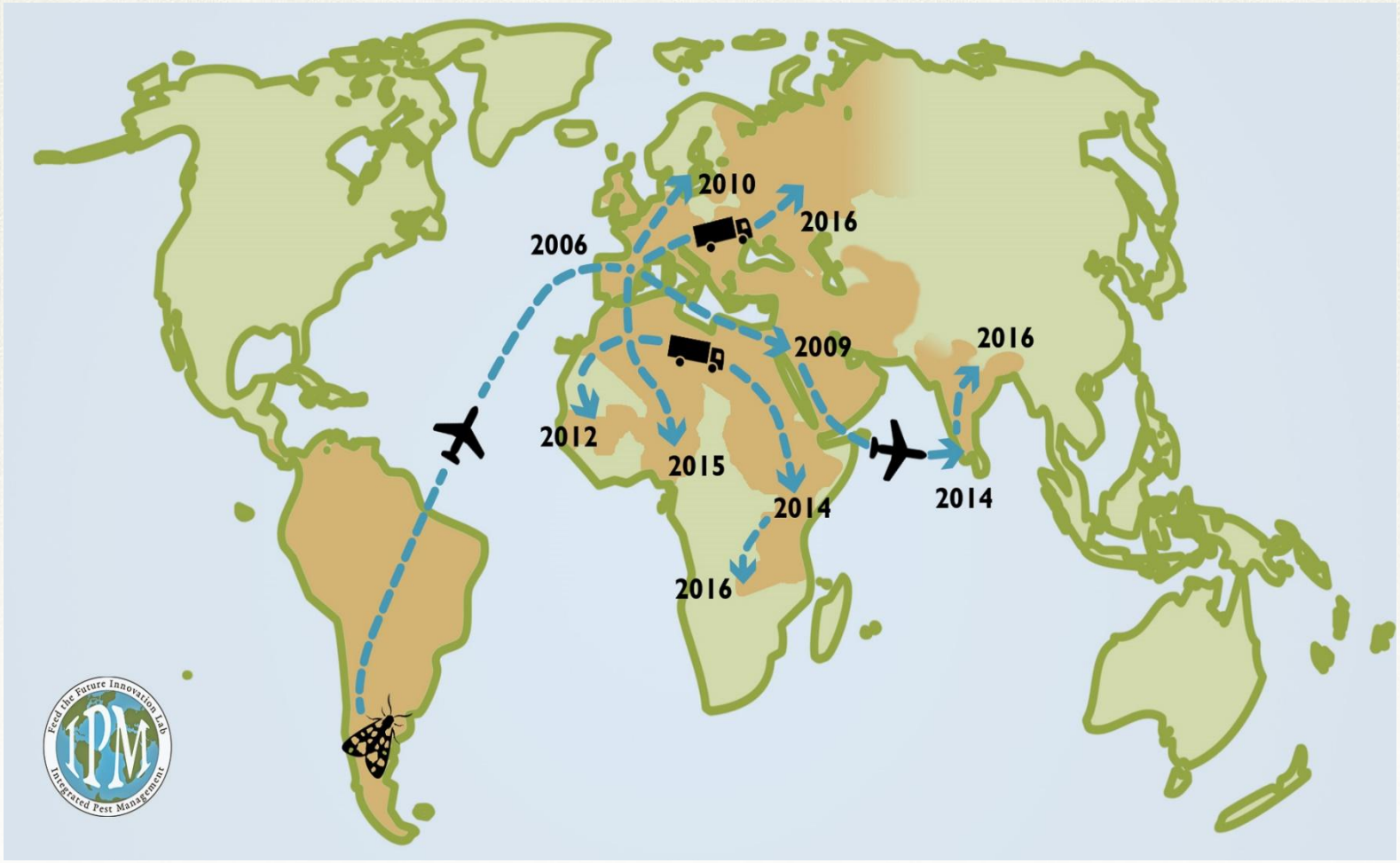
Tuta absoluta Migration



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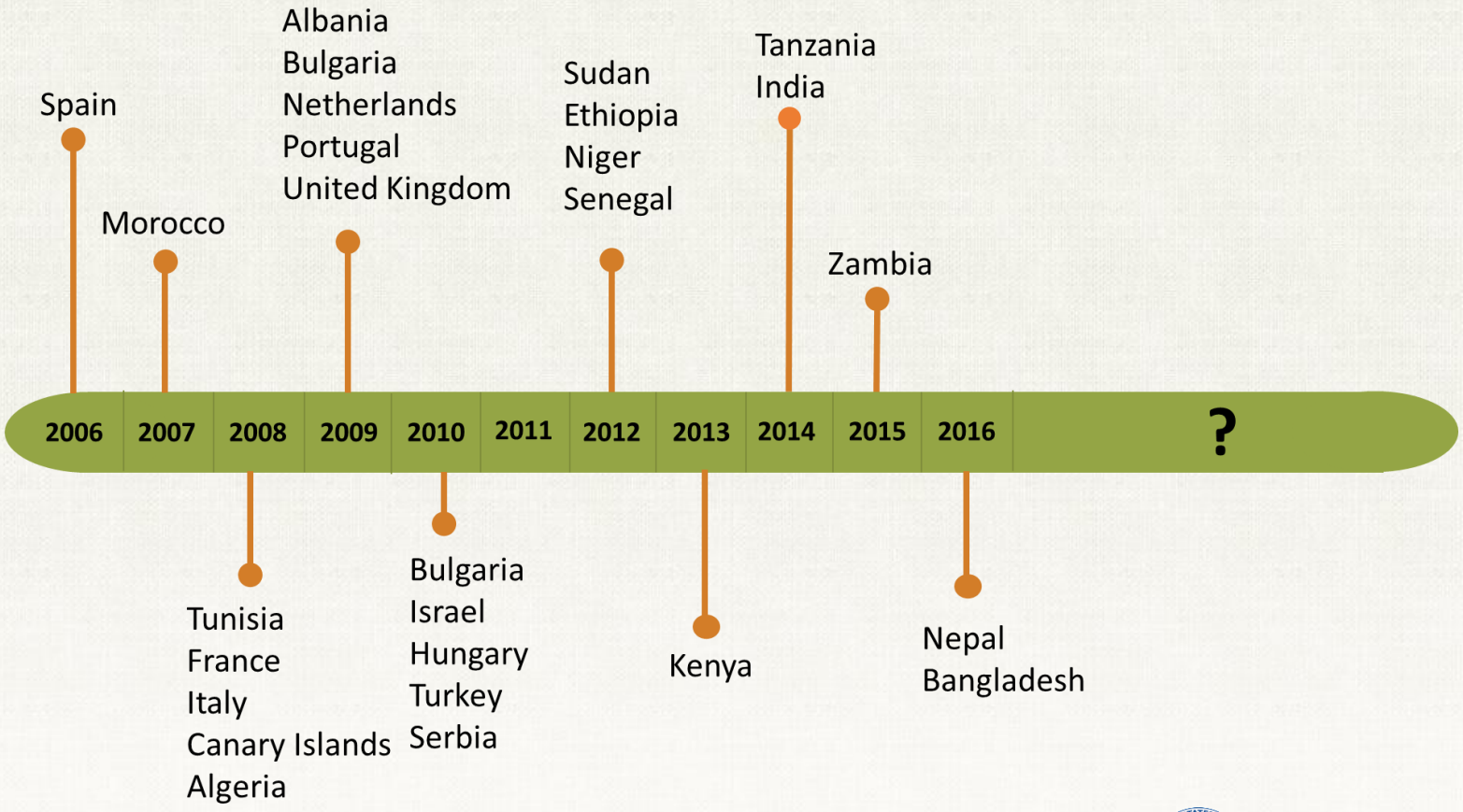
Tuta absoluta – Establishment



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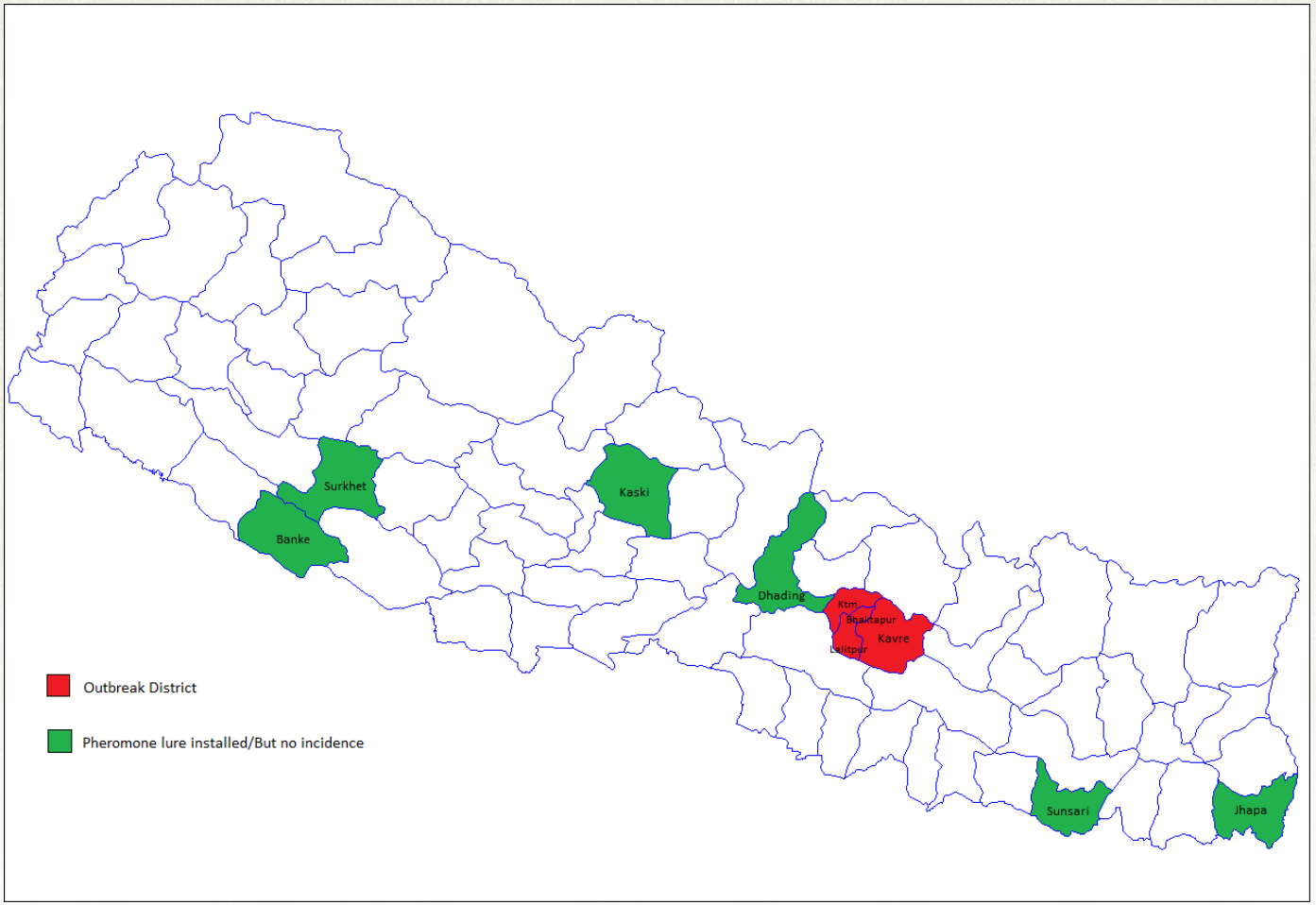
Tuta absoluta Establishment in Nepal (July 2016)



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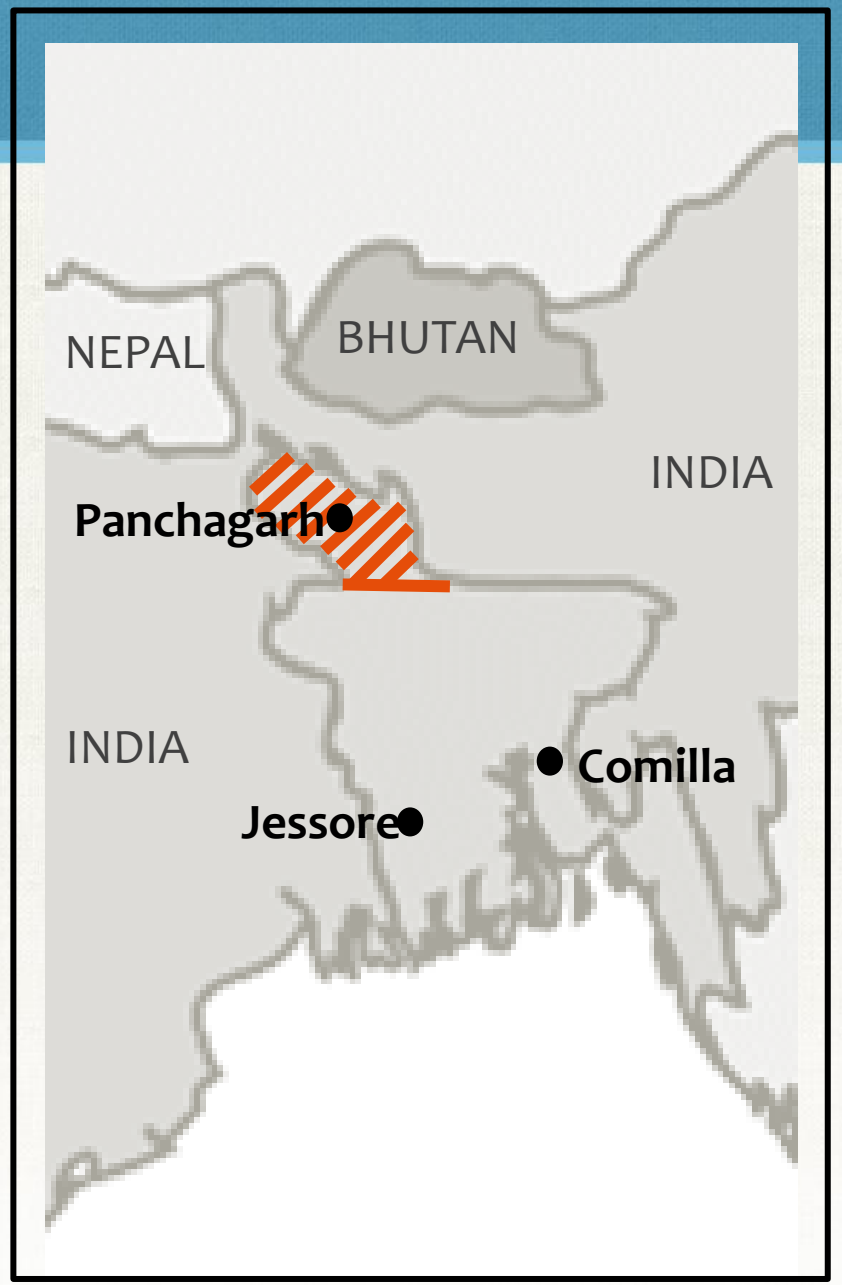
Establishment of *Tuta absoluta* in Bangladesh (May 2016)



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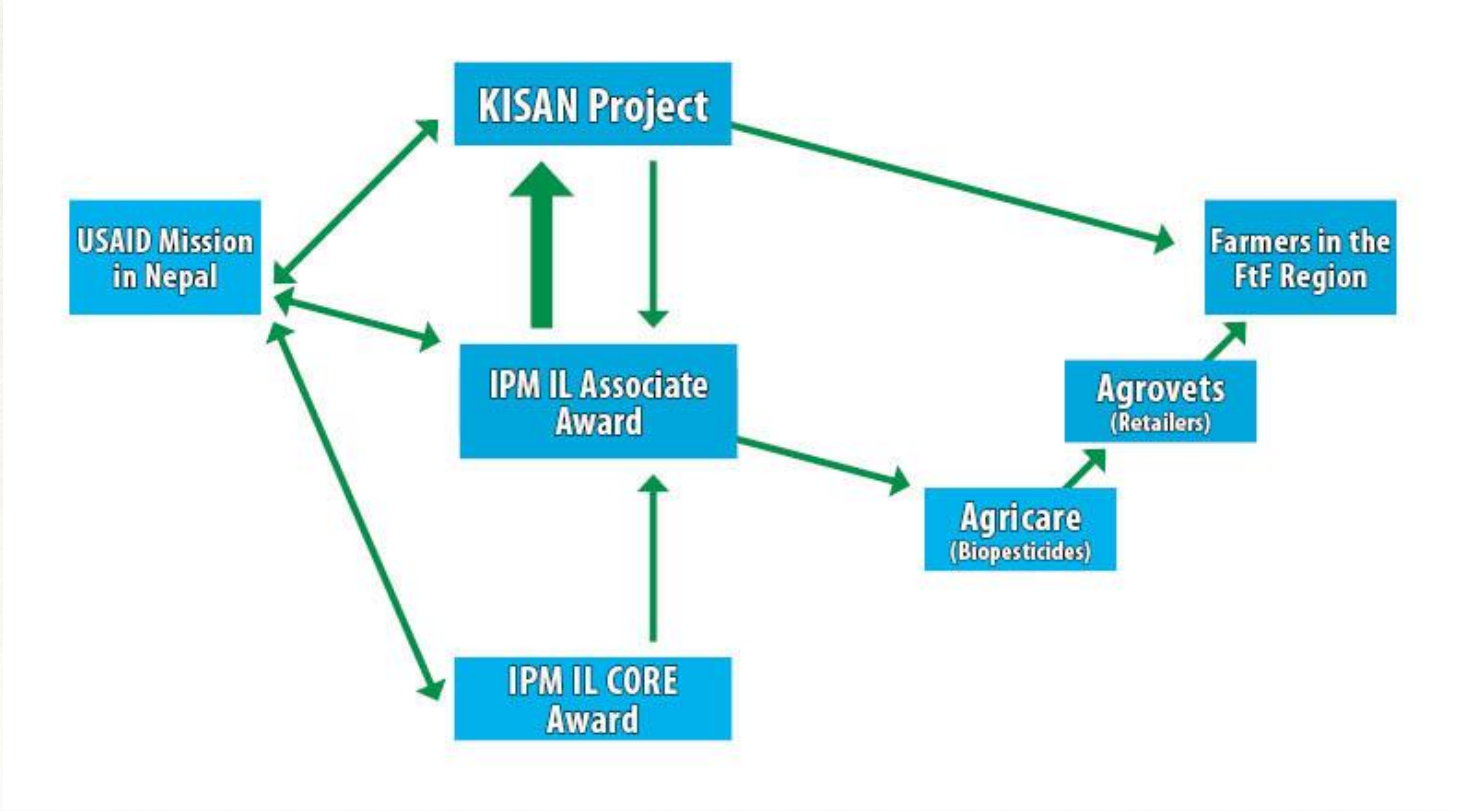
Tuta absoluta Workshop

IPM IL conducted *Tuta absoluta* workshops In Senegal (May 2013), Ethiopia (Nov. 2013), Kenya (July 2014), Nepal (Feb. 2015), Bangladesh June (2015) Tanzania (July 2015) and Cambodia (Sept. 2016).

Flow Chart – Technology Transfer



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Mission Involvement in IPM Innovation lab Activities

Meyer in Virus Diseases Workshop

Kneuppel at Agricare Meeting

Mission with IPM IL Partners

Meyer in a Tomato Farm

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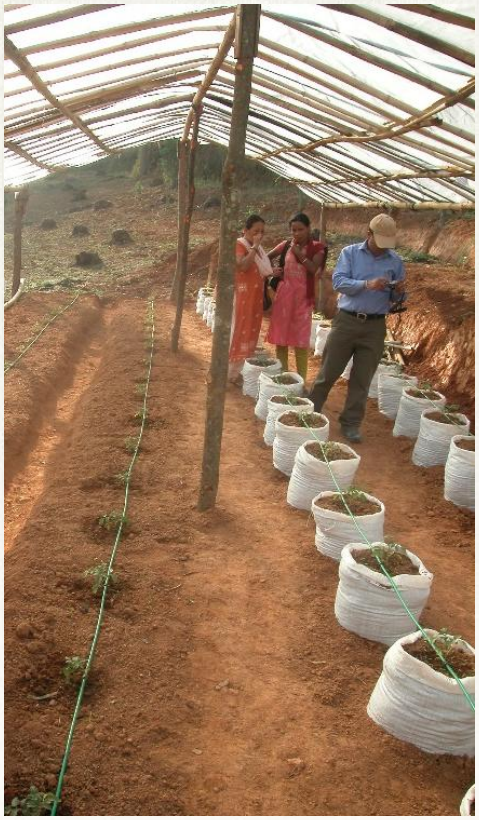
IPM IL and KISAN Demonstration Fields



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IPM IL and KISAN Activities

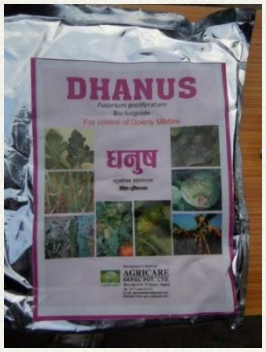





IPM IL Training Session for KISAN

Innovation Lab Council Visit to IPM IL and KISAN Field

Agricare Products and Facilities



Biopesticide and Biofertilizer Products

Agricare Facility

A Stall at the Exhibition

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Agrovets in FtF Region

Agrovet Selling Products

Agrovet Store

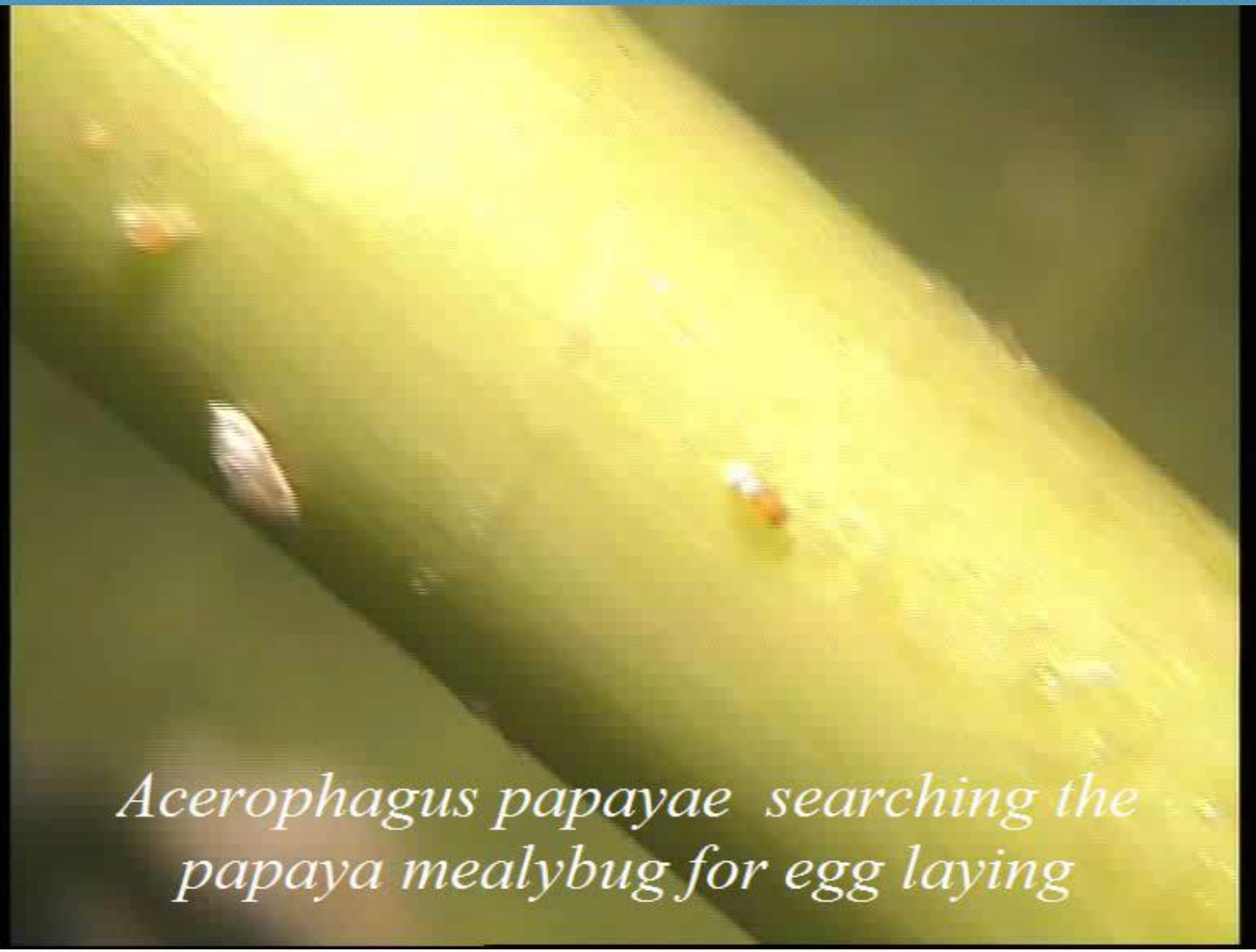
IPM IL Scientists Discussing with Agrovets

Agrovet Explaining to Visitors

Papaya Mealybug

- **Origin:** Mexico
- **Spread:**
  - **1990s** – Caribbean, Florida, and South America.
  - **2001-2005** – Micronesia and Hawaii.
  - **2008-2009** – India, Indonesia, Malaysia, Thailand, and Sri Lanka.
  - **2010-2011** – Reunion Island, Ghana, Benin, and Nigeria.
  - **2014** – Tanzania, Mauritius, and Mosambique.

A parasitoid introduced for control of papaya mealybug in India resulted in a benefit between $500 Million and $1.34 Billion.


Acerophagus papayae searching the
papaya mealybug for egg laying

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IPM IL Impact Assessment

Country and Authors	Crop	IPM Practice(s)	Net Benefits (millions)
Uganda, Moyo et al., 2007	Peanuts	Virus resistant variety	$33-36
Mali, Nouhoheflin, et al., 2011	Tomato	Cultural	$21-24
Uganda, Debass, 2000	Beans and maize	Cultural	$36-202
Bangladesh, Debass, 2000	Eggplant and cabbage	Cultural practices	$26-29
Bangladesh, Rakshit et al., 2011	Cucurbits	Pheromone traps	$3-6
Ecuador, Baez, 2004	Plantain	Cultural	$59-63
Ecuador, Quishpe, 2001	Potatoes	Resistant variety	$50
Albania, Daku, 2002	Olives	Cultural	$39-52
Honduras, Sparger, et al., 2011	Eggplant, onion, tomato, and pepper	Cultural practices	$17
India, Selvaraj, 2012 (preliminary analysis)	Mulberry, papaya, and cassava	Papaya mealybug parasitoid release	$500-$1,340

Thank You.