

Developing IPM Packages for Vegetable Crops in West Africa and South Asia

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HOT SPOTS

- Niger
- Haiti
- Darfur (W. Sudan)
- Afghanistan
- Korea (DPR)
- Colombia
- Dem. Rep. of Congo
- Mali
- Southern Africa
- Bolivia

Countries in West African IPM CRSP

Senegal, Mali, Ghana



West African team

Senegal, Mali, Ghana

US: Doug Pfeiffer, Don Mullins, Carlyle Brewster, Jim Westwood, Pat Hipkins, Bob Gilbertson, Sally Miller, George Mbata

Mali: Kadiatou Toure Gamby, Moussa Noussourou, Aminata Dolo, Sidiki Traore, Issa Sidibe

Senegal: Emile Coly, Dienaba Sall

Ghana: Michael Osei, Brandford Mochiah, Eric Cornelius

Initial planning







Field visits in Senegal, Mali



Obstacles

Extension resources

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Extension resources

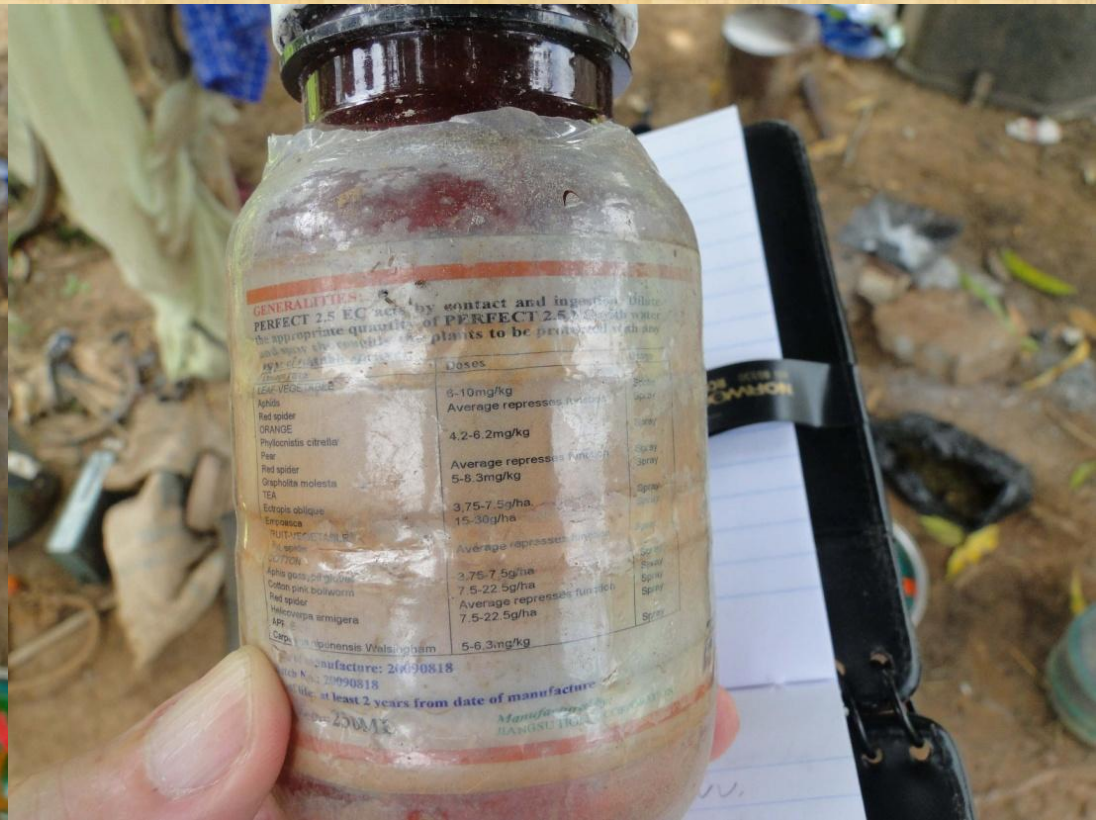
Pesticides readily available – insufficient knowledge



Obstacles

Extension resources

Pesticides readily available – insufficient knowledge



Obstacles

Extensive
Pest

edge

GENERALITIES:

PERFECT 2.5 EC acts by contact and ingestion. Dilute the appropriate quantity of PERFECT 2.5 EC with water and spray the rough parts of plants to be protected with any type of suitable sprayer.

Usage rate:	Doses	Usage
LEAF-VEGETABLE		
Aphids	6-10mg/kg	Spray
Red spider	Average represses function	Spray
ORANGE		
Phyllocnistis citrella	4.2-6.2mg/kg	Spray
Pear	Average represses function	Spray
Red spider	5-8.3mg/kg	Spray
Grapholita molesta		Spray
TEA		
Ectropis oblique	3.75-7.5g/ha	Spray
Empoasca	15-30g/ha	Spray
FRUIT-VEGETABLE		
Red spider	Average represses function	Spray
COTTON		
Aphis gossypii Glover	3.75-7.5g/ha	Spray
Cotton pink bollworm	7.5-22.5g/ha	Spray
Red spider	Average represses function	Spray

W.H.O. CLASS II MODERATELY TOXIC


Average represses function
 7.5-22.5g/ha
 5-6.3mg/kg

Manufacture: 20090818
 at least 2 years from date of manufacture
 BANGSU TRADING

In one field, containers for:

- lamba cyhalothrin/acetamiprid
- deltamethrin
- methomyl
- cartap
- abamectin
- Bt



West Africa IPM Packages

- **Objective 1:** Develop and implement an IPM package for tomato in Ghana, Mali and Senegal.
- **Objective 2:** Develop and implement potato IPM packages in Mali and Senegal
- **Objective 3:** Develop and implement IPM packages for cabbage in Mali, Senegal, with new addition of Ghana

What is an IPM Package

- Essentially the same as an IPM program
- A set of practices to present to farmer, that address pest management issues from site selection through harvest, that when followed, assure a crop produced in a sustainable fashion

West Africa IPM Packages

- Objective 1: Develop and implement an IPM package for **tomato** in Ghana, Mali and Senegal.
 - Ghana: Michael Osei, Brandford Mochiah, Eric Cornelius
 - Mali: Moussa Noussourou, Aminata Dolo, Seriba Katile, Issa Sidibe
 - Senegal: Samba Diao, Papa Demba Kane

Tomato pests in W Africa

Tomato fruitworm, *Helicoverpa armigera*

Tropical armyworm, *Spodoptera littoralis*

Sweetpotato whitefly, *Bemisia tabaci*

Begomoviruses (Geminiviridae)

Damping off

Alternaria

Ralstonia, Bacterial wilt

Rootknot nematode

Whiteflies/Geminiviruses

- Host-free period
- Tomato yellow leafcurl virus had devastated tomato industry
- Research had shown virus only hit tomato and pepper, and not transovarially transmitted in vector (*Bemisia tabaci*)
- 2-3 month host-free period cleansed virus from system
- Has allowed resurgence of tomato industry in Mali



- Tomato fruitworm, *Helicoverpa armigera*
- Tropical armyworm, *Spodoptera littoralis*



Tomato IPM Packages

- Frequency of pesticide use by Malian tomato growers

	Baguinéda	Kati	Niono	Samanko
Once/day	9	40	-	-
Once/2-3 d	-	10	-	-
Once/7 d	9	10	9	-
Once/10 d	-	20	82	-
Once/15 d	9	10	9	-
2-3 times/crop	-	-	-	80
No pesticides	64	10	-	20

Overall %
use

36

90

100

80

Tomato IPM Packages

Potential IPM program for bacterial wilt

Use pathogen-free transplants

Use resistant varieties or resistant rootstocks (grafting)

Field selection-avoid planting in fields infested with *R.*

solanacearum

Weed management

Sanitation

Crop rotation, including rice production





Seedlings from IPM nursery vs. Farmers' nursery



Tomato IPM Packages

- Key components to date:
 - Host-free period
 - Development of improved varieties (hybrids cv. Shasta (Campbell's) and cvs H9881 and Qwanto (Heinzseed) and the open pollinated varieties OPGP1 and OPGP5)
 - Clarification of viruses present
 - Identification of nematodes affecting tomato

IPM CRSP at OIRED



IPM CRSP

Integrated Pest Management
Collaborative Research Support Program



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Announcements

- IPM CRSP co-sponsoring the 12th International Plant Virus Epidemiology Symposium in Tanzania
- A new, IPM CRSP-authored book on insect pests in tropical Asia now available through CABI
- The CRSPs at the World Food Prize/2012 Borlaug Dialogue
- Biodiversity | IPM: A Proposed Conference in Indonesia, July 2013
- 13th International IPM Congress to be held in Honduras in October, IPM CRSP session planned
- Regional Planning Meeting for



Fighting pests, improving crops, bettering lives worldwide

The IPM CRSP raises the standard of living of people in developing countries by working with them to develop the best solutions to the agricultural challenges they face.

The multifaceted farming techniques of the IPM CRSP mean farmers and their families are

Pest alert:
Tuta absoluta

The confirmation of an insect in Senegal

Latest News

- IPM CRSP confirms presence of invasive insect in Senegal
- Former IPM CRSP graduate student

A new tomato problem to be addressed!

- *Tuta absoluta* (Gelechiidae)
 - Tomato pinworm (also used for *Keiferia lycopersicella*)
 - Tomato leafminer (also used for *Liriomyza* spp.)
 - South American tomato pinworm



A new tomato problem to be addressed!

- *Tuta absoluta* (Gelechiidae)
 - Introduced into Spain 2006
 - Spread to Netherlands, Iran
 - Egypt across North Africa



A new tomato problem to be addressed!

- *Tuta absoluta* (Gelechiidae)
 - Introduced into Spain 2006
 - Spread to Netherlands, Iran
 - Egypt across North Africa
 - **First report in West Africa!**



Tuta absoluta (Gelechiidae)

- Found at CDH/ISRA in Dakar by Dienaba Sall



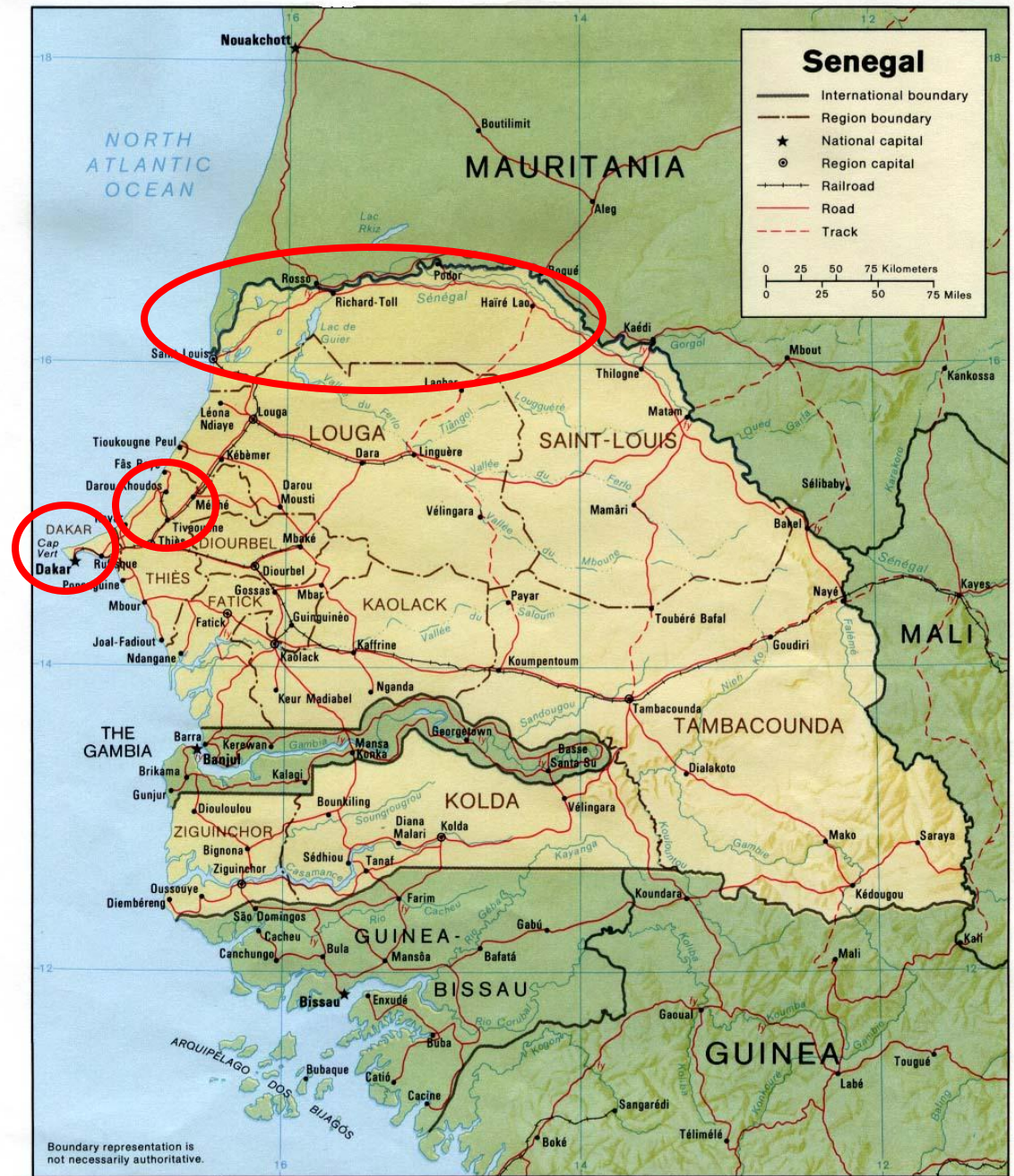
Tuta absoluta (Gelechiidae)

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- Found in Niayes region (Diogo)



Tuta absoluta (Gelechiidae)

- Found at CDH/ISRA in Dakar by Dienaba Sall
- Found in Niayes region (Diogo)
- Status in Saint Louis?



West Africa IPM Packages

- Objective 3: Develop and implement IPM packages for **cabbage** in Mali, Senegal, with new addition of Ghana
 - Ghana: Michael Osei and Brandford Mochiah
 - Mali: Kadiatou Gamby, Sidiki Traore, Issa Sidibe
 - Senegal: Dienaba Sall, Papa Demba Kane

Cabbage pests in W Africa

Diamondback moth, *Plutella xylostella*

Cabbage webworm, *Helulla undalis*

Cabbage head caterpillar, *Crocidolomia pavonana*

Cabbage looper, *Trichoplusia ni*

Tropical armyworm, *Spodoptera littoralis*

Tomato fruit worm, *Helicoverpa armigera*

Cabbage, mustard aphids, *Brevicoryne brassicae*,
Lipaphis erysimi

Rootknot nematode, *Meloidogyne incognita*

Black rot, *Xanthomonas campestris*

Bacterial soft rot, *Peronospora*

Alternaria

Rhizoctonia

- Diamondback moth, *Plutella xylostella*



- Diamondback moth, *Plutella xylostella*

Defoliation injury in head

International cabbage pest

Problems with insecticide resistance



- Cabbage webworm, *Helicoverpa undalis*

- Early boring in meristem causes multiple heads with insufficient size
- Later injury to leaves
- (A related species, *H. rogatalis*, in US)



- *Helicoverpa, Spodoptera*



Injury – foliar injury, tunneling through layers of head



- Cabbage, mustard aphids, *Brevicoryne brassicae*, *Lipaphis erysimi*



Irrigation in Dogon Country



- Black rot



Preliminary results

- Inherently harder to evaluate entire package
- But can also do component research (though may miss synergistic interactions)
- Several control tactics are being evaluated against lepidopteran pests of cabbage:

- 1) *Bacillus thuringiensis*

- 2) deltamethrin

- 3) row covers

- 4) neem

- 5) interplanting tomato with cabbage

- 6) an untreated control.

Three different planting dates are also being evaluated.

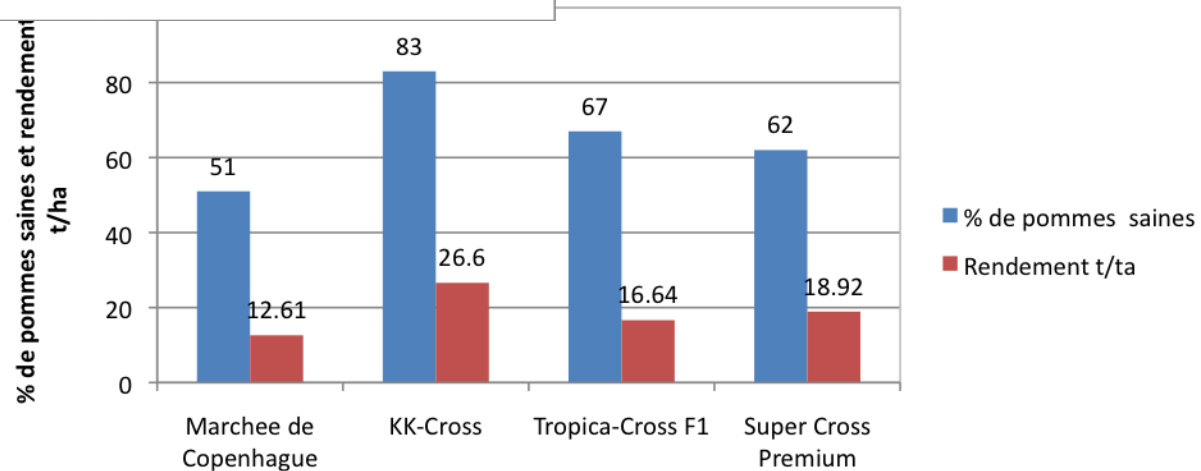
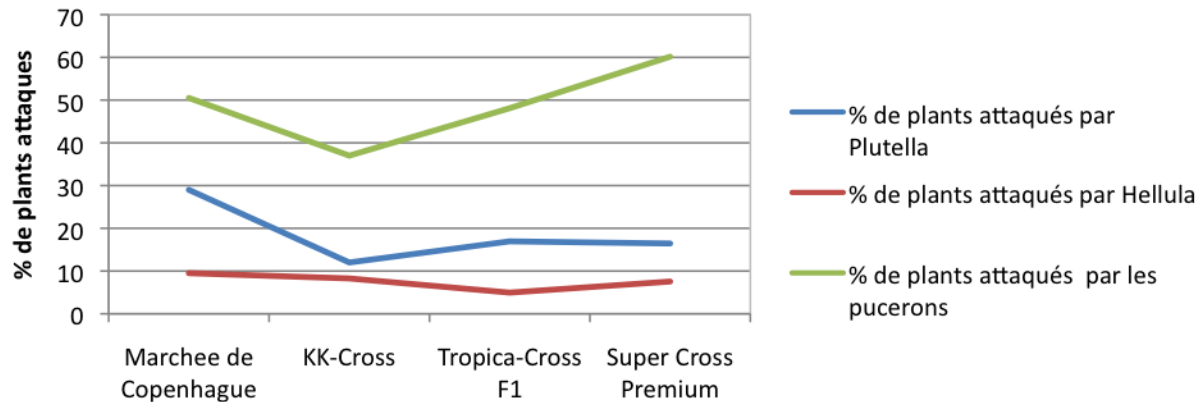
Neem

- *Azadirachta indica* oil



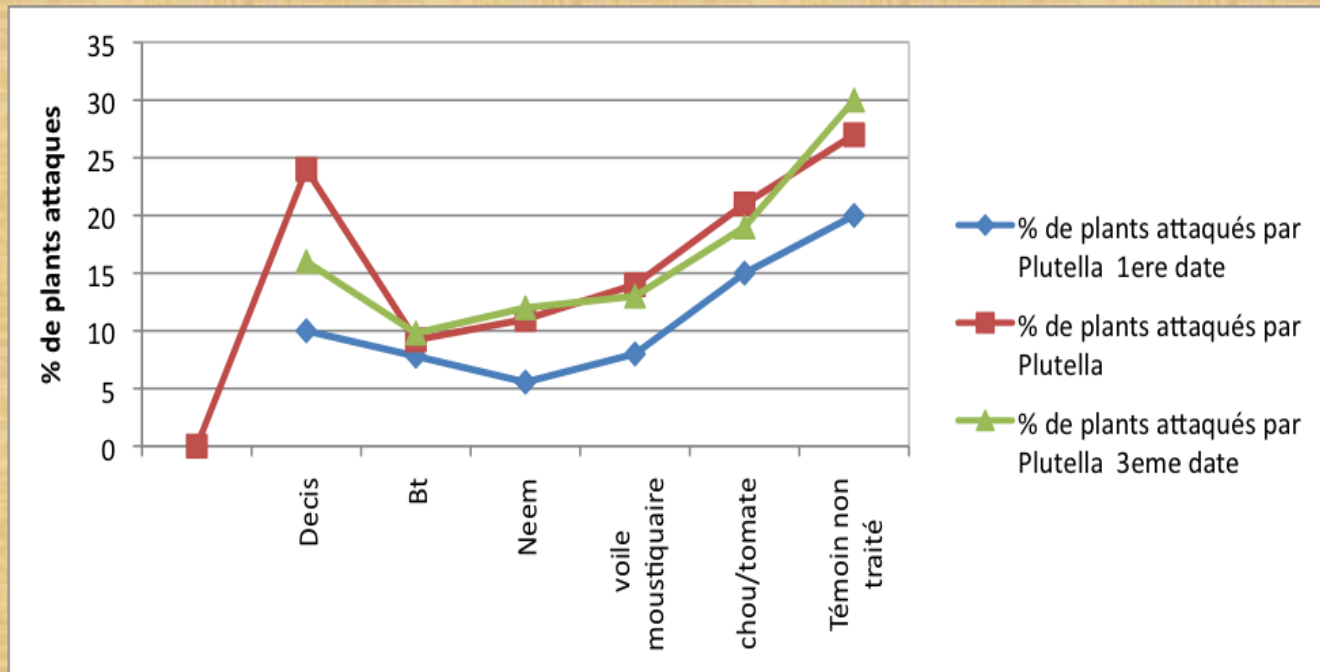
Cabbage IPM Packages

•Quality of cabbage and yields according to variety - Baguinéda 2010-2011



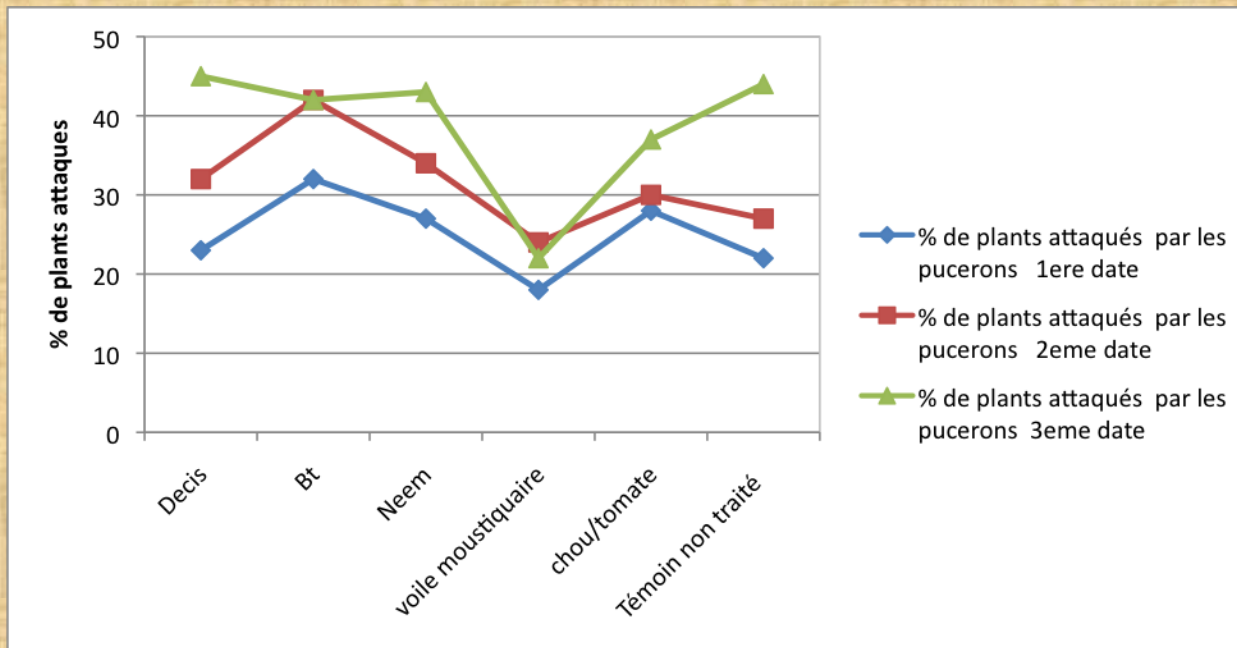
Cabbage IPM Packages

- Effect of Decis, Bt, neem, netting, tomato interplanting on *Plutella* infestation - Baguinéda



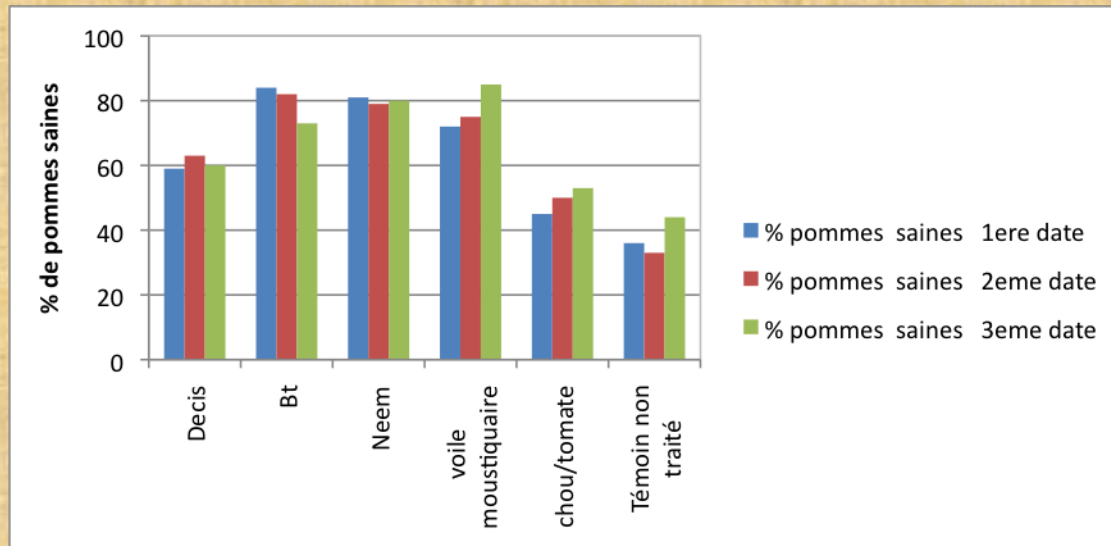
Cabbage IPM Packages

- Effect of Decis, Bt, neem, netting, tomato interplanting on aphid infestation - Baguinéda



Cabbage IPM Packages

- Effect of Decis, Bt, neem, netting, tomato interplanting on percent healthy cabbage heads - Baguinéda



Preliminary work on Biol Control of DBM

At least 5 spp of DBM parasitoids in Senegal:

Ichneumonoidea

Braconidae:

Cotesia plutellae

Apanteles litae

Chalcidoidea

Chalcididae:

Brachymeria citrea

Hockeria sp.

Eulophidae:

Tetrastichus (= *Oomyzus*) *sokolowskii*

Our tasks in West Africa:

- Immediate prospects
 - Training in composting technology
 - **Changes in spray and harvest practices**
 - Farmer education in pest biology
 - Pest monitoring methods
- Researchable topics
 - Pest and parasitoid species composition
 - Efficacy of biopesticides
 - Efficacy of cultural methods, e.g. interplanting
 - Resistant cvv that are suited for tropics

In one field, containers for:

- lamba cyhalothrin/acetamiprid
- deltamethrin
- methomyl
- cartap
- abamectin
- Bt



Need improved sanitation for Cabbage

Debris usually left in field after harvest



Proposed IPM Package for Cabbage

Site selection

Site preparation

Seed bed

Transplanting

Production

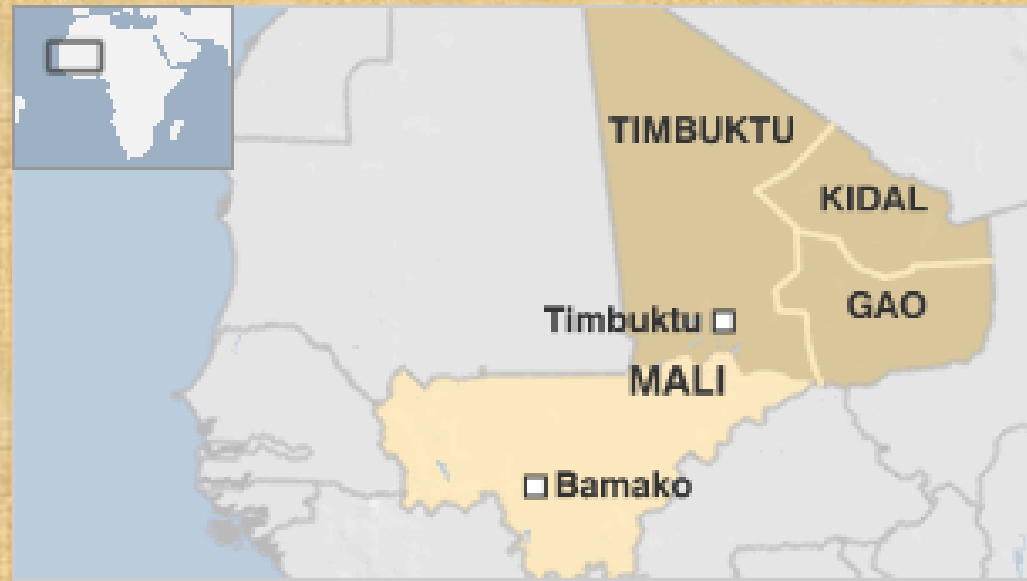
Post harvest

Host Country Political Situation

- Elections in Senegal
- Coup in Mali

Coup in Mali

- Insurgents in north
- Army insufficiently armed
- Coup in March 2012
- Insurgents swept down, control half the county
- Economic embargo







Questions?



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