

**Good Morning**  
**Nzuri Asubuhi**  
**Bonjour**

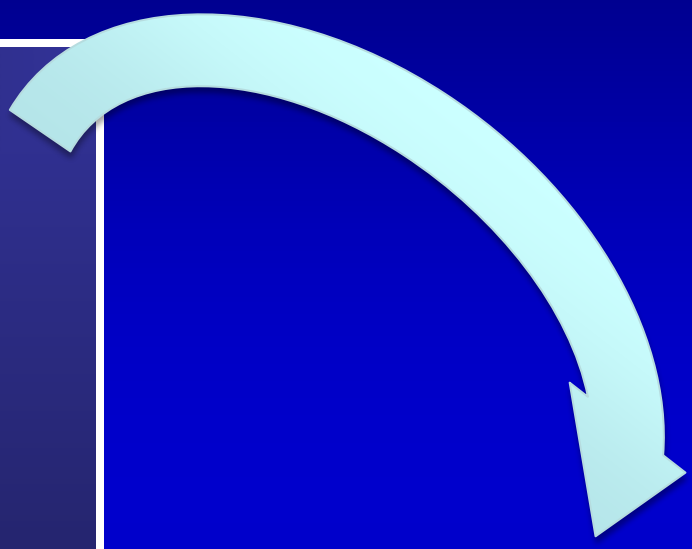
# *Agricultural Nets and Floating Row Covers: New Tools for Vegetable Production in Africa*



*Vance Baird (MSU)  
Thibaud Martin (CIRAD)  
Mathieu Ngouajio (MSU)*

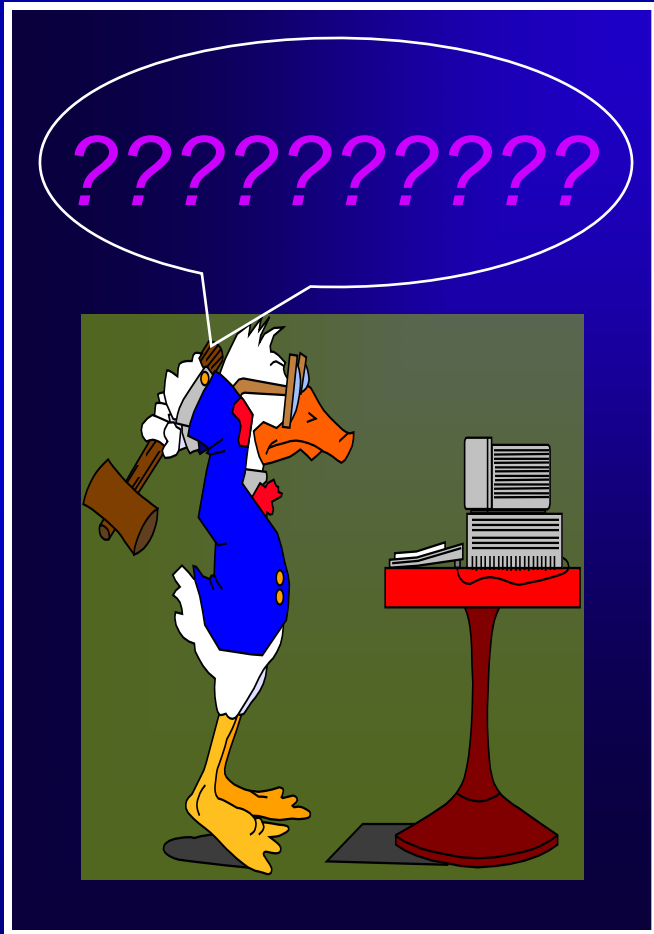
# ***Project background***

- *About 33% of the population in sub-Saharan Africa is undernourished (FAO 2006)*
- *Fruit and Vegetable consumption is 20 to 80% below the recommended intake levels*



***Malnutrition continues to promote chronic diseases among the populations***

# *Challenges*



- *Pest, weed and disease management*
- *Lack of adequate training*
- *Lack of capital*
- *Environment, etc.*

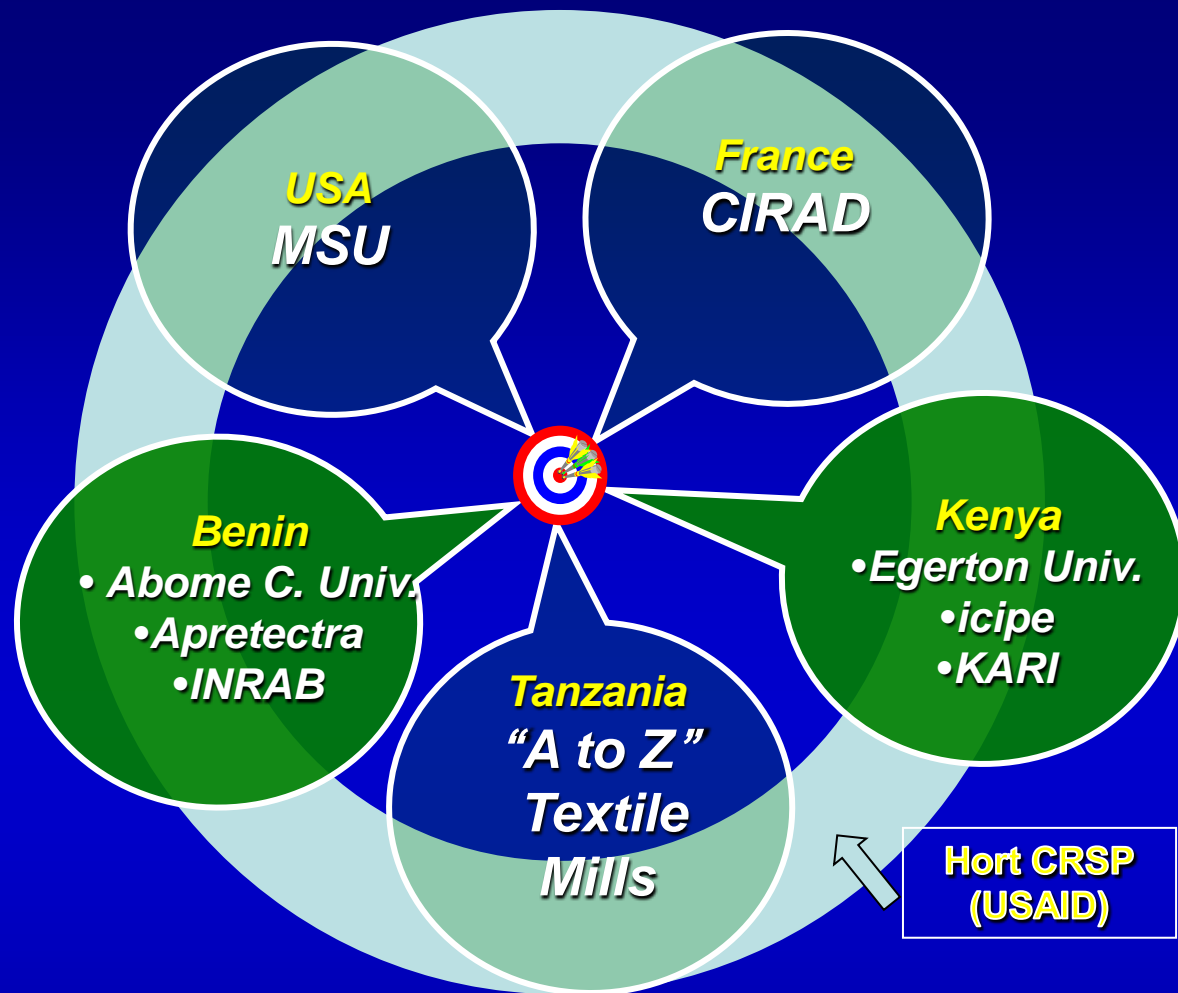
*Common situation*



*Preferred Situation*



*Partnership  
to develop  
solutions  
adapted to  
low income,  
small-scale  
vegetable  
growers*



## **Partnership among**

- 5 countries
- 10 institutions/organizations
- More than 15 researchers

# ***Program Personnel Update***

Prof. Dr. **Mathieu Ngouajio** has taken a one-year leave of absence from the Horticulture Department at Michigan State University to serve as the United States Department of Agriculture's National Program Leader for Cropping Systems

USDA - National Institute of Food and Agriculture (NIFA)  
Institute of Food Production and Sustainability  
Stop 2240  
1400 Independence Avenue, SW  
Washington, DC 20250-2240

# *Team composition*

## •USA

- *Dr. Mathieu Ngouajio (PD) – MSU- Vegetable production specialist*
- *Dr. Karim M. Maredia- MSU- IPM specialist (project advisory board member)*
- *Dr. Vance Baird (New PD)- MSU*

## •France

- *Dr. Thibaud Martin (Co-PD)- CIRAD- Entomologist*
- *Dr. Laurent Parrot- CIRAD- Economist*
- *Dr. Hubert De Bon-CIRAD- Agronomist (project advisory board member)*

## •Kenya

- *Dr. Lusike Wasilwa –KARI-Molecular plant Pathologist*
- *Dr. Subramanian Sevgan – icipe – IPM specialist and Entomologist*
- *Dr. Mwanarusi Saidi – Egerton University – Horticulture specialist*
- *Dr. Muo Kasina – KARI – IPM specialist and Entomologist*
- *Ms. Fatuma Omari – KARI*

## •Benin

- *Dr. Françoise Komlan- INRAB- Agronomist*
- *Dr. Anselme Adegbedi- Abomey Calavi University- Economist*
- *Mr. Damien Ahounagassi- APRETECTRA- Extension specialist*
- *Mr. Serge Simon-CIRAD- Agronomist*

## •Tanzania

- *Dr. Pierre Guillet- A to Z Textile Mills- Entomologist*



# ***General Objective***

***Harness alternative pest management techniques, micro-climate modifications and educational opportunities to improve vegetable production in Africa***

# ***Specific Objectives***

## ***Objective # 1:***

### ***Technology Development / Implementation***

***Adapt and optimize AgroNets, and other row cover technologies, for year-round production of vegetables under diverse local conditions***

# ***Specific Objectives***

## ***Objective # 2:***

### ***Cost and Social Impact***

***Determine the costs, benefits, and socio-economic viability of AgroNets and row cover technologies***

# ***Specific Objectives***

## ***Objective # 3:***

### ***Capacity Building & Extension***

***Increase local human capacity, female empowerment, adoption and use of locally-adapted “AgroNets” and other row covers in target communities***



# Target Countries

EAST AFRICA

Kenya

WEST AFRICA

Benin

Differences

- Climatic
- Socio-economic
- Etc.



# ***New applications for an Existing technology***



# *Simple, but broadly impactful, Technology*



**Eco-Friendly Nets**

Insect  
population  
dynamics  
**Pest exclusion**  
**New pests**

Micro-climate  
modification  
**Light**  
**Temperature**  
**Relative Humidity**  
**Soil Moisture**

Crop biology  
& physiology  
**Growth**  
**Architecture**  
**Reproduction**

**Yield, Quality, and Economics**

# *Research and Extension activities*

## **Benin: Cabbage**

**Year 1**  
**On-Farm**  
**Innovative farmers**  
**(40 sites)**

**Year 2**  
**On-Farm**  
**Innovative farmers**  
**(40 sites)**

**Year 3**  
**On-Farm**  
**Full scale extension**  
**(>100 sites)**

## **Benin: Tomato** **Kenya: Cabbage + tomato**

**Year 1 & 2**  
**On-Station Research &**  
**Training**  
**(3 sites)**

**Year 2**  
**On-Farm**  
**Innovative farmers**  
**(15 sites)**

**Year 3**  
**On-Farm**  
**Full scale extension**  
**(>50 sites)**



# ***Activities: Benin***

## ***Accomplishments***

- q ***Demonstration trials in 21 farms***
- q ***40 farms selected for next set of trials***
- q ***21 farmers trained (13 female and 8 males)***
- q ***A large survey of 300 farmers conducted***

NGO (APRETECTRA) Team



Farmer training and surveys

# *Activities: Benin*

## *Accomplishments*

- q Second season of research station trials underway*
- q Serge Simon has been assigned full time to the project (Cirad match)*

Serge Simon (Cirad)



# *Research activities in Benin*

INRAB Tomato nursery trial



INRAB Tomato production trial



# ***Extension activities in Benin***

**Example of farmers: Seme Region**



# Activities: Kenya

## Accomplishments

- q Two seasons completed on nursery studies
- q Second field season underway

Research station sites: ★

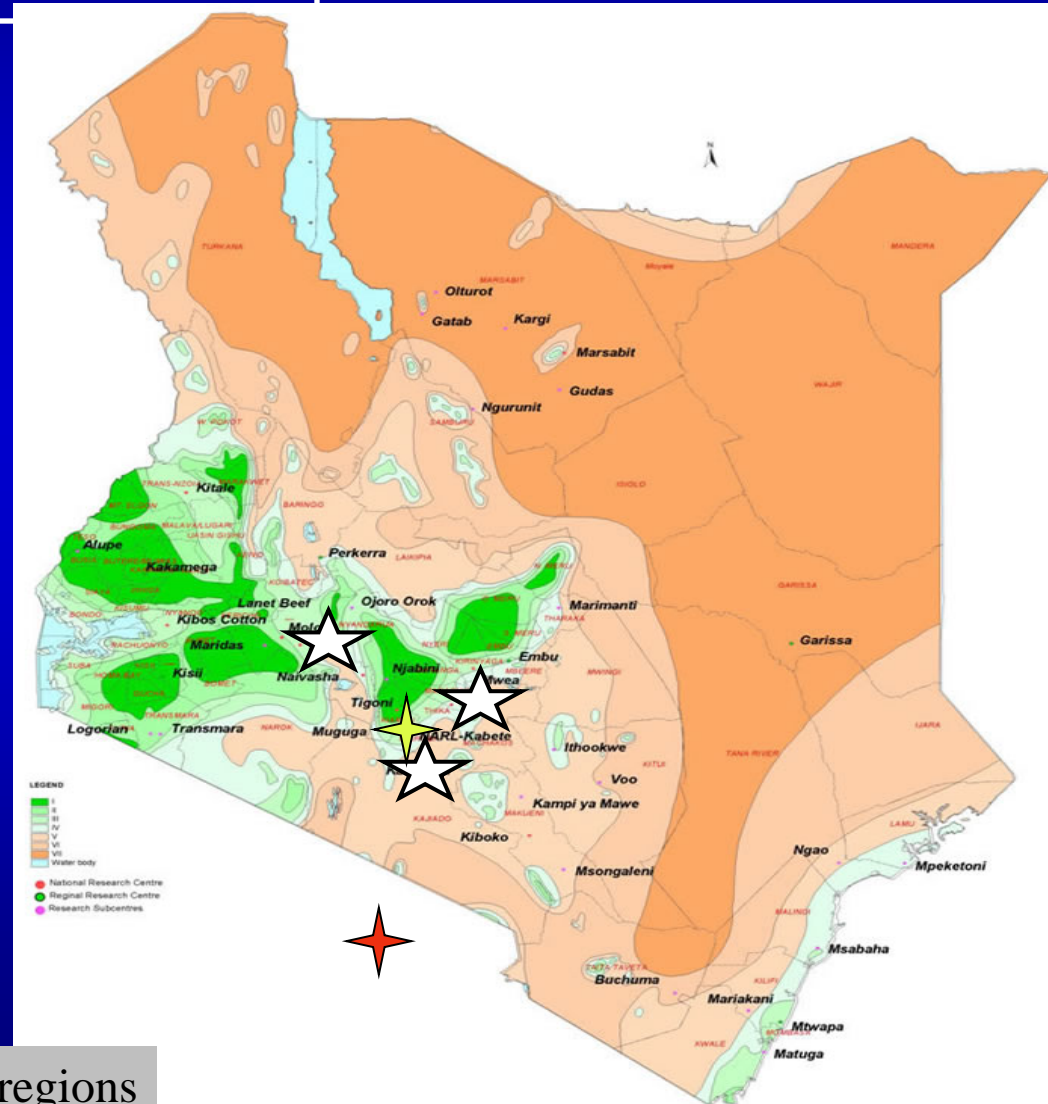
- Njoro: High Land
- Nairobi: High-Mid Land
- Thika: Low Land

Laboratory site: ★

- Nairobi (*icipe*)

Net Production site: ★

- Arusha, Tanzania



# ***Activities: Kenya***



**Egerton University site**



**Field day at Egerton University**

# *Activities: Kenya*



Interaction with key partners during field days at KARI Nairobi





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## Crops spend the night under mosquito nets



Photo: WILLIAM OERINATION Graduate student Judd used to trap and kill common pests that destroy crops.

The East African Fresh Produce Journal, Horticultural, Agricultural News and the Latest in the field of Horticulture.

**Hortinews**

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### Mosquito nets for vegetables

5/Feb/2012 1:29:20 am

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**Hortinews**

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## Tanzania-based Consortium to start manufacturing Agronets

Companies to rely on long experience and big capacity to produce effective and low priced nettings for crop protection.

5/Feb/2012 1:29:58 am

Google | Email | Tweet | Share 3



By Gatu Mbaria  
 A Tanzanian Company, A to Z Textile Mills, member of a consortium of companies producing OlysetR nets in joint venture with Sumitomo Chemicals Japan recently started to manufacture Agronets. Farmers can use to

# THE STANDARD

Kenya's Bold Newspaper



Sunday, 5th February 2012

Headlines Chapter Six of the Constitution has left a trail of ...

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## Kari plans to secure greens from pests

Published on 02/10/2011

The agricultural research firm is due to unveil safety nets to help farmers cost effectively manage pests and insects in horticultural farms, writes FREDRICK OBURA

Small-scale farmers in fruits and vegetables production could soon be laughing all the way to the bank, thanks to a [new technology](#) using nets to keep insects and pests away



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- from crops.
- The Kenya Agriculture winding up its resear farmers cost effect horticultural farms.
- "We are concluding suitability of agron Assistant Director Dr "By next year June the nets from local Research Institute "It is a cheap, and that would help



# ***Direct applications of the technology***

***nNursery protection  
during transplant  
production***

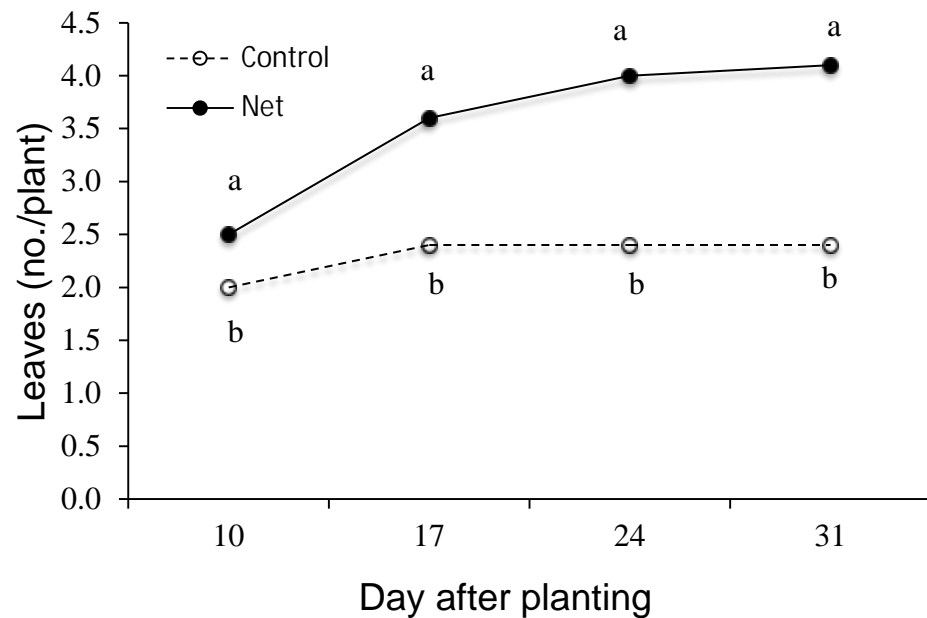
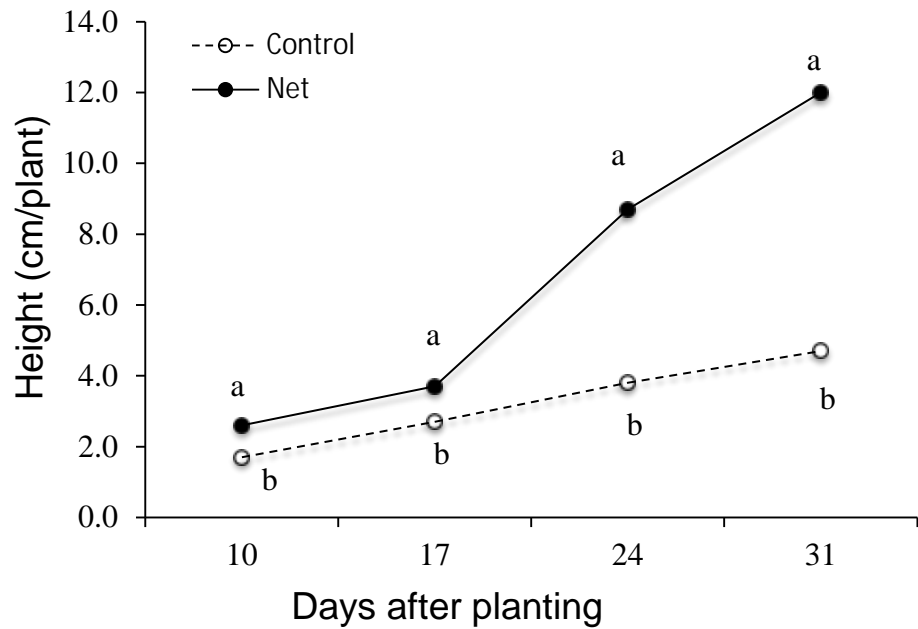
***E.g. Cabbage transplant trial  
at KARI March 2011***



**No net**



**Net protection**



- ***High percentage of seed germination with the nets (95% vs. 45%)***
- ***Improved seedling growth and development***

# ***Direct applications of the technology***

***n Open field vegetable production***

***E.g. Cabbage field trials in Benin***

Benin field trials

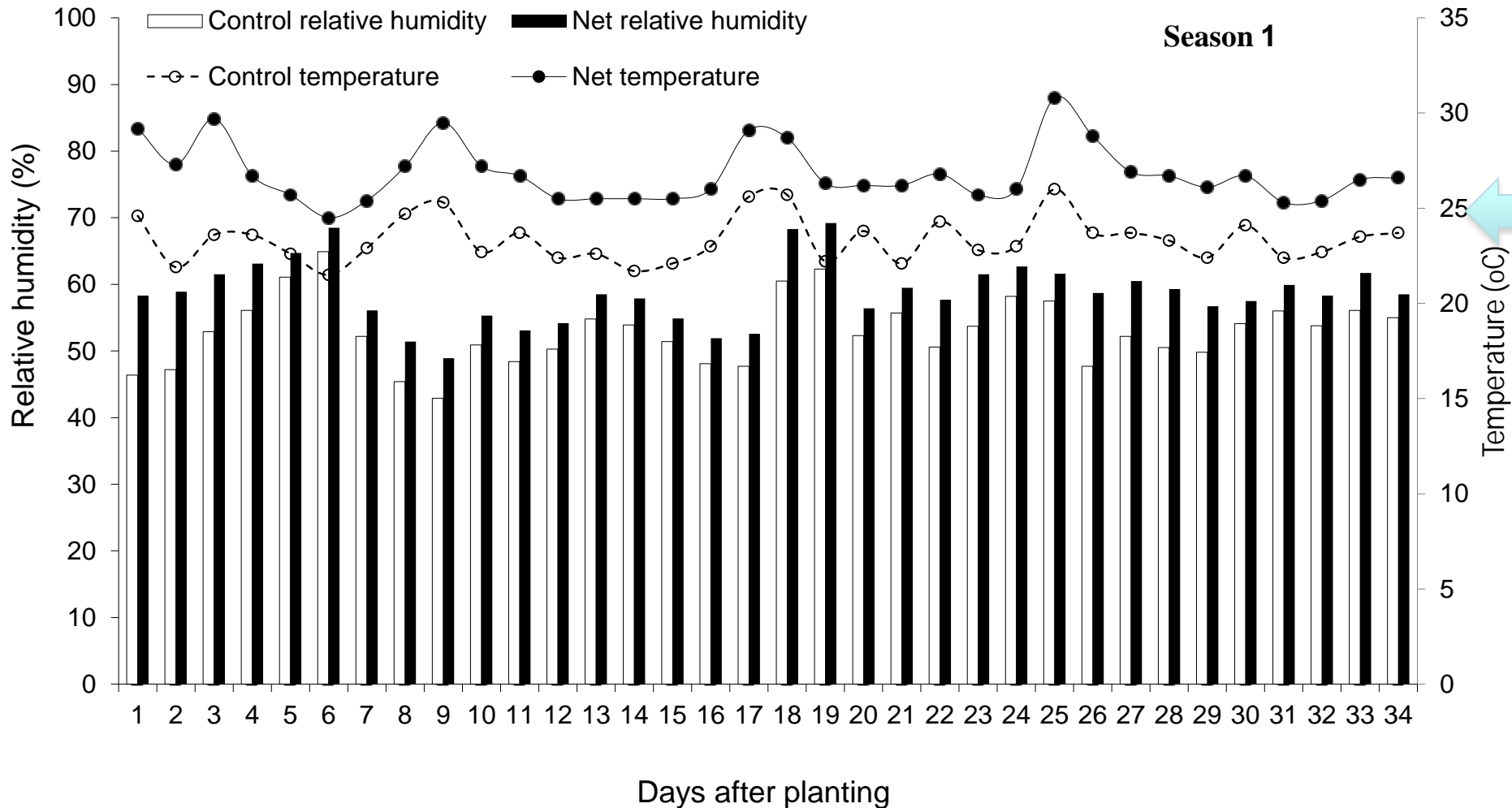


No net

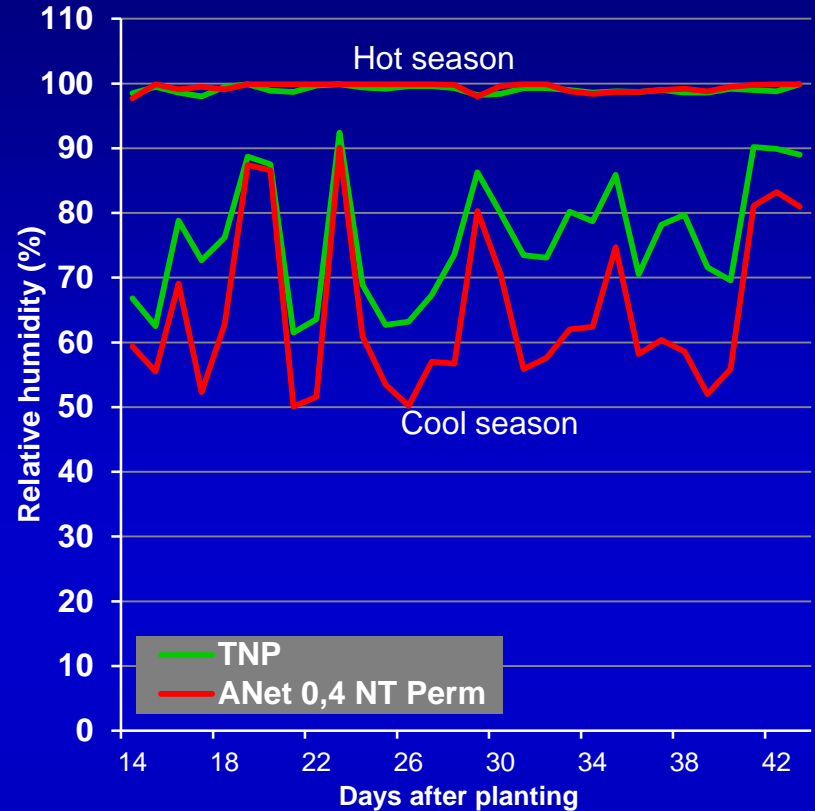
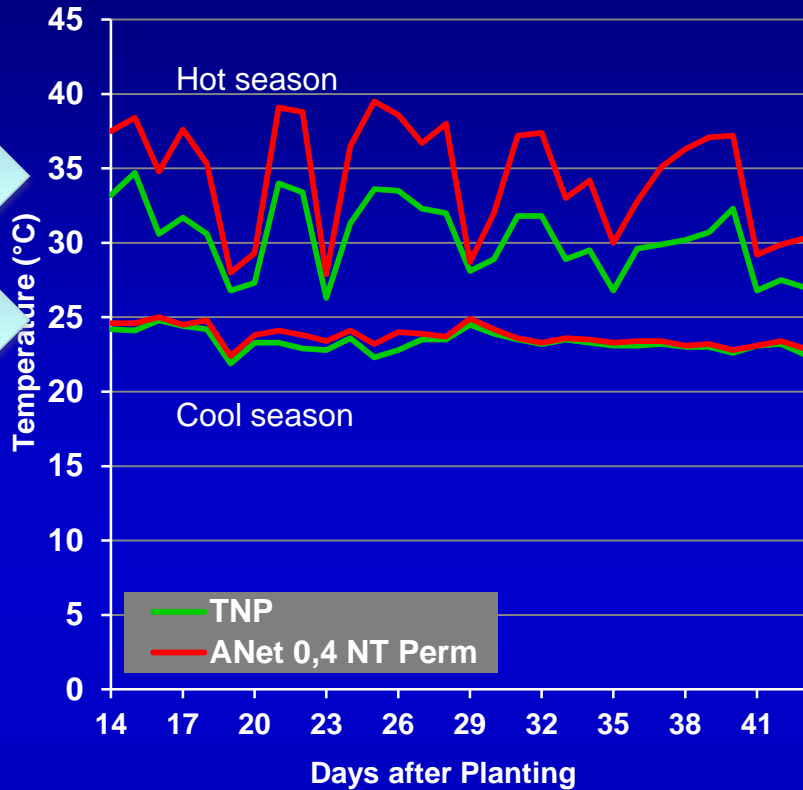
Net protection

# Microclimate data Kenya 2011

Uniform response in two growing seasons (season 1 shown here)



# Microclimate data Benin 2011



## Big contrast between the two seasons

q Relative humidity near 100% during the hot season

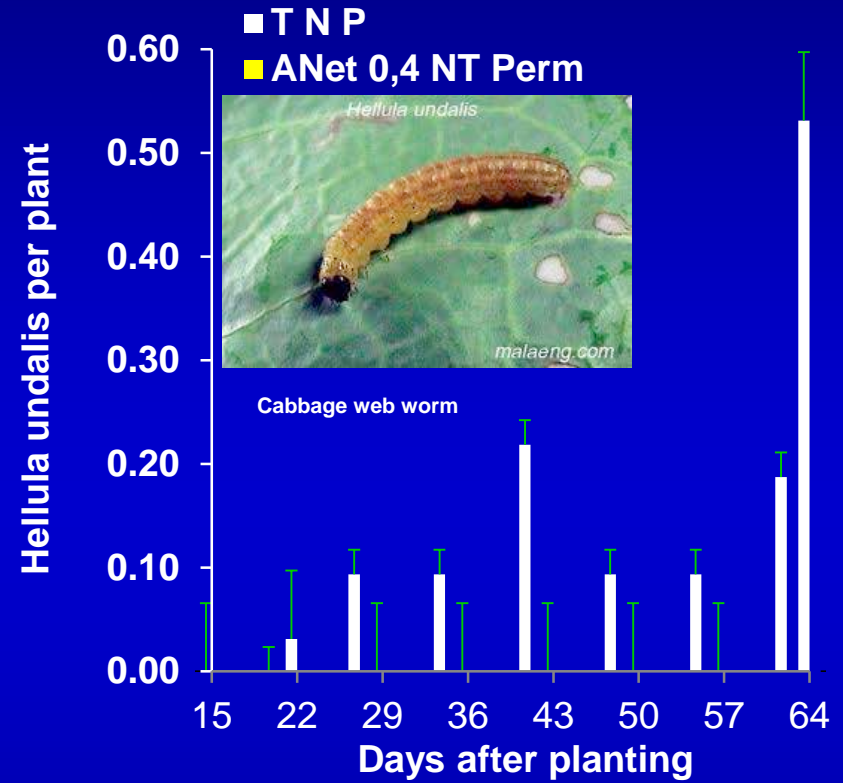
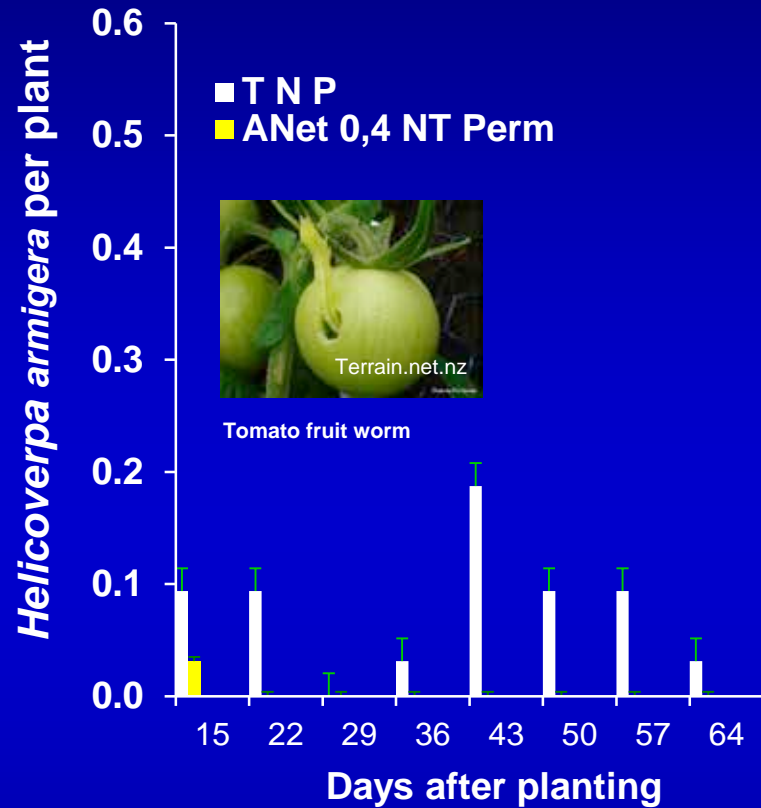
q Temperature too high inside the nets during the dry season

>>>> Poor germination and transplant growth in the hot season

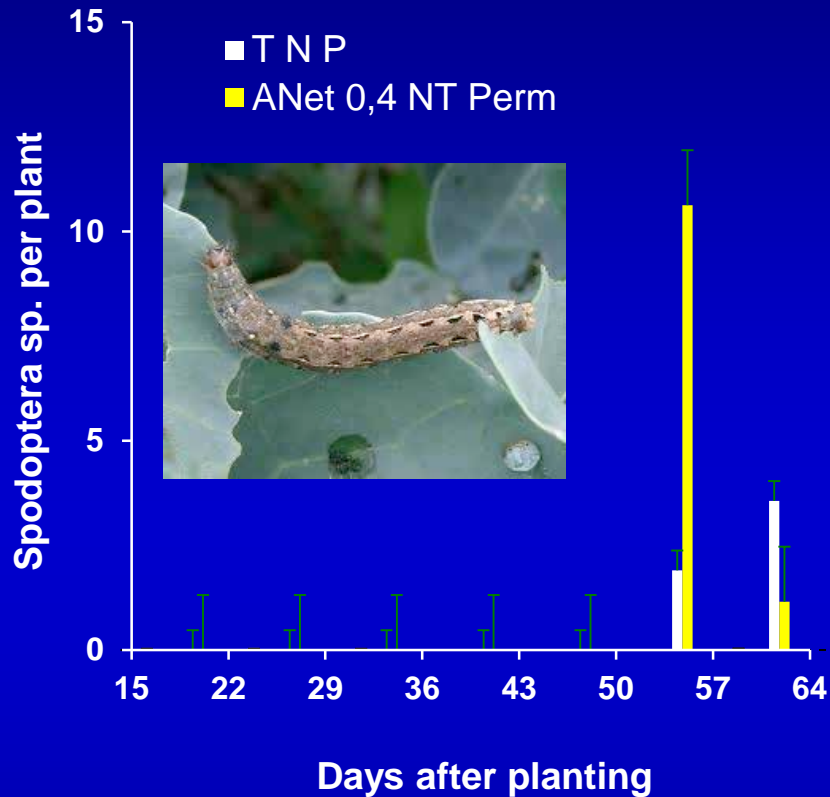
Farmers developed innovative strategies by shading the nursery with palm leaves



# Insect data Benin 2011



# *Insect data Benin 2011*



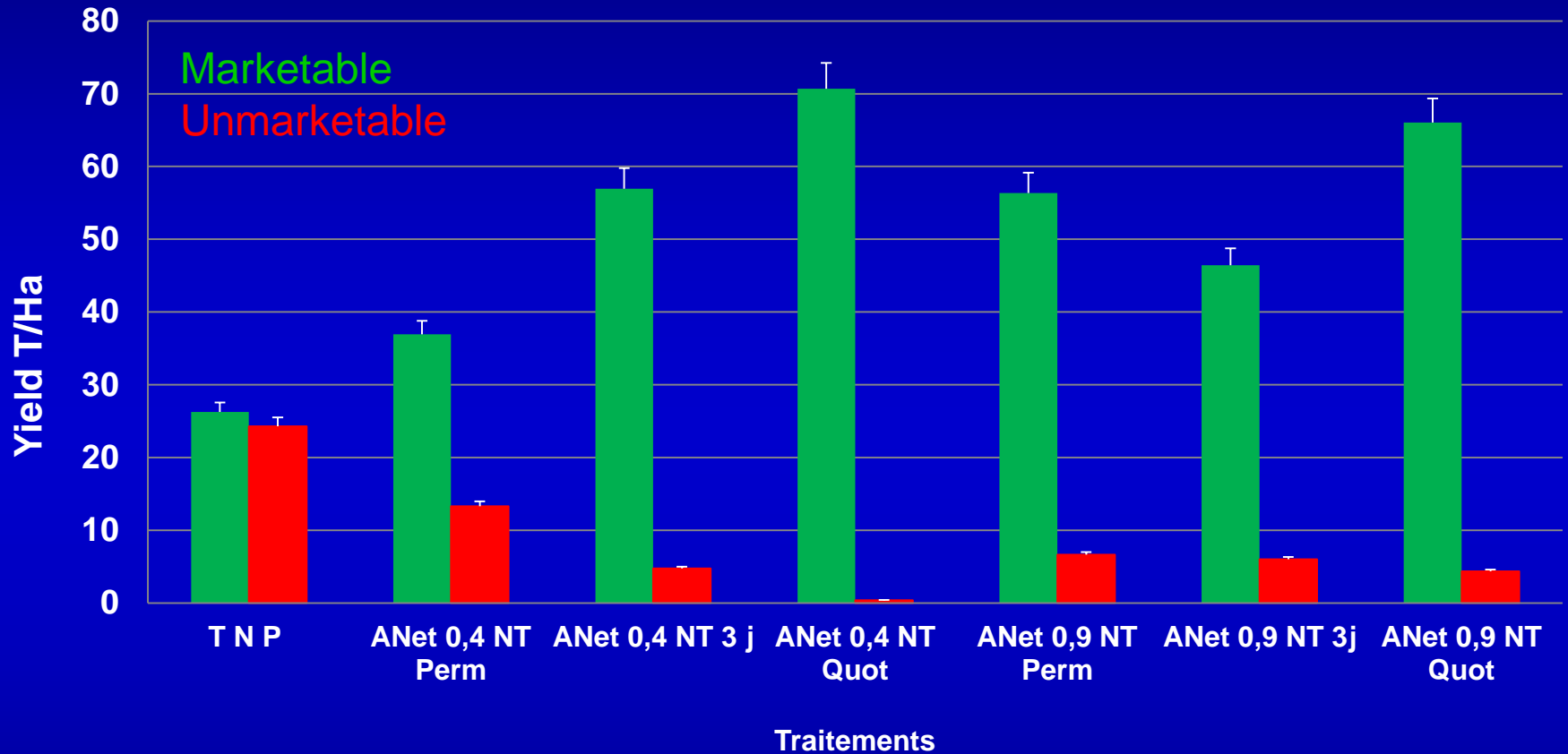
Aphids

**The nets do not control all insects especially aphids**



**Nets treated with insecticides**

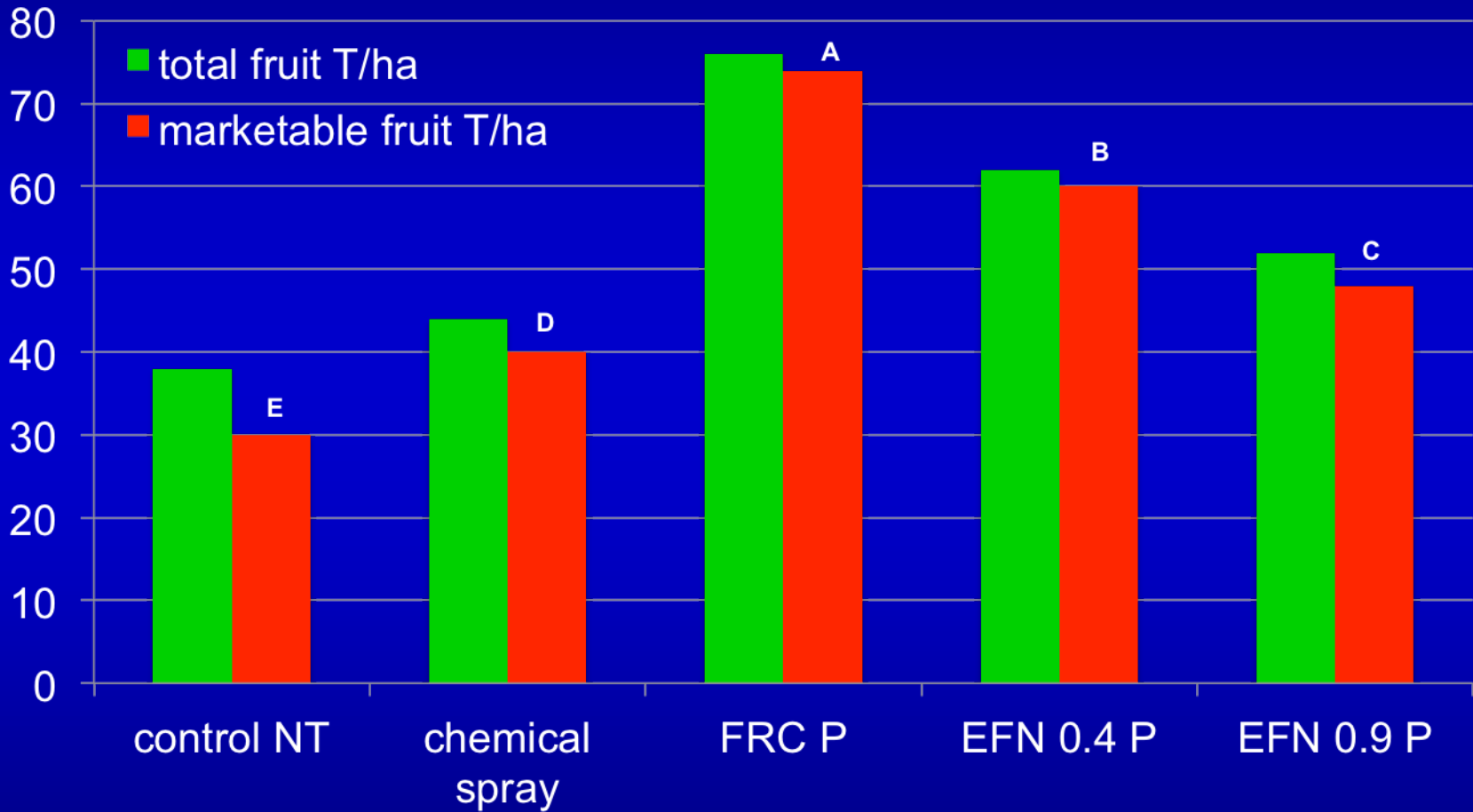
# Cabbage yield Benin 2011



70% decrease of chemical sprays in farmer fields



# Tomato yield Kenya 2011-2012



# ***Yield and quality improvement***



# ***Capacity building: Student training***

<b>Student</b>	<b>Country</b>	<b>Institution</b>	<b>Degree</b>
Faustin Vidogbéna	Benin	University of Abomey-Calavi	Ph.D.
Catherine Gacheri	Kenya	Kenyatta University	M.S.
Judith Kiptoo	Kenya	Moi University	M.S.
Carolyn Achieng'a	Kenya	Kenyatta University	M.S.
Victor Juma	Kenya	Kenyatta University	M.S.
Elisha Otieno Gogo	Kenya	Egerton University	M.S.
Everlyne M'mbone Muleke	Kenya	Egerton University	M.S.
Victor Agohoundjè	Benin	EPAC University of Abomey-Calavi	B.S.*
Hilaire Agonsè	Benin	GASA Formation (Private University)	M.S.
Lauriane Yèhouénou	Benin	FSA University of Abomey- Calavi	B.S.*
Gildas M. Adjovi	Benin	FSA University of Abomey- Calavi	B.S.*
Rustique G. J. Akodogbo	Benin	FSA University of Abomey- Calavi	B.S.*
Sandrine S. S. L. Sègla	Benin	FSA University of Abomey- Calavi	B.S.*
Yèyinou Ginette Azandeme	Benin	icipé	Ph.D.
Emilie Delétré	France	Cirad	Ph.D.

***\* B.S with research project***

# ***Capacity building: Student training***

**Four students defended their research in Benin**



# *Capacity building: Student training*

Hundreds of High School students have visited trials in Kenya



# *Capacity building: Student training*

Excellent tool to  
draw student  
interest in  
agriculture



# ***Capacity building scientists***

- ***Agro-ecology and IPM short course at MSU: June 17- Aug 3, 2012***
- ***Five scientists from focus countries attended the training***

## **An International Short Course**



**Agroecology, Integrated  
Pest Management (IPM)  
and  
Sustainable Agriculture**

**June 17 – 27, 2012  
Michigan State University**

# Acknowledgements



***French Embassy in Kenya (\$135,000 PhD fellowship)***



# Questions

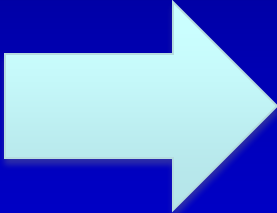
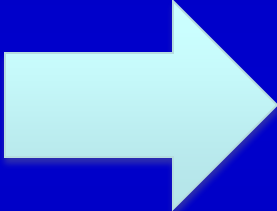
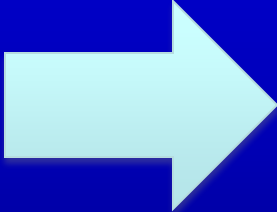
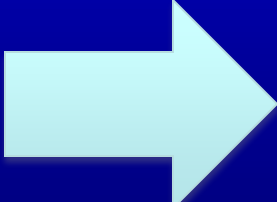
For more informations:

- Saidi M, EO Gogo, FM Itulya, T Martin, M Ngouajio 2013. Microclimate modification using eco-friendly nets and floating row covers improves tomato (*Lycopersicon esculentum*) yield and quality for small holder farmers in East Africa (submitted)
- Gogo EO , M Saidi, FM Itulya, T Martin, M Ngouajio 2013. Eco-friendly nets and floating row covers reduce pest infestation and improve tomato (*Lycopersicon esculentum*) yield for small holder farmers in East Africa. *Biological Agriculture & Horticulture* (submitted)
- Kamal A, E Delétré, Romain Bonafos, T Martin 2013. Repellent effect of an alphacypermethrin treated net against the whitefly *Bemisia tabaci* Gennadius. *Journal of Economic entomology* (submitted)
- Martin T, R Palix, A Kamal, E Delétré, R Bonafos, S Simon, M Ngouajio 2013. A repellent treated netting as a new technology for protecting vegetable crops. *Journal of Economic Entomology* (accepted)
- Muleke EM, M Saidi, FM Itulya, T Martin, M Ngouajio 2013. Enhancing Cabbage Seed Germination and Seedling Quality Using Eco-Friendly Nets. *Agronomy* 3, 2.
- Gogo EO, M Saidi, FM Itulya, T Martin, M Ngouajio 2012. Microclimate Modification Using Eco-Friendly Nets for High Quality Tomato Transplant Production by Small-Scale Farmers in East Africa. *Hort Technology*, 22, 292-298.

**Thank You**  
**Asante**  
**Merci**



# *Topics to cover*

- **What do we want to achieve:**  
*General information on the project (8 min)*  Vance
- **What we have accomplished so far: Project accomplishments (12 min)**  Thibaud
- **What remains to be accomplished: Future activities (5 min)**  Thibaud
- **Questions ??? (5 min)**  Team

# ***New applications for an existing technology***



***Teaching an old dog new tricks***