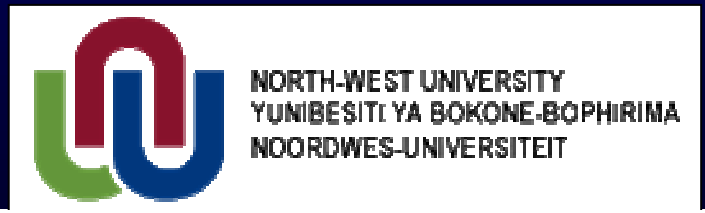
# Vetiver grass as component of Integrated Pest Management Systems

**Johnnie van den Berg**

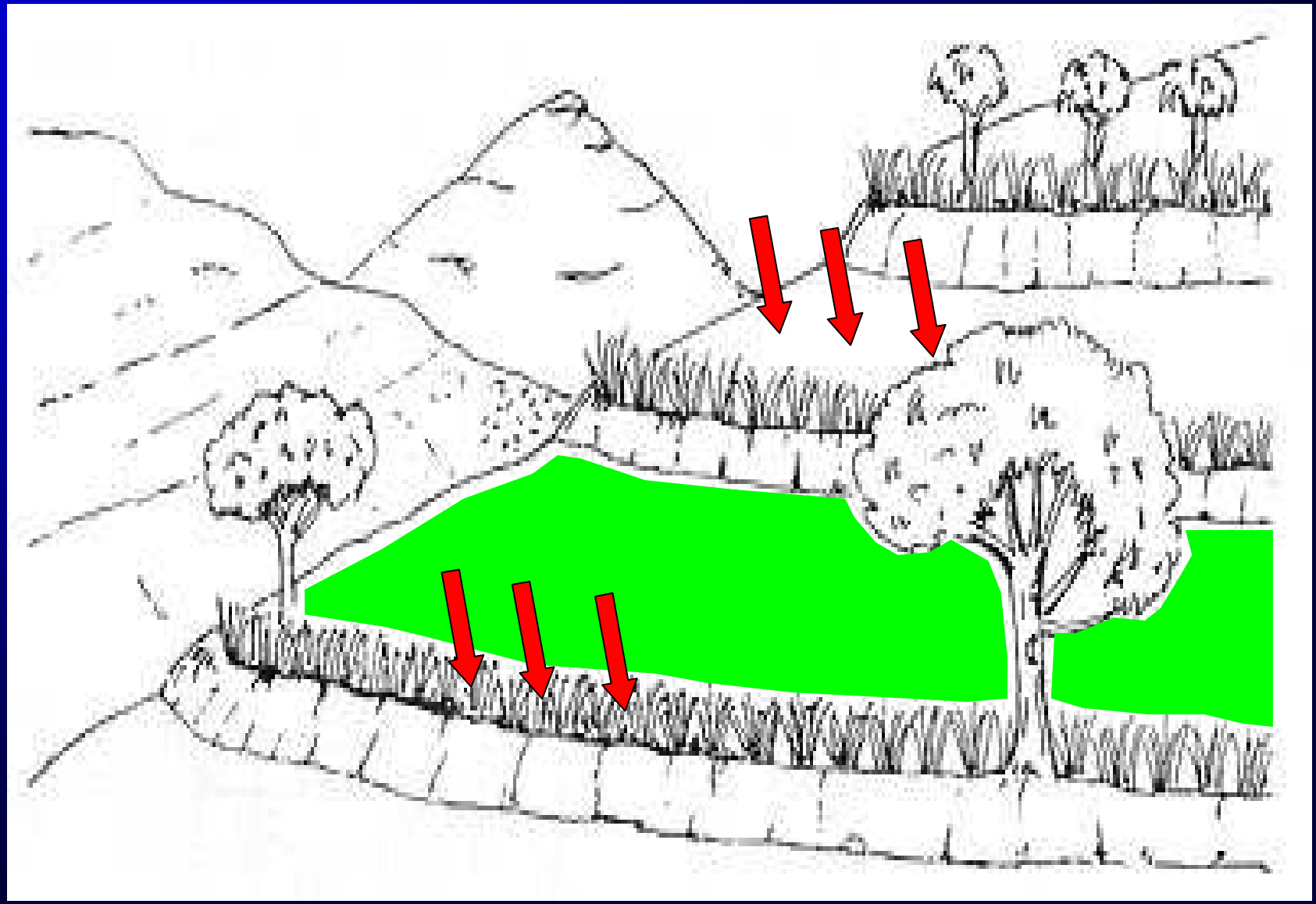
**School of Environmental Sciences and Development,**
**North West University**
**South Africa**



# Aims of presentation:

- to show how Vetiver can help people
- role of Vetiver grass technology (VT) in pest management

# Malawi: soil erosion management



# Insect pests

Stem borer in sorghum

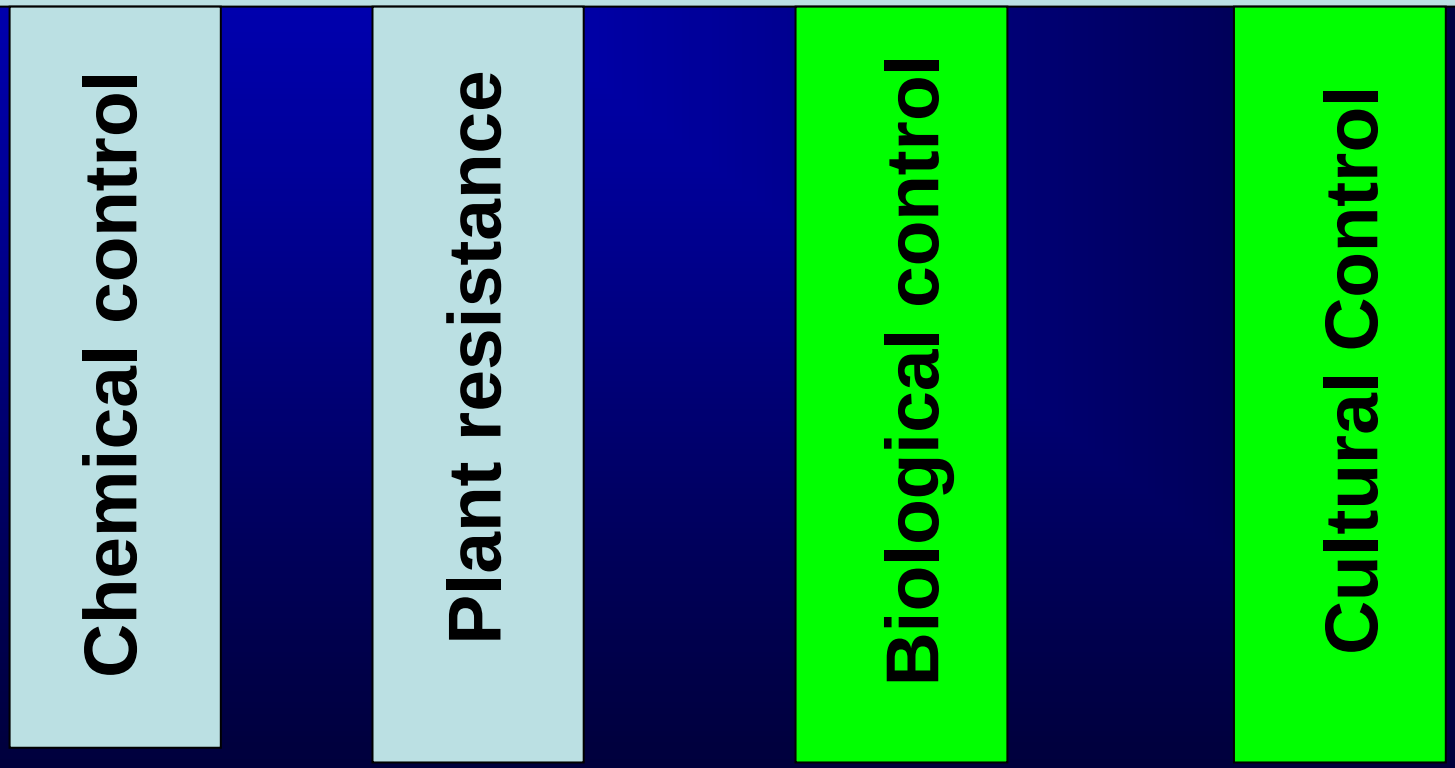
## Damage to maize

# What is Integrated Pest Management (IPM) ?

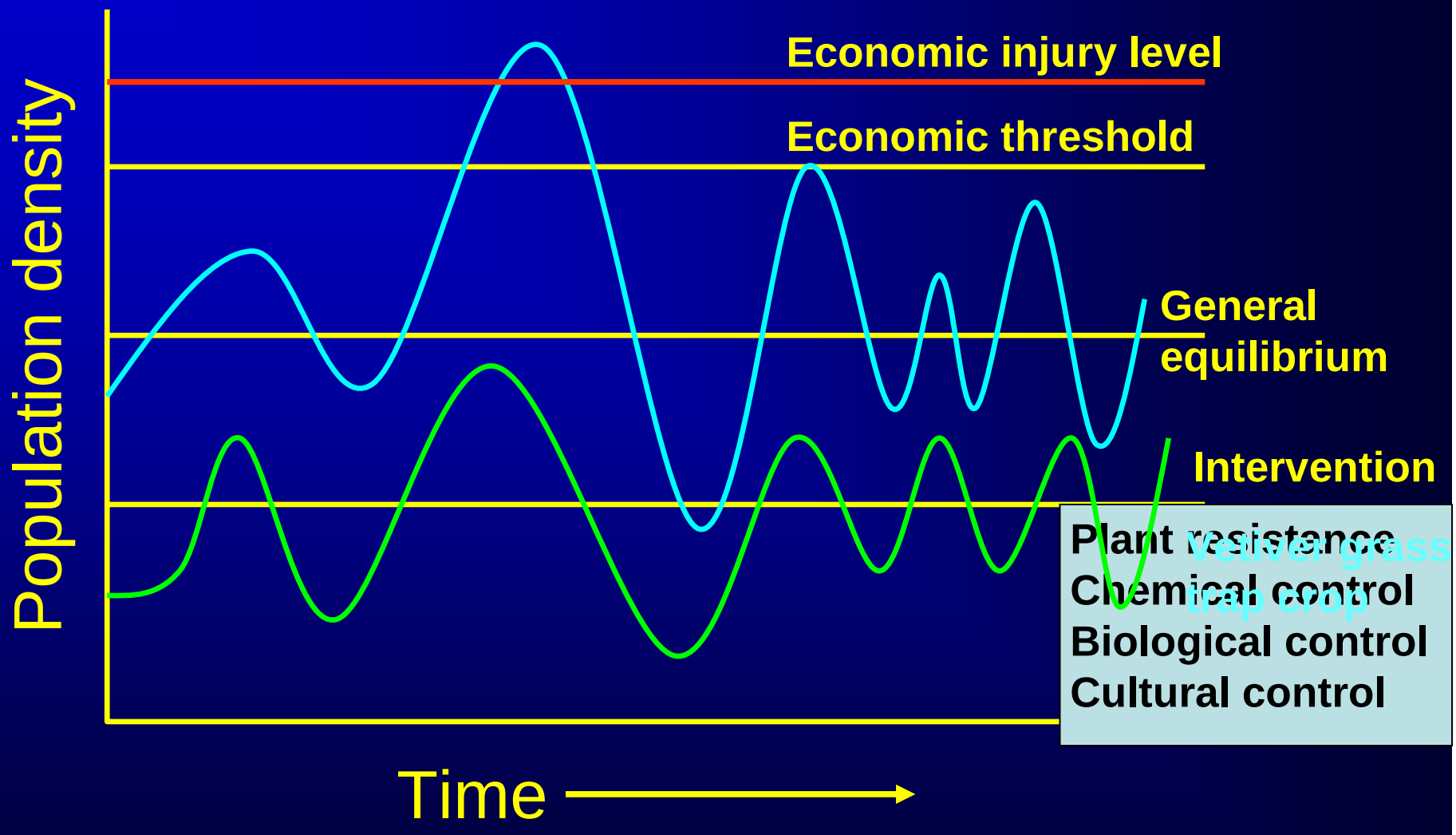
A system that uses:

- all suitable techniques
- in a compatible manner
- to suppress pest populations

# Integrated Pest Management (IPM)



# Aim of IPM


Economic injury level
Economic threshold
General equilibrium
Intervention
Plant resistance
Chemical control
Biological control
Cultural control
weaver grass
trap crop
Population density
Time

# 1. Stem borers of maize and sorghum

# Life cycle of stem borers

Moth

Eggs

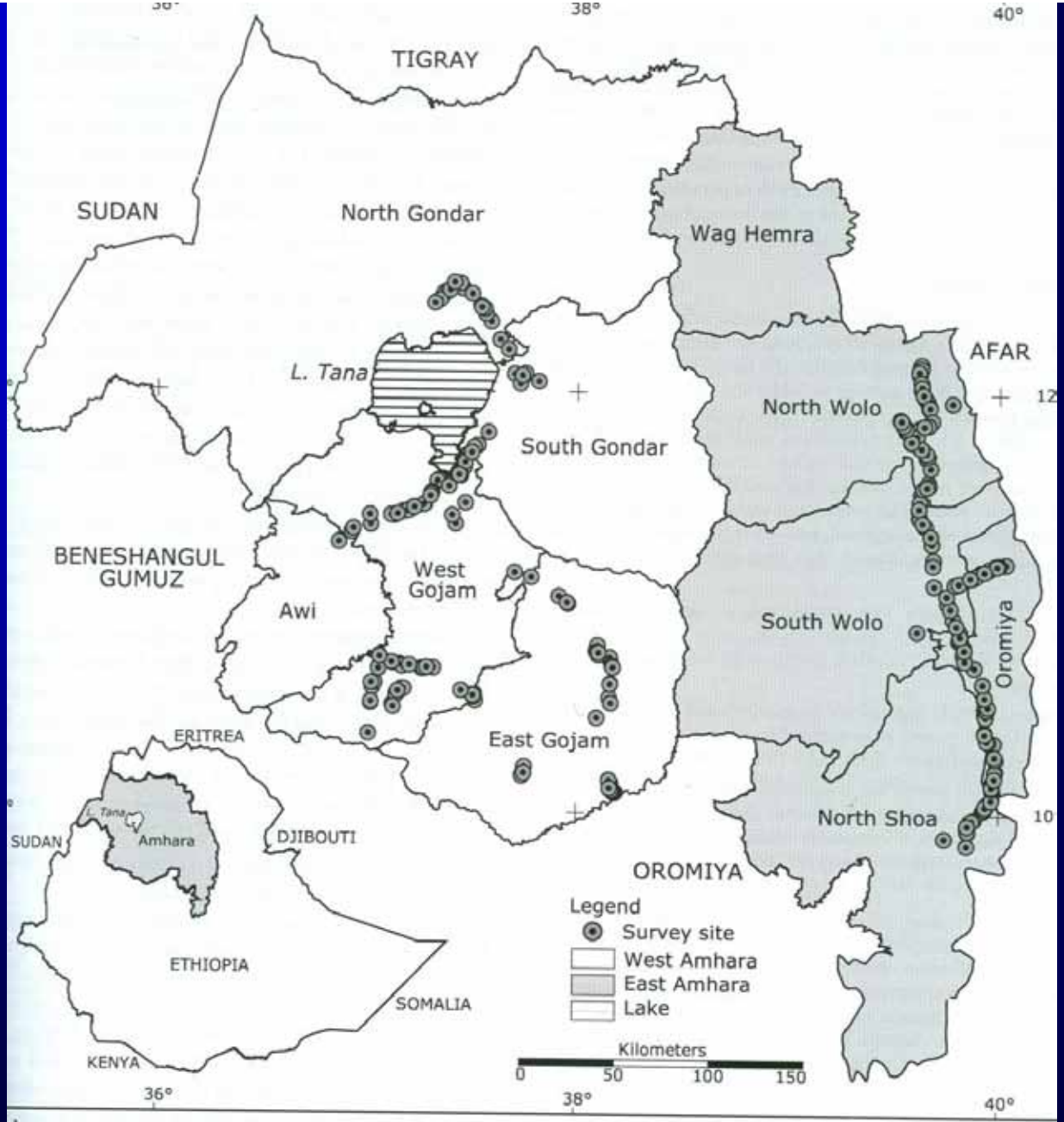
Larvae

Pupae

# Stem borers of maize and sorghum in Ethiopia

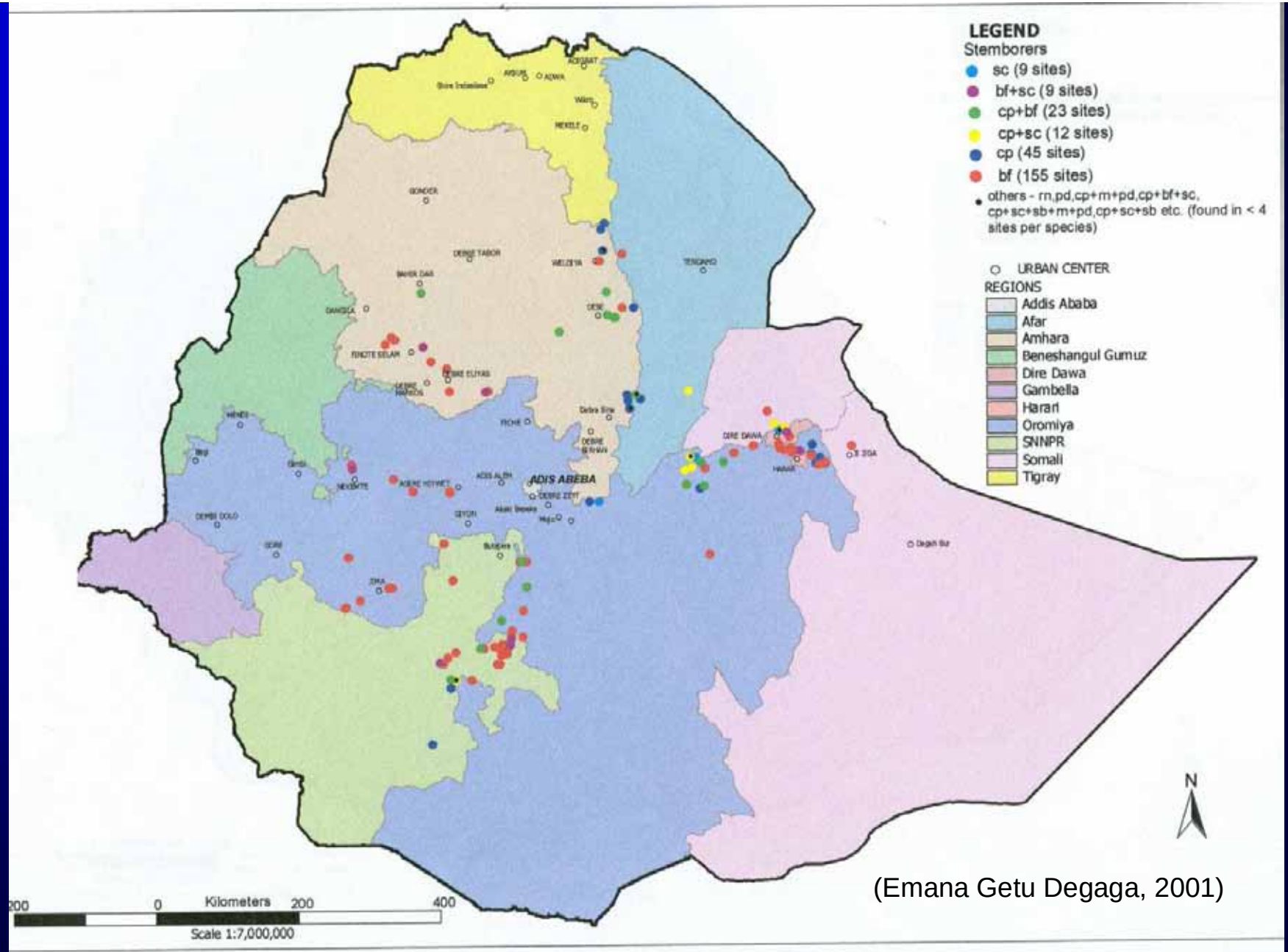
Excellent research on stem borers have been done in Ethiopia over the past 3 decades.

Vetiver has also been used successfully to limit soil erosion




localities in the Amhara state, 2003 and 2004 (dotted circles indicate survey localities, West Amhara is the cool-wet and East Amhara the semi-
es, and L. Tana indicates Lake Tana).

Melaku Wale, *et al*. 2006. Ann. Soc. Entomol. Fr. 42: 389-402.




(Emana Getu Degaga, 2001)

Figure 4.1: Stem borers Distribution in Ethiopia in 1999

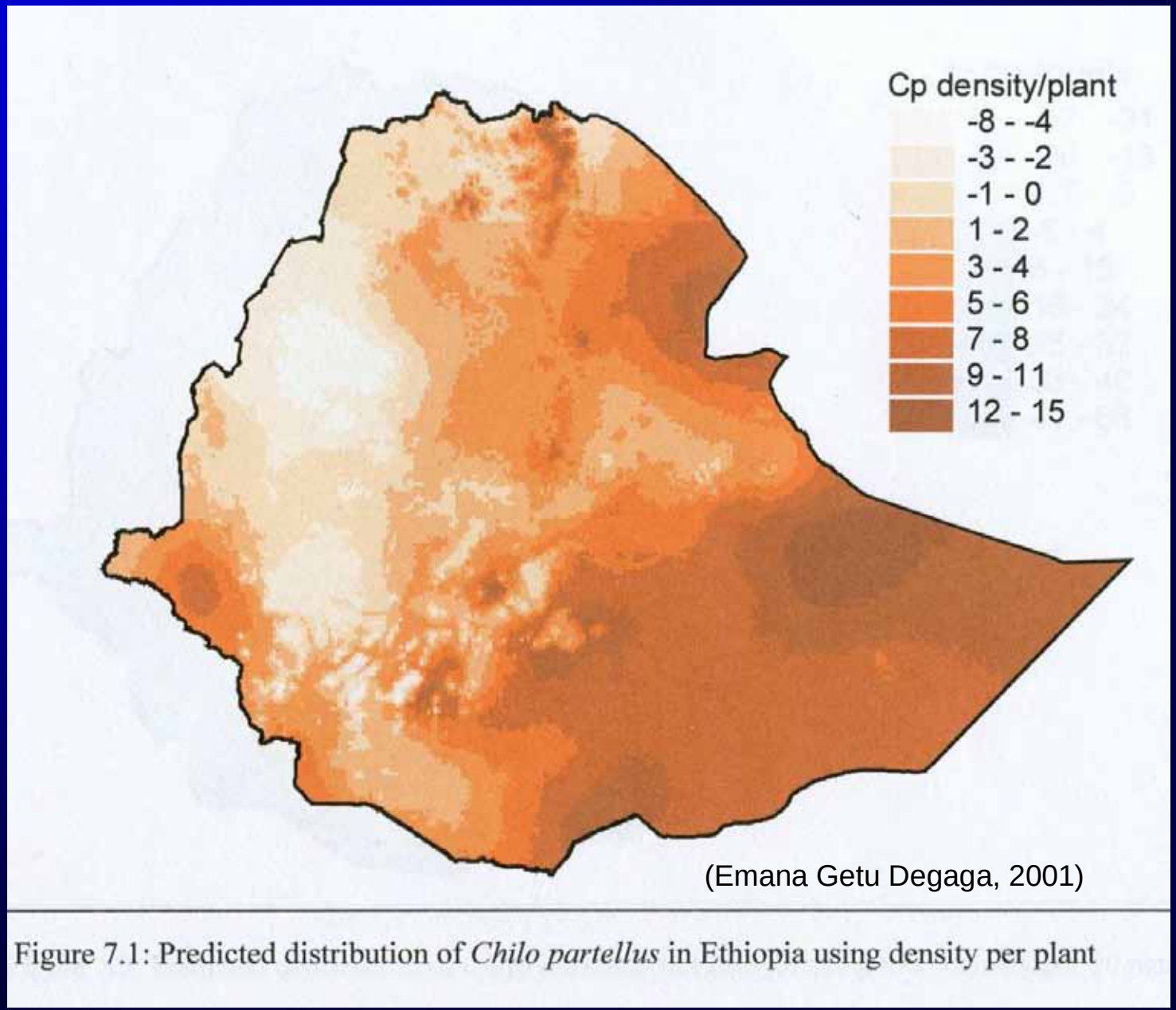
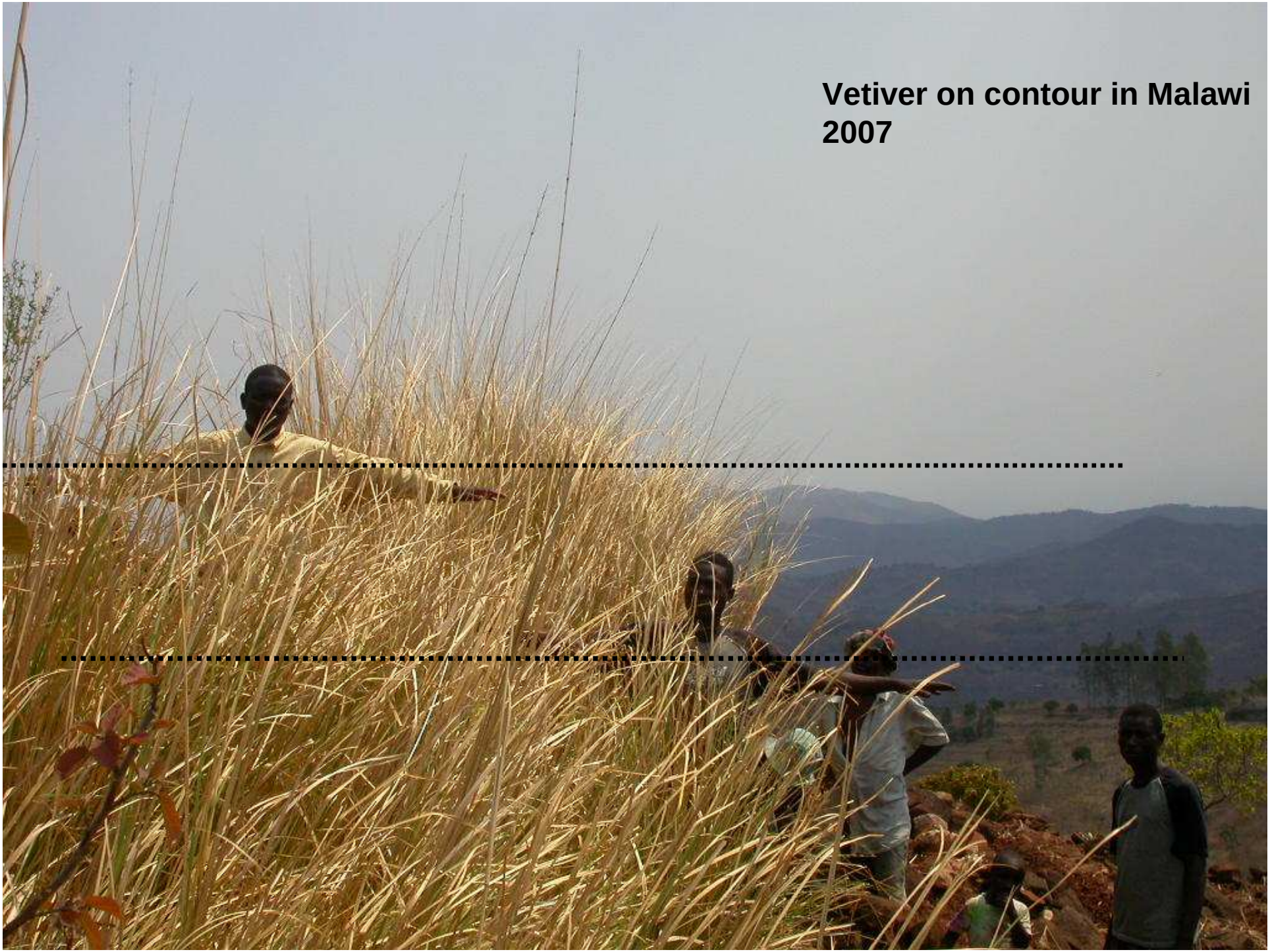



Figure 7.1: Predicted distribution of *Chilo partellus* in Ethiopia using density per plant

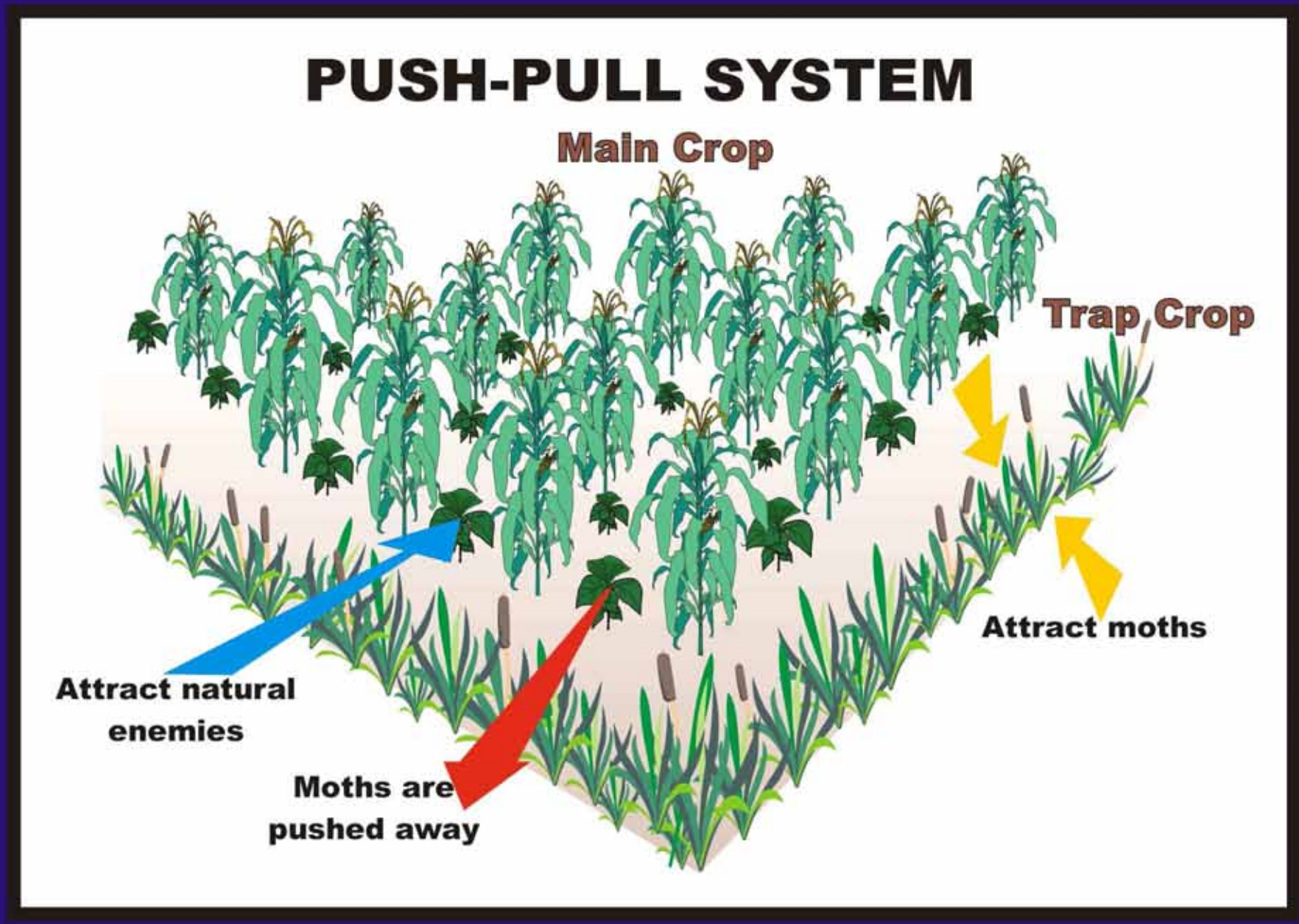
**Vetiver on contour in Malawi**
**September 2007**

**Vetiver on contour in Malawi**
**2007**



**Vetiver on contour in Malawi 2007**

# Habitat management system




Soil erosion & trap crop

# Characteristics of ideal trap crop

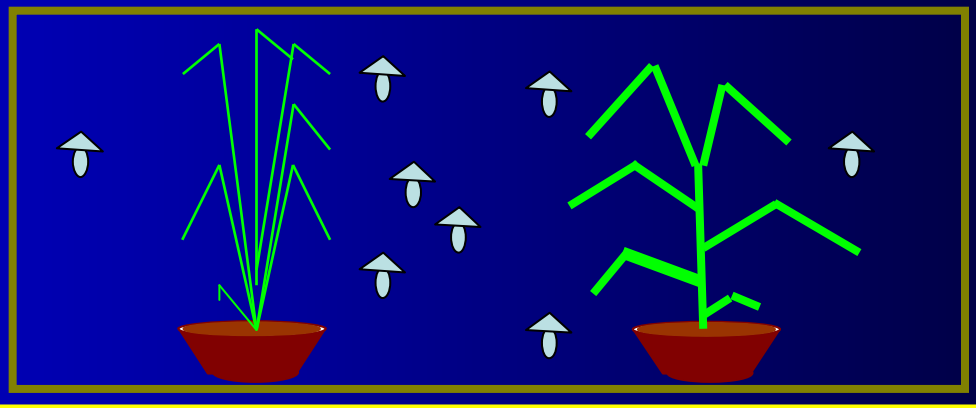
- Highly attractive for oviposition

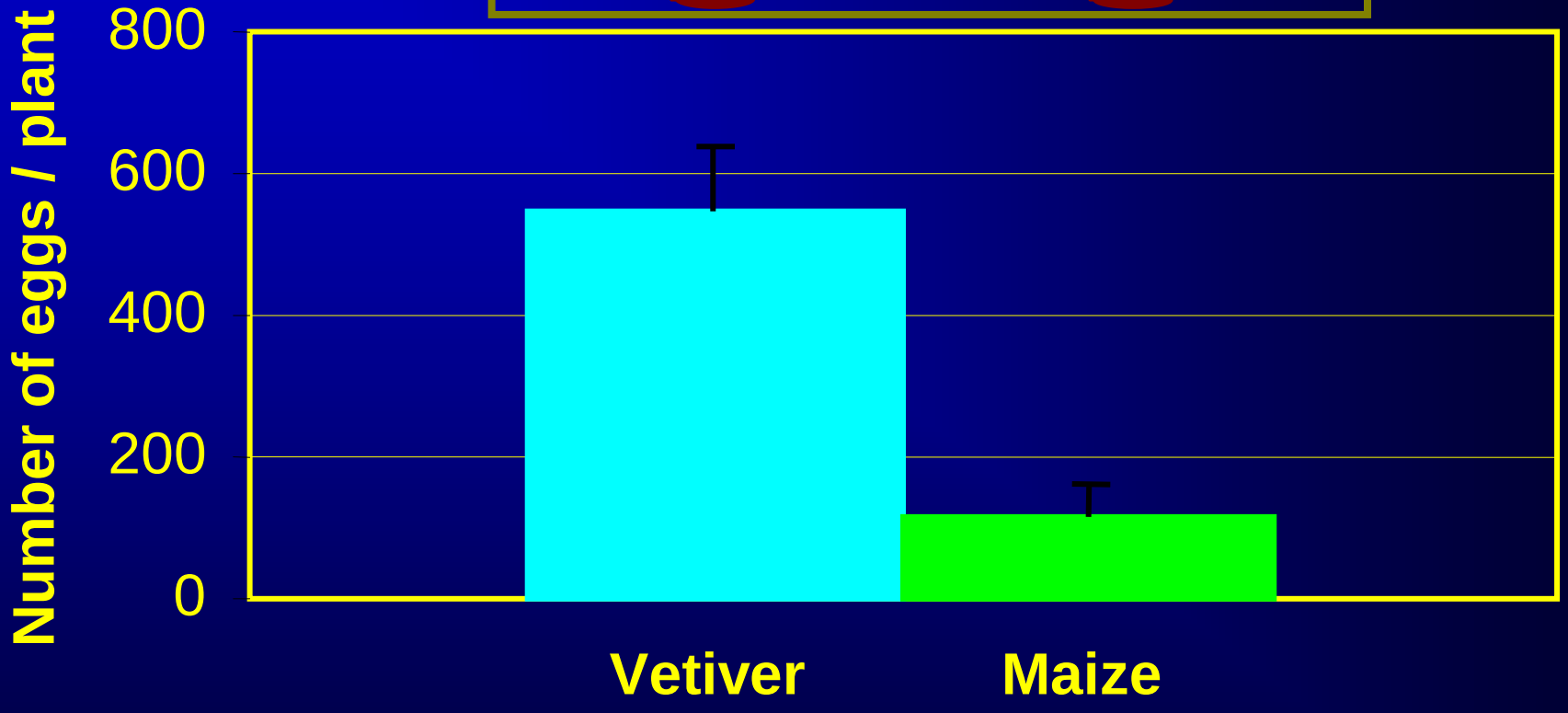
- Low larval survival

# AIMS:

- To evaluate vetiver as trap crop under fields conditions.

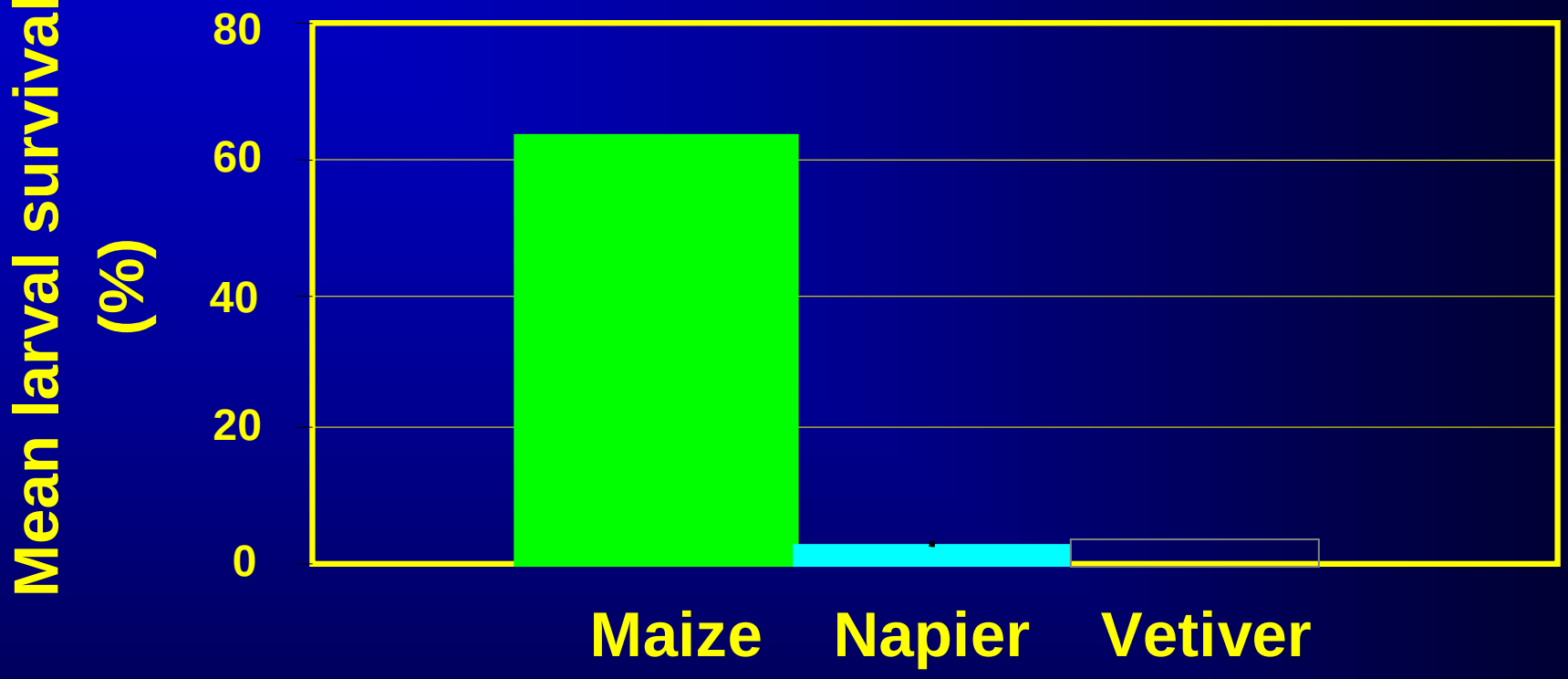
# Two-choice tests





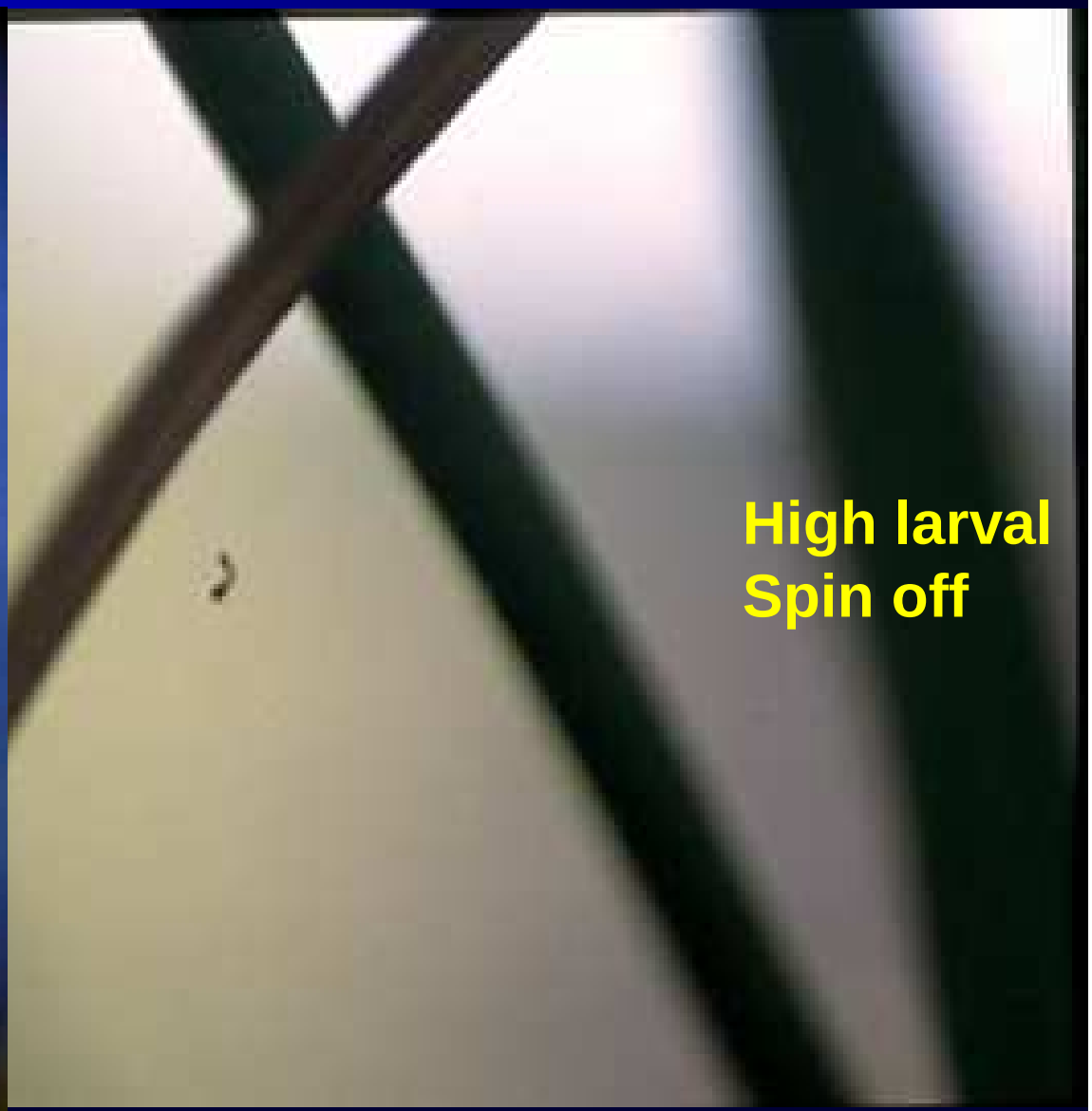

**Number of eggs per plant laid by *Chilo* moths in 2-choice tests in cages**

# 2. Larval survival




**Survival of *Chilo partellus* larvae after 28 days on potted plants in a green house experiment.**

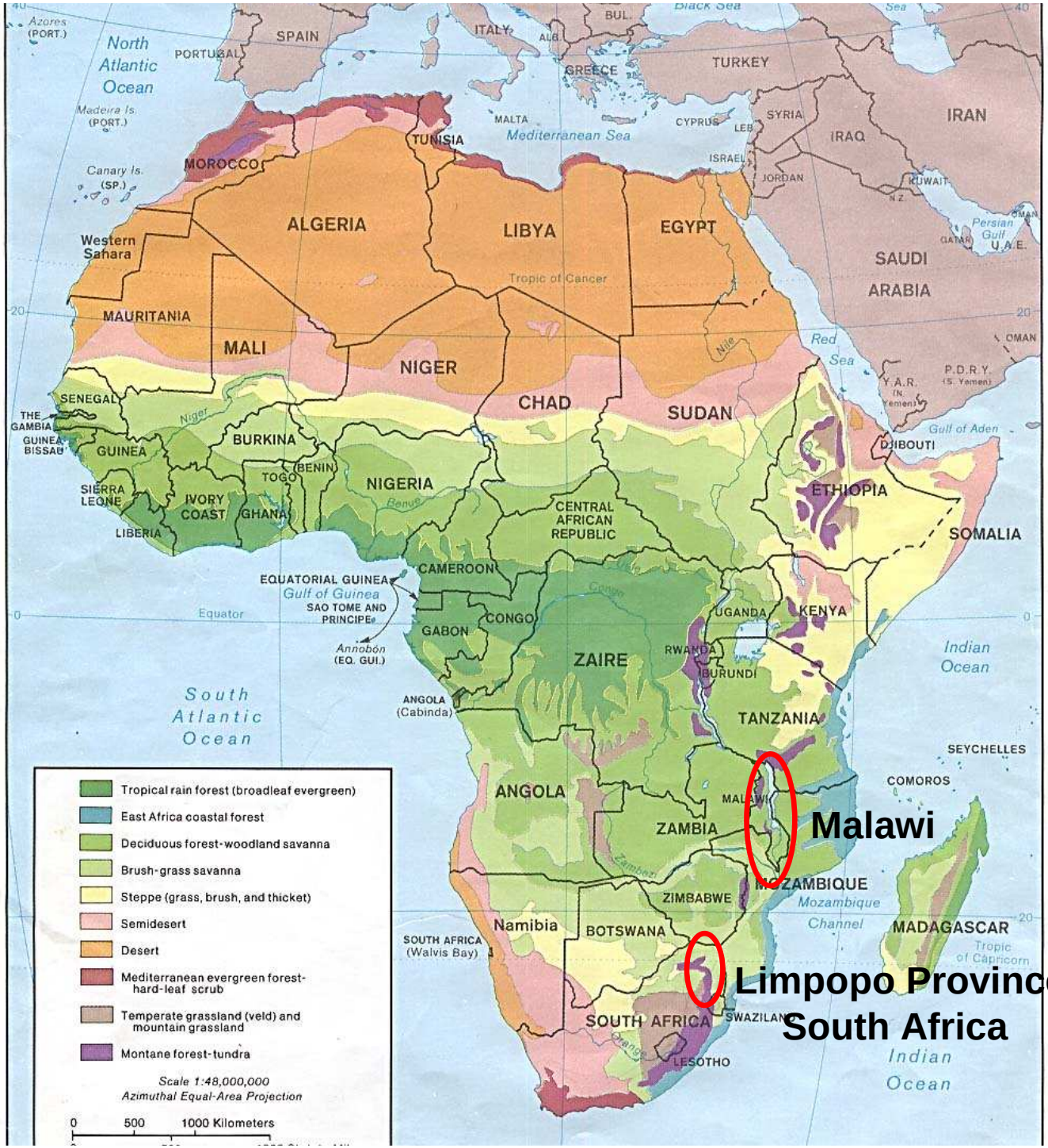
# Mortality factors reducing larval survival

# 3. Field studies

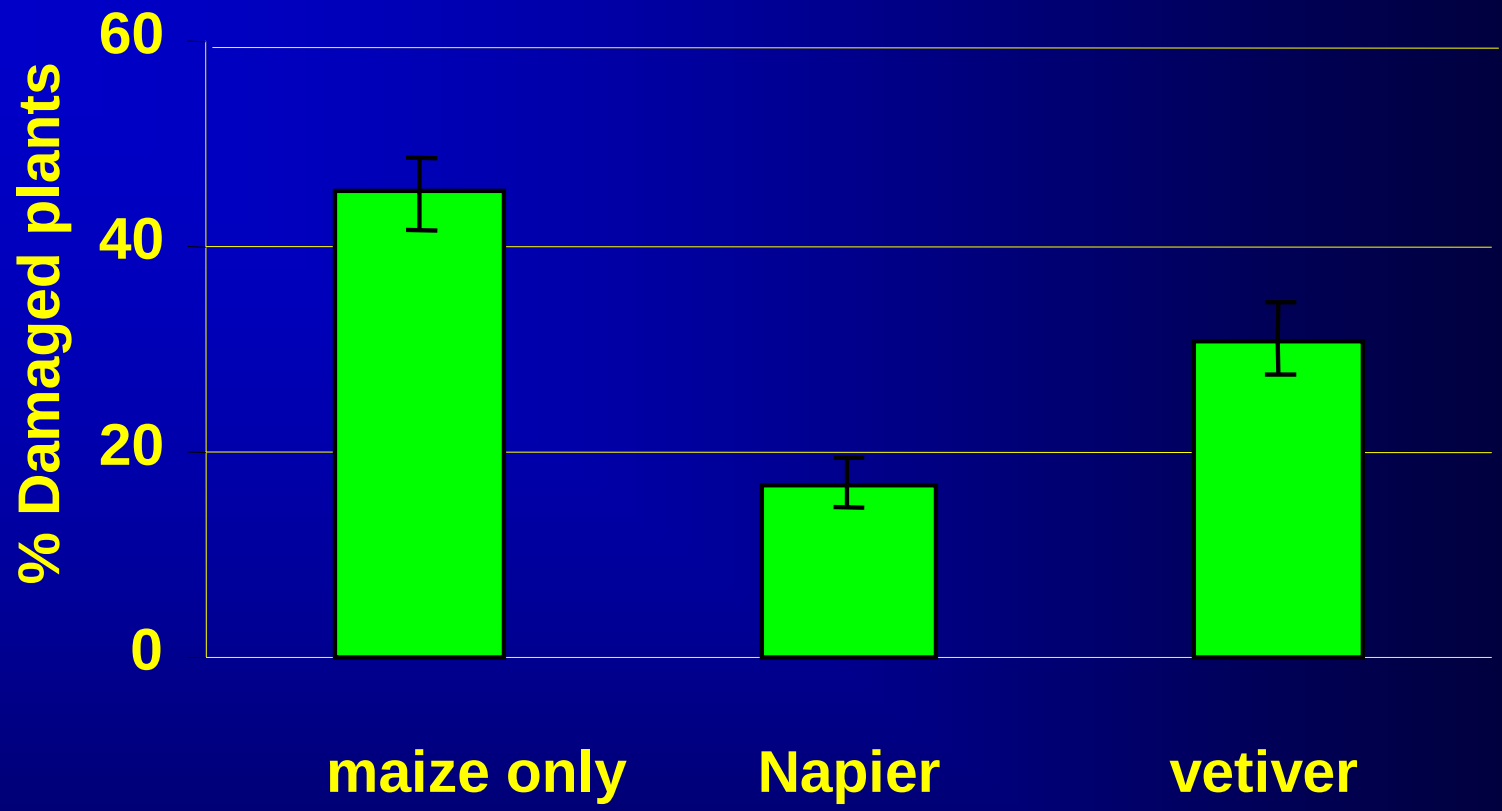
## South Africa & Malawi

- Napier grass, vetiver, maize monocrop
- vetiver and maize monocrop


Malawi
Limpopo Province
South Africa
Tropical rain forest (broadleaf evergreen)
East Africa coastal forest
Deciduous forest-woodland savanna
Brush-grass savanna
Steppe (grass, brush, and thicket)
Semidesert
Desert
Mediterranean evergreen forest-hard-leaf scrub
Temperate grassland (veld) and mountain grassland
Montane forest-tundra
Scale 1:48,000,000
Azimuthal Equal-Area Projection
0 500 1000 Kilometers
North Atlantic Ocean
Mediterranean Sea
Red Sea
Gulf of Aden
Persian Gulf
Gulf of Guinea
Indian Ocean
South Atlantic Ocean
Equator
Tropic of Cancer
Tropic of Capricorn
SPAIN
PORTUGAL
ITALY
GREECE
TURKEY
SYRIA
IRAQ
IRAN
CYPRUS
ISRAEL
JORDAN
KUWAIT
SAUDI ARABIA
MOROCCO
ALGERIA
TUNISIA
LIBYA
EGYPT
Western Sahara
MAURITANIA
MALI
NIGER
CHAD
SUDAN
SENEGAL
THE GAMBIA
GUINEA BISSAU
GUINEA
BURKINA
BENIN
TOGO
NIGERIA
SIERRA LEONE
IVORY COAST
GHANA
LIBERIA
CENTRAL AFRICAN REPUBLIC
ETHIOPIA
SOMALIA
DJIBOUTI
CAMEROON
EQUATORIAL GUINEA
SAO TOME AND PRINCIPE
GABON
CONGO
ZAIRE
UGANDA
KENYA
RWANDA
BURUNDI
TANZANIA
ANGOLA
ZAMBIA
MALAWI
ZIMBABWE
MOZAMBIQUE
Namibia
BOTSWANA
SOUTH AFRICA
SWAZILAND
LESOTHO
MADAGASCAR
SEYCHELLES
COMOROS

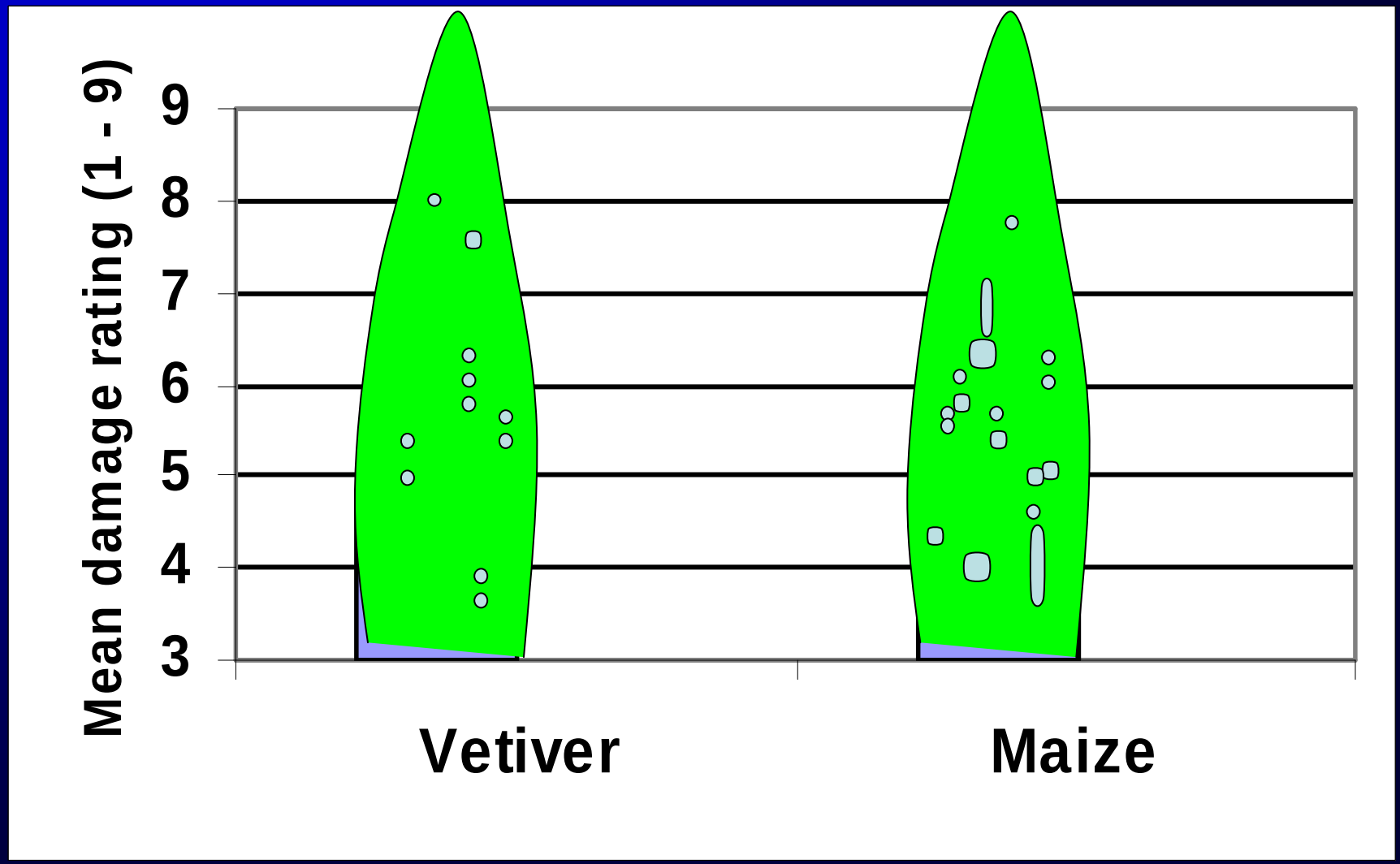
# Limpopo Province – South Africa

# Field experiment in Malawi (Oct 2005+2006)




**Damaged plants (%) in a monocrop block of maize and blocks surrounded by Napier or vetiver grass**

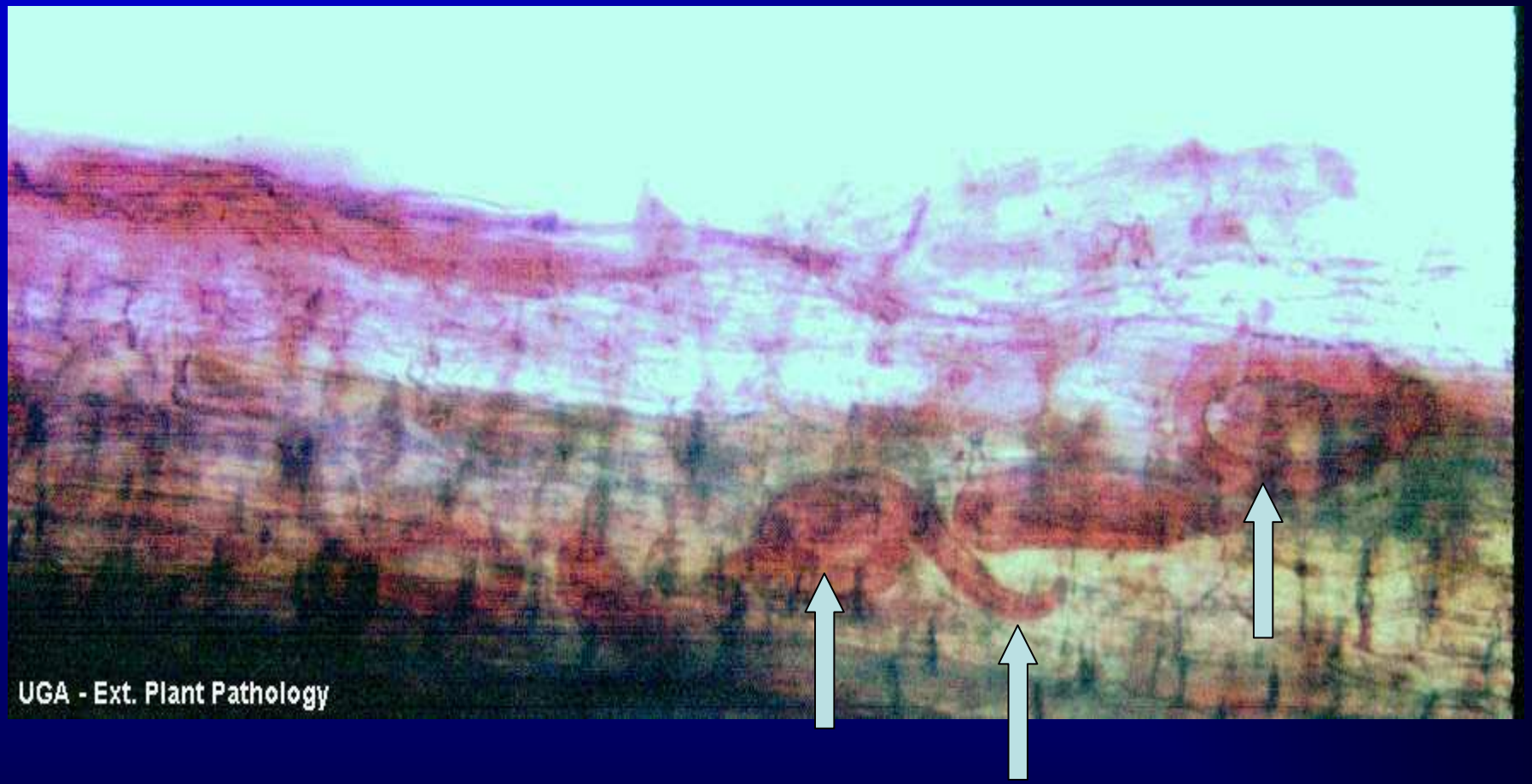
# Damage rating in maize



# CONCLUSIONS

- **Vetiver grass exhibited all the characteristics of an ideal trap crop for *Chilo partellus***
- **More field evaluations needed**

# 4. Nematodes




# Nematodes inside roots

# Food garden

# Root knot nematode (*Meloidogyne*) damage

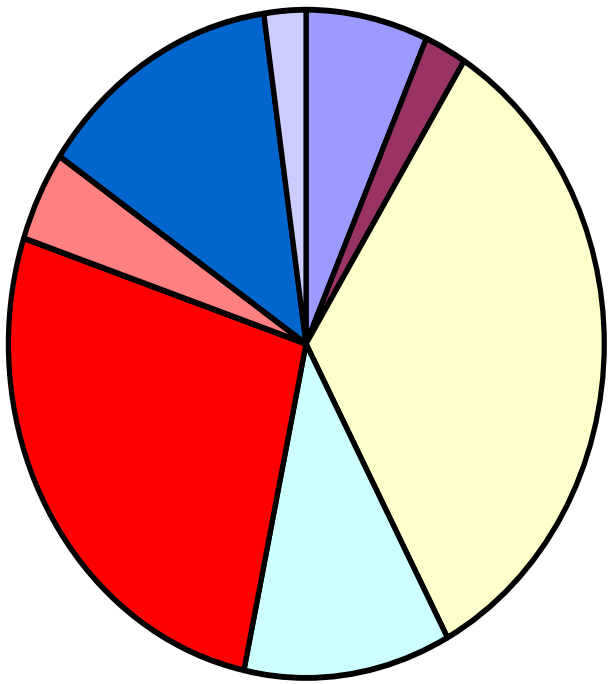
**Table 1. *Meloidogyne incognita* race 2 numbers / 50g roots and RF-values on vetiver grass and vegetable crops**

| Crop | *M. incognita* numbers per 50 g roots | RF-values |
|---|---|---|
| Tomatoes (susceptible control) | 266 733 a | 93 a |
| Tobacco | 155 867 b | 55 b |
| Watermelon | 112 750 bc | 39 bc |
| Green pepper | 49 554 c | 17 c |
| Groundnut (resistant control) | 141 d | 0.05 d |
| Cotton | 28 d | 0.01 d |
| Vetiver | 567 d | 0.20 d |

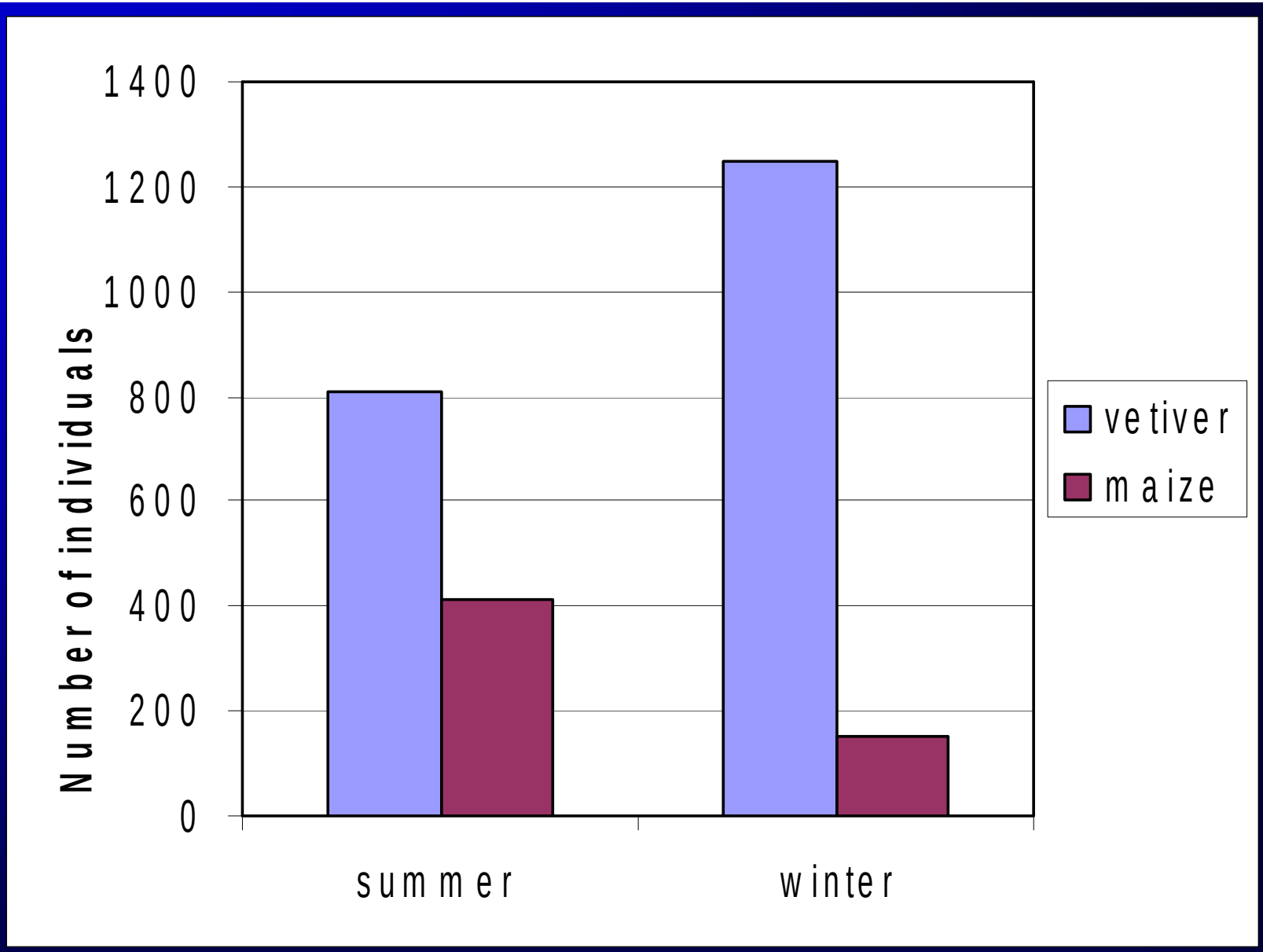
# Arthropod diversity and beneficial insects

D-vac sampling

# Number species per order

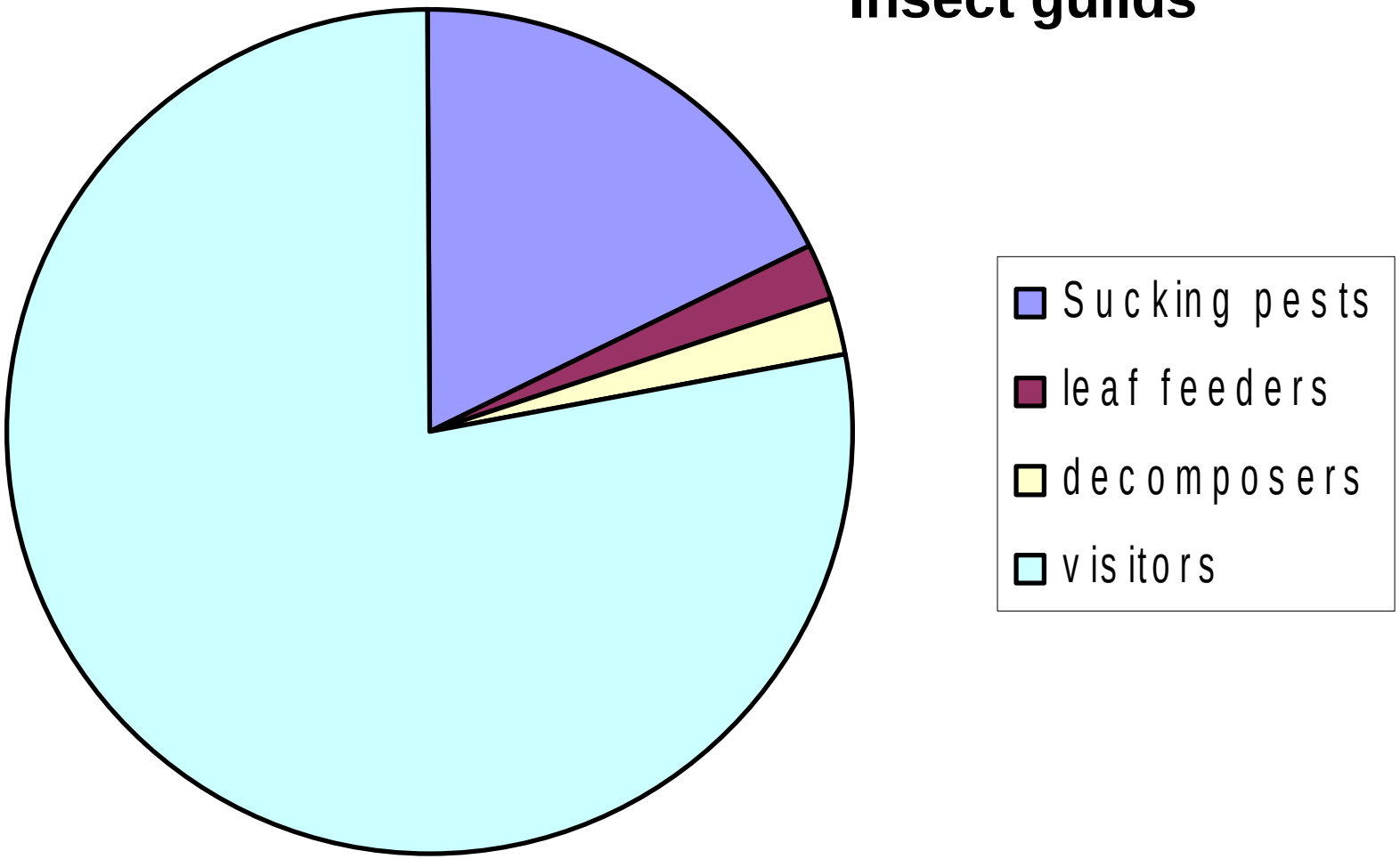


- Lepidoptera
- Orthoptera
- Diptera
- Coleoptera
- Hymenoptera
- Hemiptera
- Homoptera
- Colembola




**Abundance of arthropods per sample during a winter and summer sampling**

## Insect guilds



# Diversity of beneficial insects on vetiver (in winter)

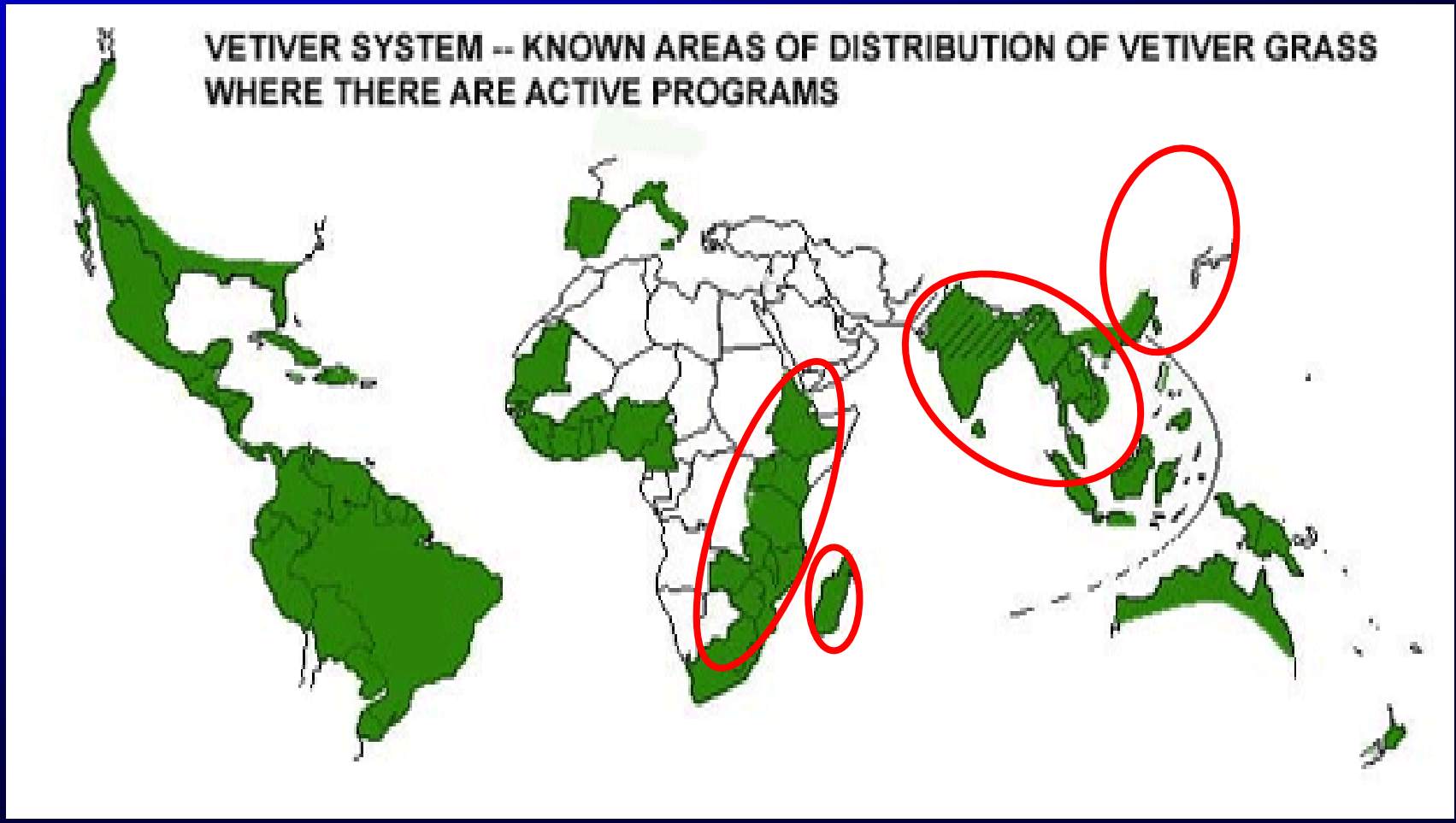
**Pine apple fields**
**In the eastern Cape**

**Hemiptera sucking bug damage (Venezuela)**

# 8. Integrated pest management

**Vetiver alone is not enough to control pest**
**It must form part of "crop health management" system**

# Distribution of vetiver grass and *stem borer* problem areas



# Added-on benefits to vetiver


# CONCLUSION

- Vetiver grass helps people