

# Biological invasions by insects in Mozambique: The case of the tomato leaf miner, *Tuta absoluta*



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# INTRODUCTION

**Biological Invasions** (invasive alien species - IAS): species which are accidental and/or deliberately introduced to a new area

**The term “biological invasion” highlights the negative impacts on biodiversity, human economy and/or health**



Biological invasions are emerging as one of the major threats to sustainable development, impacting:

1. Agriculture;
2. Biodiversity;
3. ecosystem services;
4. human health, and;
5. increasing human vulnerability

**They represent a major threat to agricultural production and food security**



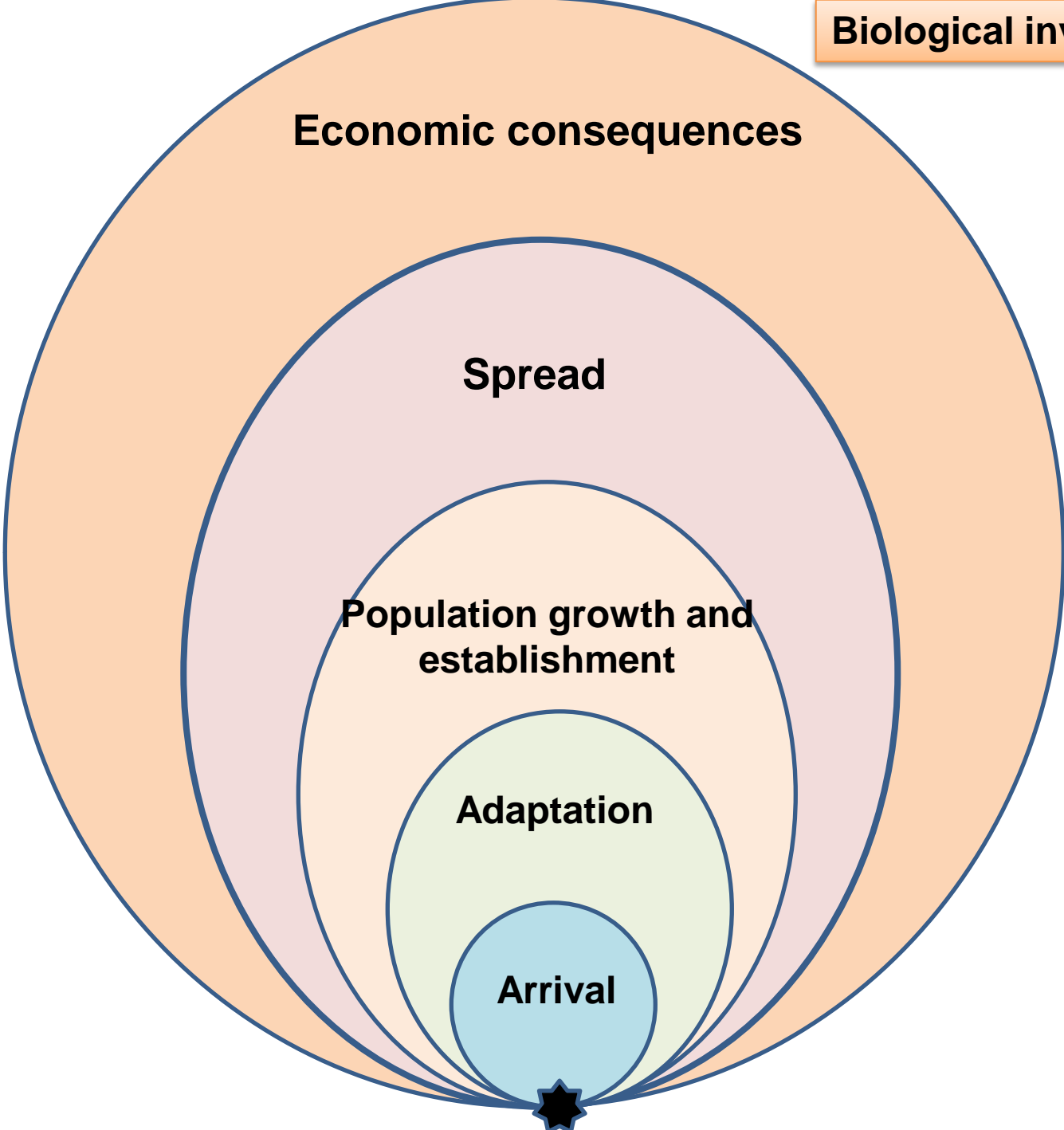
# Factors that contribute for increasing rates of invasions

Several factors which contribute to rapid acceleration of introductions of insect species include:

1. Process of international Globalization
2. Rapid development of transport
3. Increase of human movement and interactions and their goods;
4. Increased international trade and its liberalization
5. Climatic changes



**Biological invasions progress**



Specific management strategies can be implemented to mitigate the risk posed by an invasive species at each phase

<b>Invasion phase</b>	<b>Management activities</b>	<b>Priority actions</b>
<b>Before arrival</b>	Inspection and prevention	<b>First option</b>
<b>Arrival</b>	International quarantines Inspection and rapid response	
<b>Establishment</b>	Early detection and rapid response and Eradication	
<b>Spread</b>	<b>Domestic quarantines</b> <b>Barrier zones</b>	
<b>Invasiveness</b>	<b>Implementation of controlling strategies</b>	<b>Last option</b>



**The case of the tomato leaf miner, *Tuta absoluta*:  
in Mozambique**



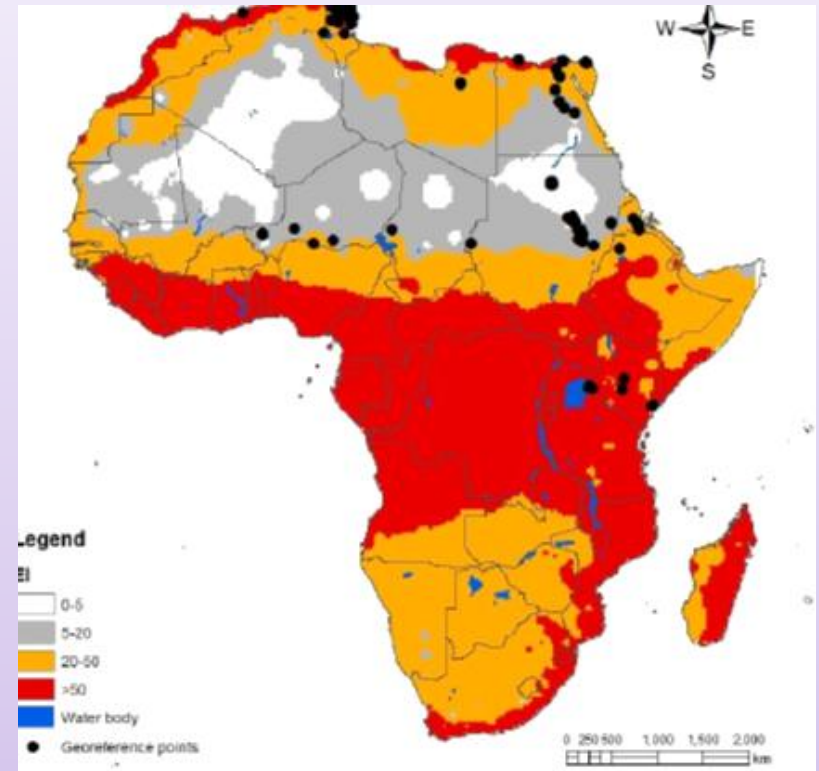
## The tomato leaf miner, *Tuta absoluta*

- *Tuta absoluta* (Lepidoptera : Gelechiidae) native from South America
- It was recently detected in African Continent in 2006
- Infestation of tomato by *T. absoluta* often results in significant reduction in yield and quality of the fruit
- Some times reaching 100% crop loss



## Some detections in Africa:

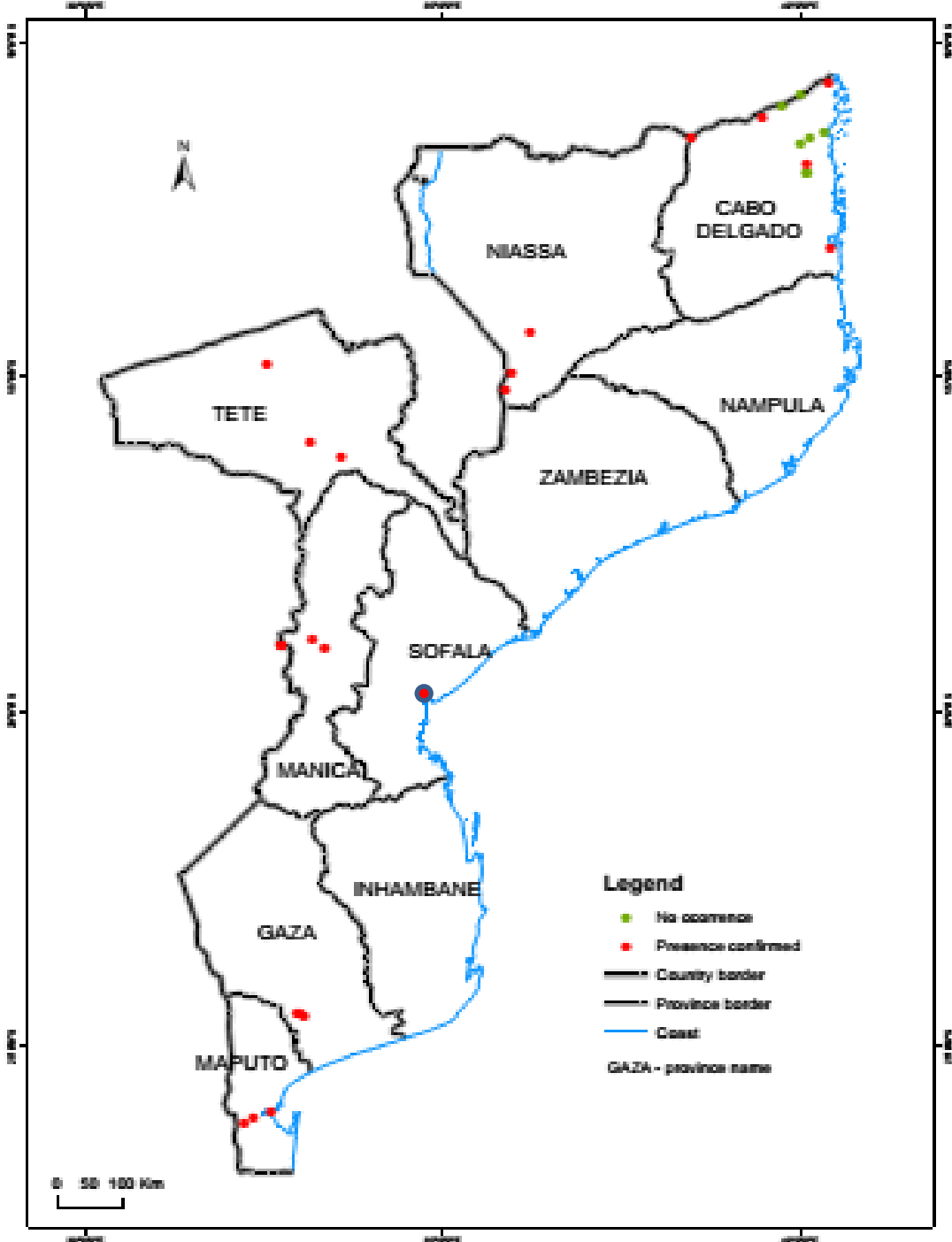
- Egypt, 2006
- Morocco 2008
- Libya 2009
- Sudan, 2011;
- Ethiopia, 2012
- Kenya, 2014;
- Tanzania, 2015;
- Uganda, 2005
- **In Mozambique, it was first detected for the first time in Manica Province, Chandroca, 2016 (traps)**



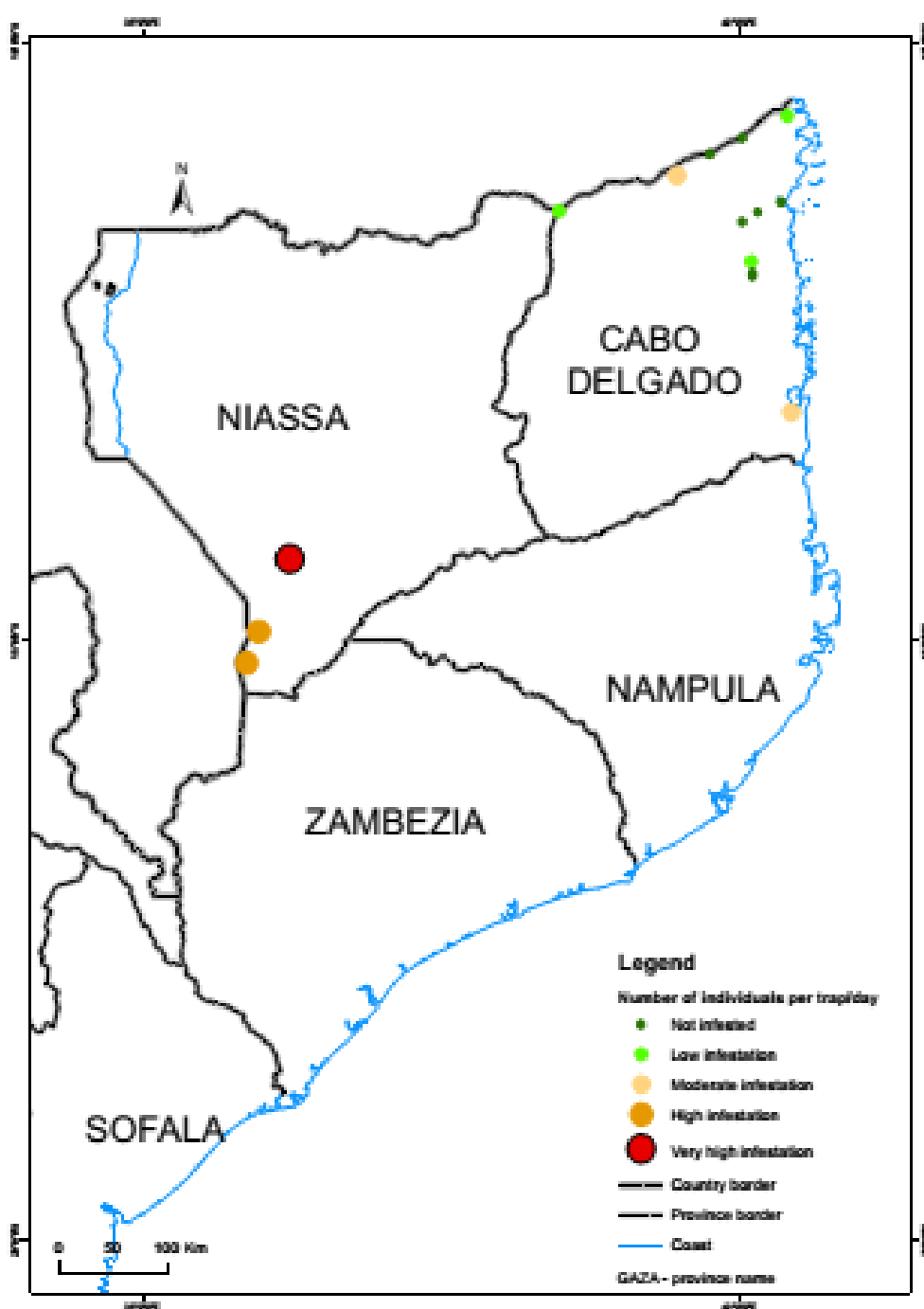
## Monitoring and detection of *Tuta absoluta*

- Surveillance to monitor the of *Tuta absoluta* was conducted
  - Northern part of the country: Cabo Delgado and Niassa provinces;
  - Central region: Manica, Tete and (Sofala) provinces;
  - South Mozambique: Maputo and Gaza provinces;
- At selected sampling sites 1 to 2 traps were placed in tomatoes fields;
- In some fields tomato leaves and fruits were collected and reared in the Laboratory;
- ENM (Maxent) was used to predict current and future distribution of *Tuta absoluta*;

# Sampling sites in Mozambique

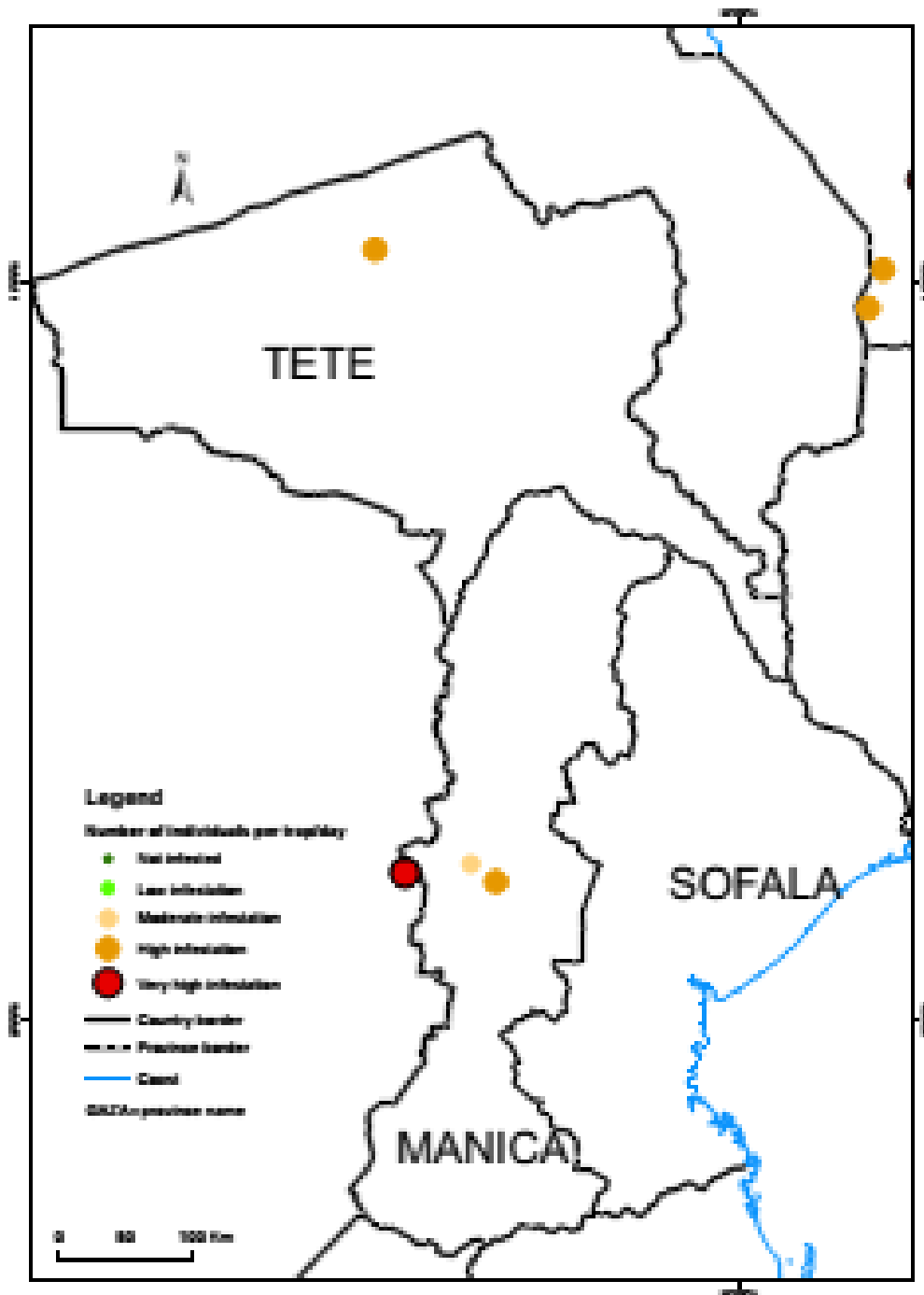


# Northern region:



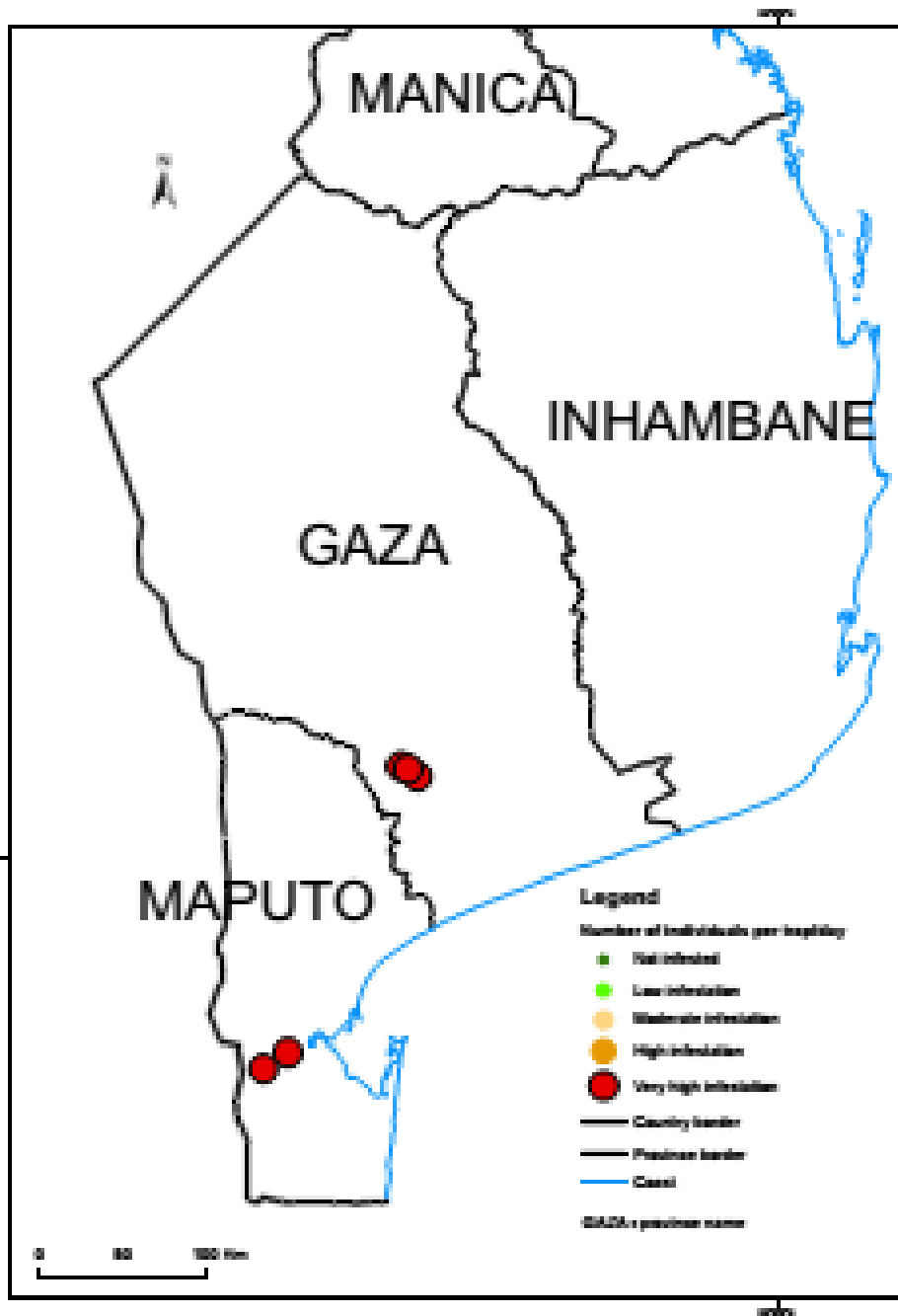
# Niassa, province

# Central region:



# Tete province

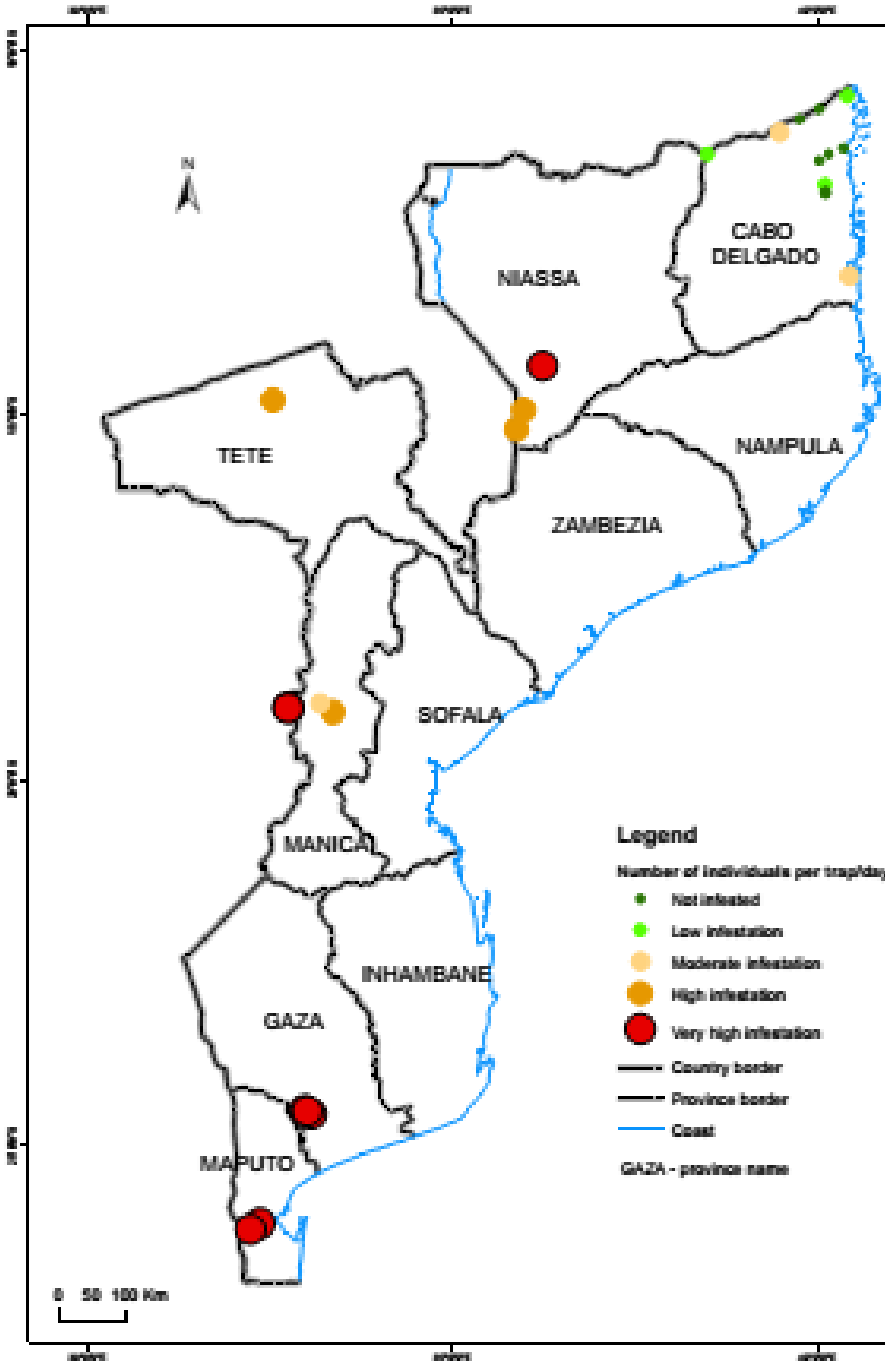
# Southern region:



Chokwe district, Gaza province



Mahelane, Namaacha district, Maputo



# Chokwe, district







**Level of infestation of the tomato leaf miner,  
*Tuta absoluta***



# Field severely infested (Tete province)

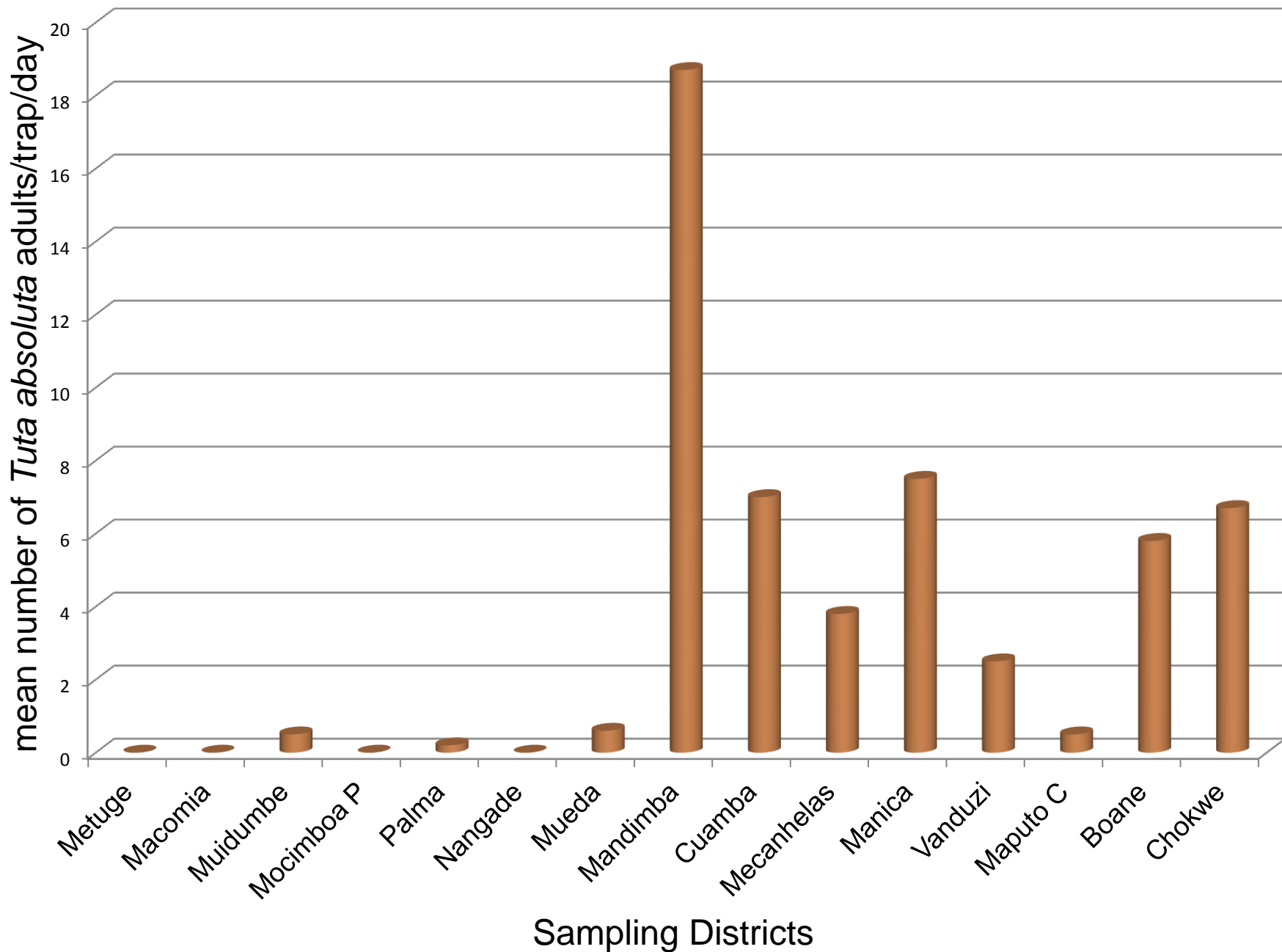


# Damage and symptoms caused by *Tuta absoluta*

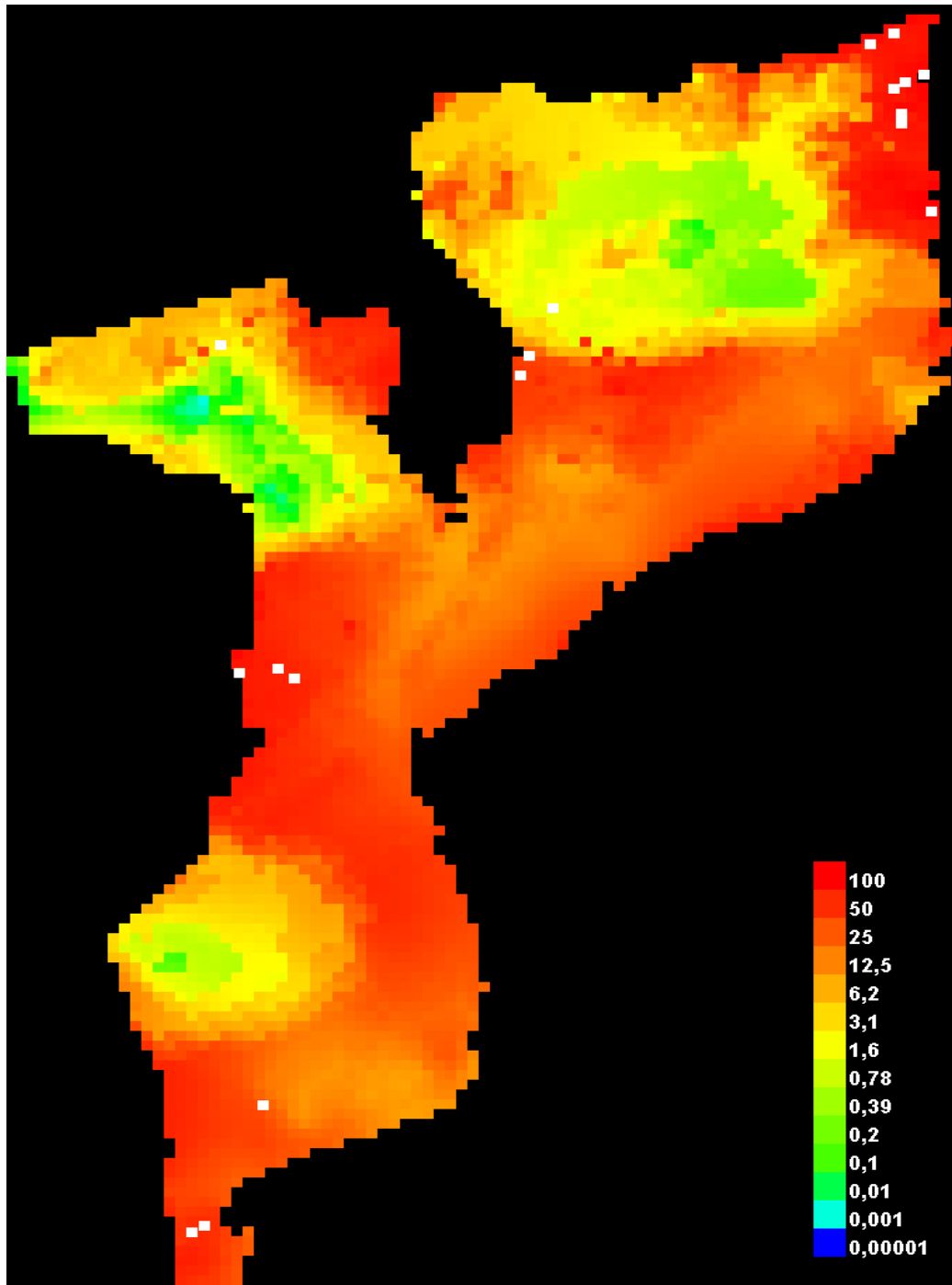


# A farmer trying to recover tomato field by applying insecticides

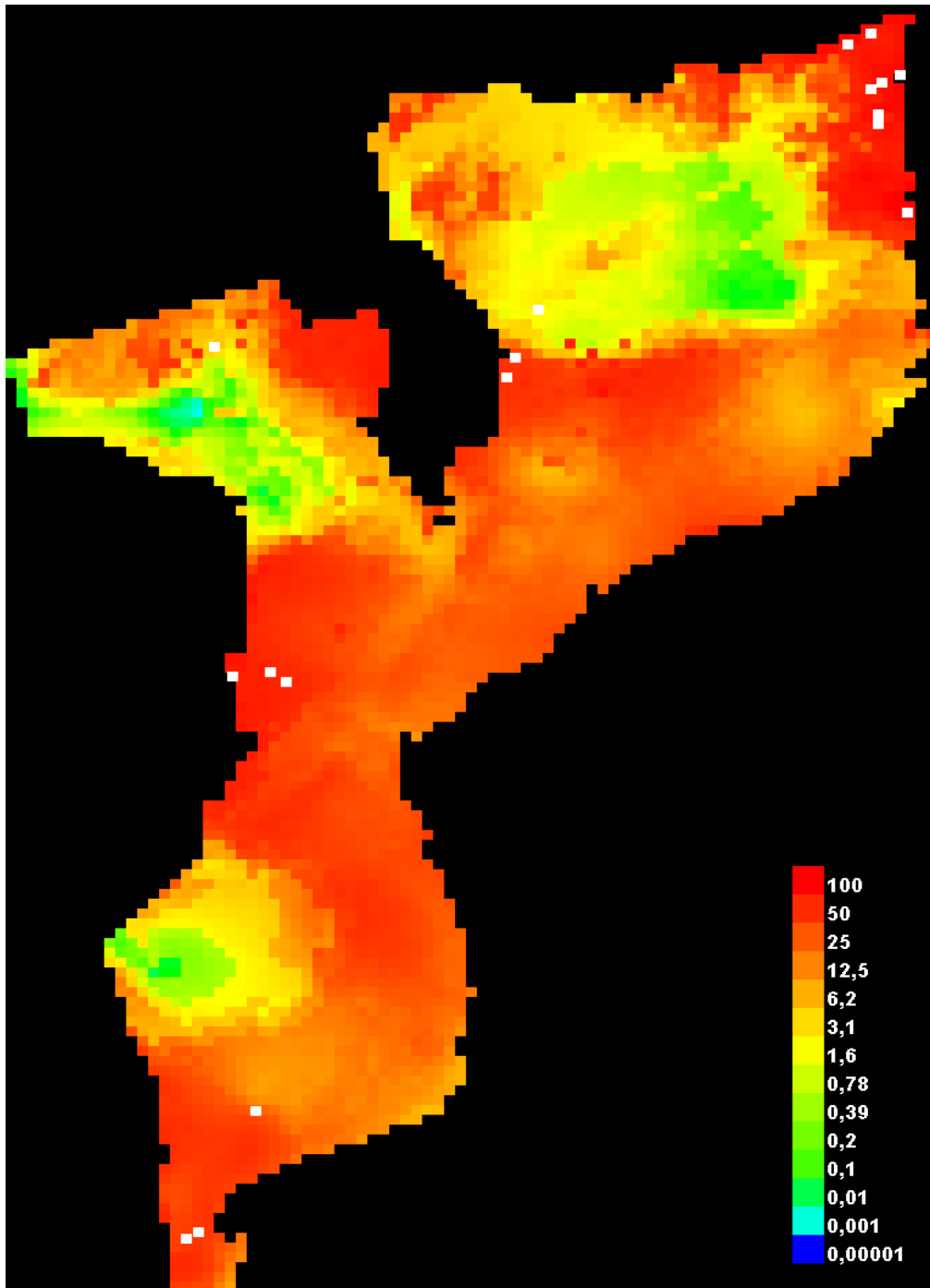




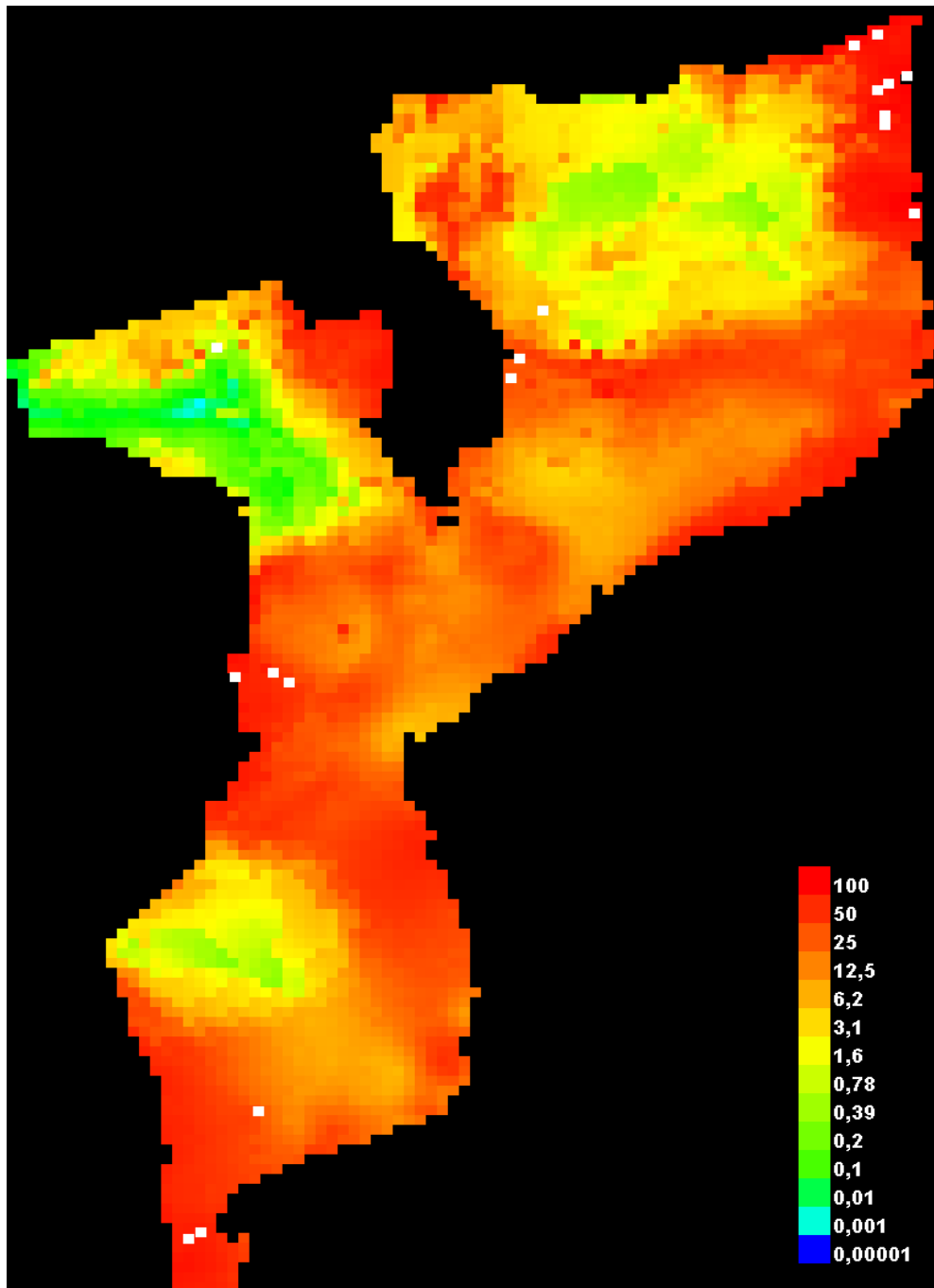
Predicting distribution of *Tuta absoluta* (today)



Predicting distribution of *Tuta absoluta* (next 20 years)



Predicting distribution of  
*Tuta absoluta* (next 50  
years)





# What to do: Controlling methods

**For effective control, need to use more than one strategy targeting more than one development stage;**

- First monitor the presence of *T. absoluta* population (adult male)
- Early in the season place 2 traps/ha
- When 3 moths/trap/week are captured, the farmer should start implementing controlling methods;

- 1. Trapping to reduce the male population**
- 2. Cultural control (Practice of Good Sanitation)**
- 3. Chemical control**
- 4. Biological control**

# 1. Mass trapping to reduce the male population

- First monitor the presence of *T. absoluta* population (adult male)
- Early in the season place 2 traps/ha
- When 3 moths/trap/week are captured, the farmer should start implementing controlling methods;
- When the number of moths is more than 30 adults/trap/ week, the number of traps should increase to 30/ha;
- The lure should be replaced every 6 weeks;

## 2. Cultural control (Practice of Good Sanitation)

- The farmers should inspect the tomato plants for miners, larvae;
- Infested plants and plant parts should be removed and destroyed;
- Plant residues after harvest should also be removed and destroyed
- Eliminate alternative host plants

### **3. Chemical Control**

The use of pesticides should be started when 3 or more moths/trap/week are caught;

## Chemical control:

### Recommened insecticidas :

1. Cypermethrin/Cipermetrina
2. Abamectin
3. Bandits 35% SC (Imidacloprid 350 g/l)
4. **Agricyro (Cyromazine) da Agrifocus (Chokwe)**
5. Runner (methoxyfenozide)

## 5. Biological control

### Search for local and/exotic natural enemies

- There are several parasitoids of *Tuta absoluta* (egg and larvae);



Although invasions are old as life itself, there is no doubt that biological invasions will continue to increase in frequency as global trade increases (Malacrida *et al.*, 2007)

**Are We Prepared to face the challenge posed  
insect invasions?**

# AKNOWLEDGEMENT



Ministério de Agricultura e  
Segurança Alimentar



***icip***e

***African Insect Science for Food and Health***

