# INNOVATIVE GREENHOUSE SUPPORT SYSTEM IN THE MEDITERRANEAN REGION; EFFICIENT FERTIGATION AND PEST MANAGEMENT THROUGH IOT BASED CLIMATE CONTROL

تحسين منظومة الزراعات المحمية بمنطقة البحر الابيض المتوسط بالاعتماد على الفلاحة الذكية واستخدام التقنيات الحديثة

**Système innovant d'aide à la décision pour la serriculture méditerranéenne (Fertigation et lutte phytosanitaire efficientes grâce à un contrôle climatique basé sur l'IoT)**

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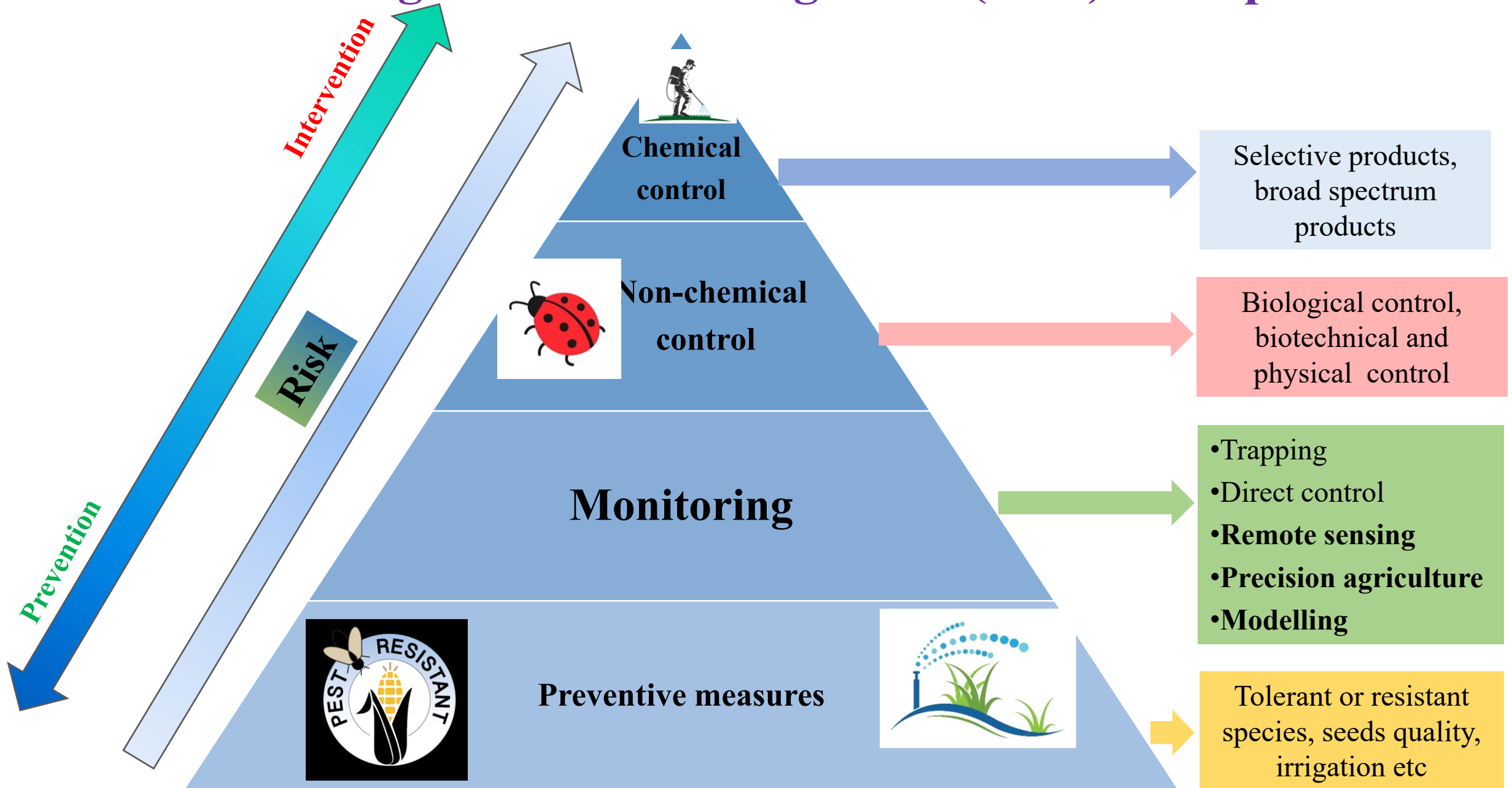# WP 2.2 DEVELOPMENT OF INTEGRATED PEST MANAGEMENT PROTOCOLS

**Concerned partners: BIOPLANET, CRRHAB, CREA, UNIPI, CAJAMAR**

**The importance of climatic parameters in integrated pest management**

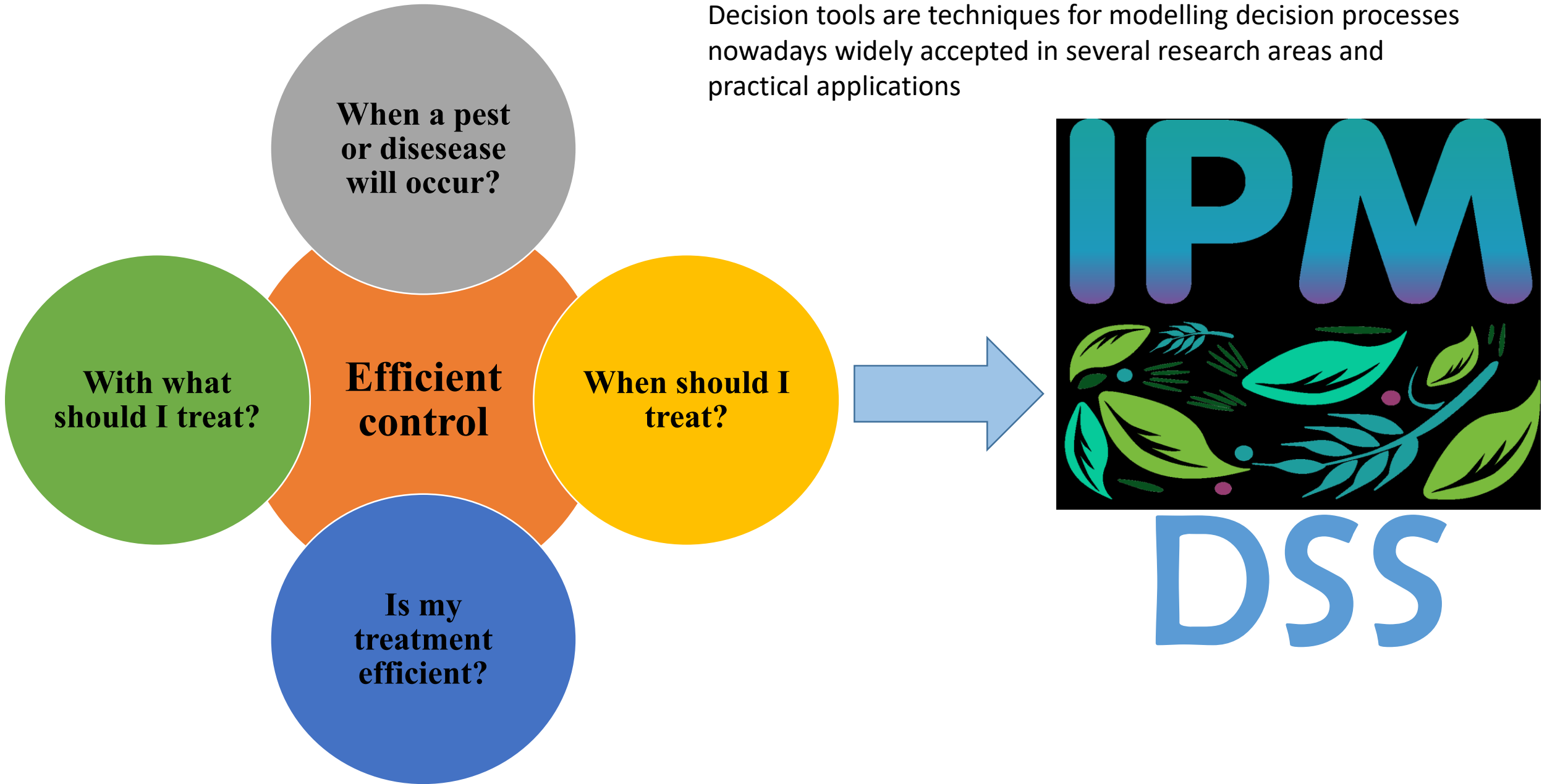ASMA LAARIF, IMED BEN AISSA, MOHSEN MANSOUR, HOUCINE JEDER, THAMEUR BOUSLAMA

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# Integrated Pest Management (IPM) concept



Intervention

Prevention

Risk

Chemical control

Non-chemical control

Monitoring

Preventive measures

Selective products, broad spectrum products

Biological control, biotechnical and physical control

- Trapping
- Direct control
- **Remote sensing**
- **Precision agriculture**
- **Modelling**

Tolerant or resistant species, seeds quality, irrigation etc

# Importance of decision support systems in IPM strategies

Decision tools are techniques for modelling decision processes nowadays widely accepted in several research areas and practical applications

When a pest or disesease will occur?

With what should I treat?

Efficient control

When should I treat?

Is my treatment efficient?

IPM

DSS

The advantages of using DSS in IPM are linked to their capacity to process and analyze complex information and to provide outputs supporting the decision-making process. Nowadays, several DSS have been developed, tackling different issues, and have been applied in different climatic conditions and agricultural contexts.
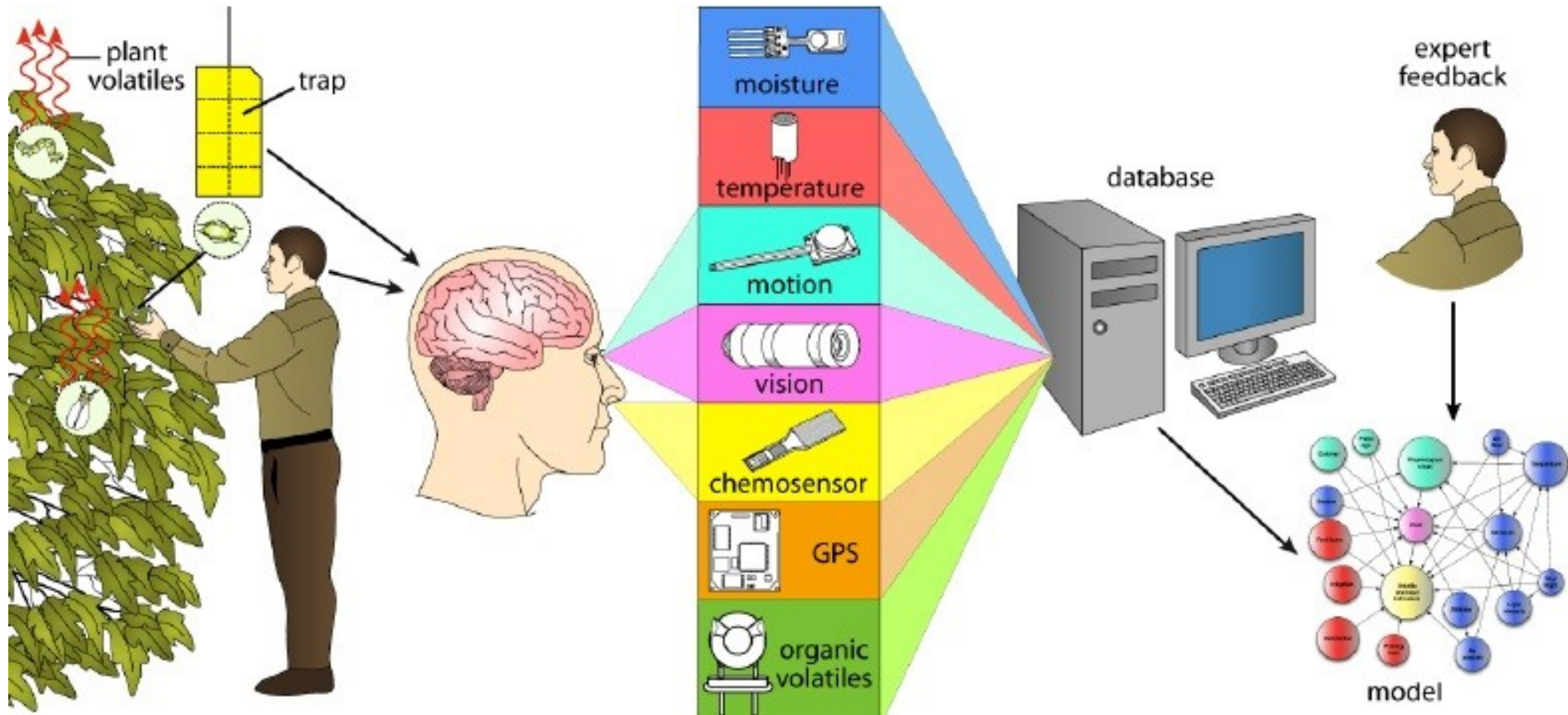


Miresmailli et al (2007).

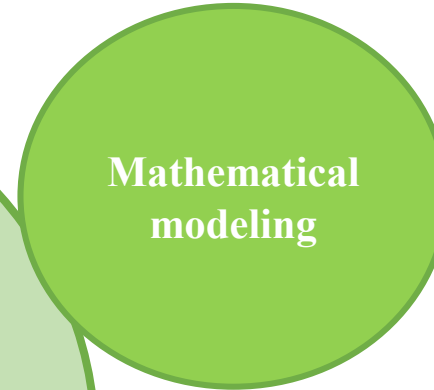# What do we need to develop a DSS for pests and diseases?



The **userfriendly** plateform can be used by farmers

**Laboratory studies**

Study the **biology** of pests and diseases and its relation with **temperature** and **humidity**
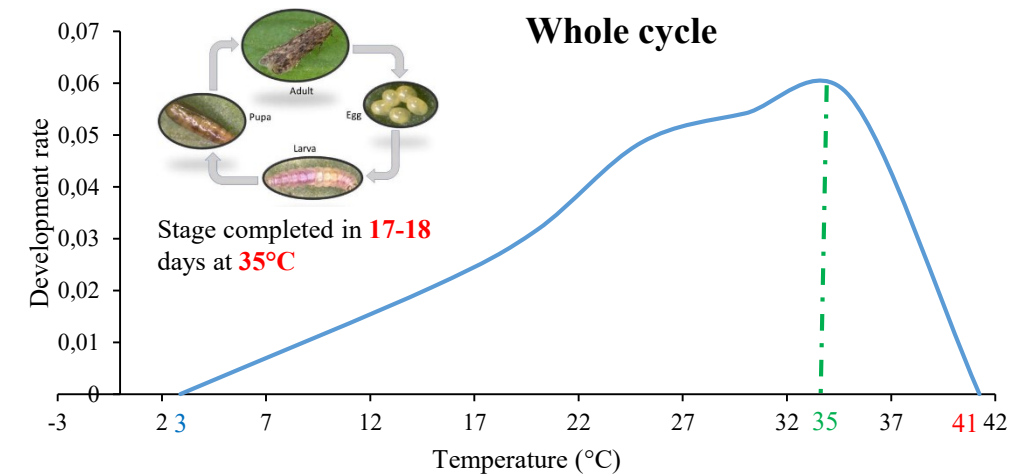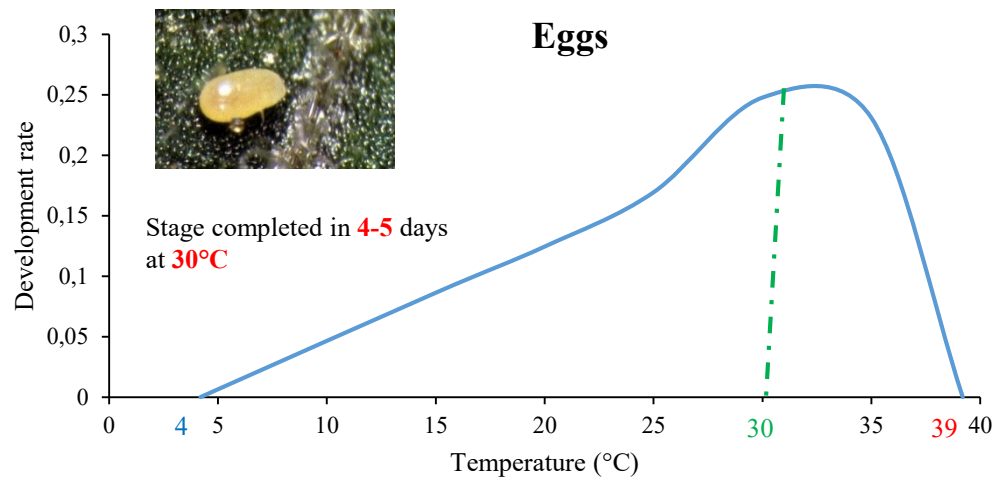
**Spreading**

**Mathematical modeling**

Modeling the **development** of pests and diseases as a function of **climatic factors**

Developing a **plateform** integrating the mathematical models

**Integration**

**Validation**

Pests and diseases **monitoring**
+
**Climatic data** aquisition

# Climatic data and pests and diseases development

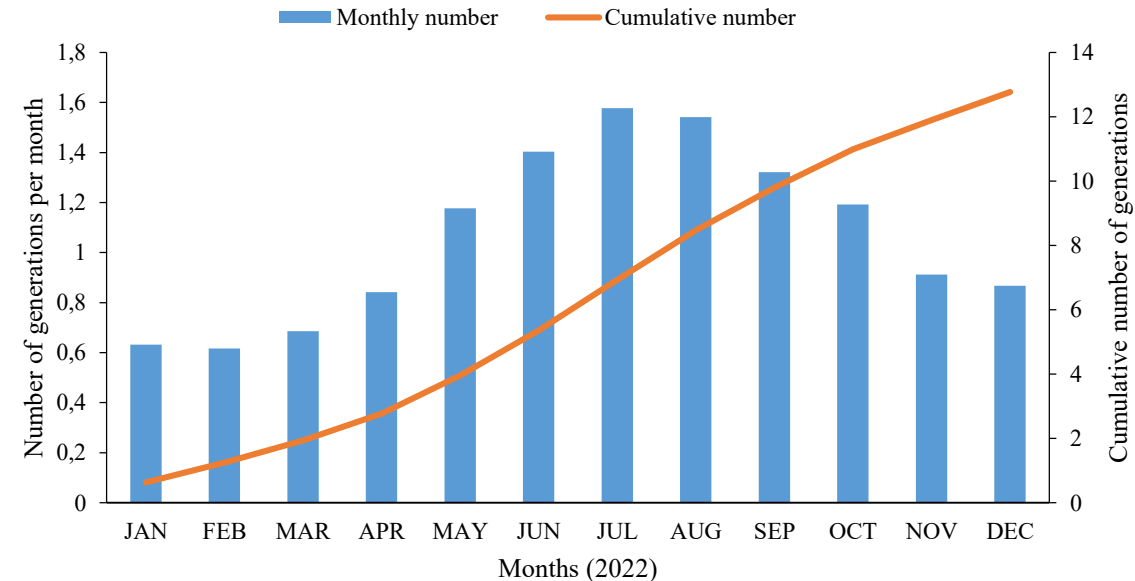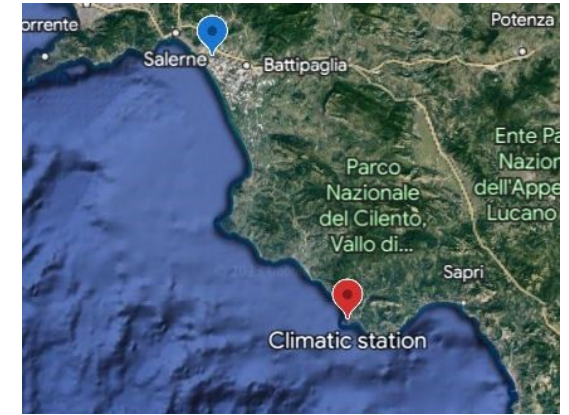## Example: *Tuta absoluta* and temperature



**Eggs**

Stage completed in **4-5** days at **30°C**

**Larvae**

Stage completed in **6-7** days at **35°C**

**Pupae**

Stage completed in **5-6** days at **25°C**

**Whole cycle**

Stage completed in **17-18** days at **35°C**
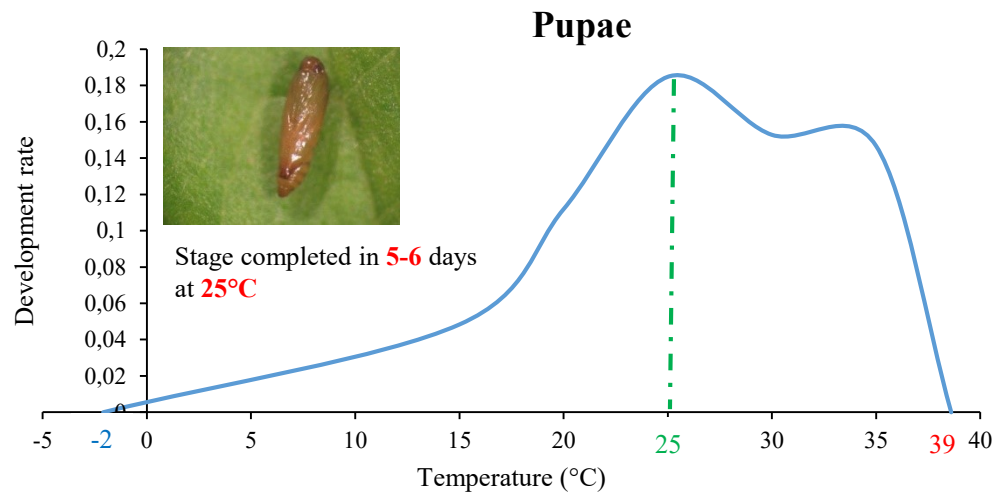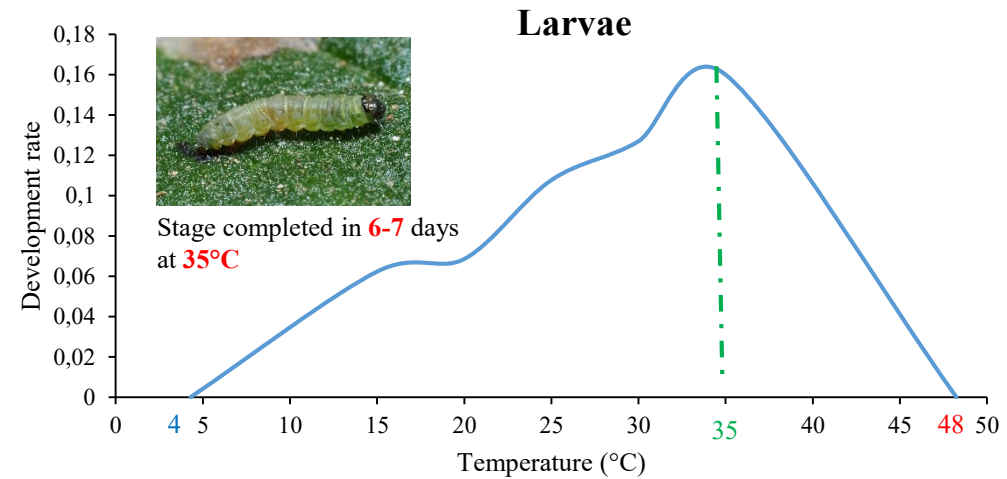
# Climatic data and pests and diseases development

## Example: *Tuta absoluta* in Italy
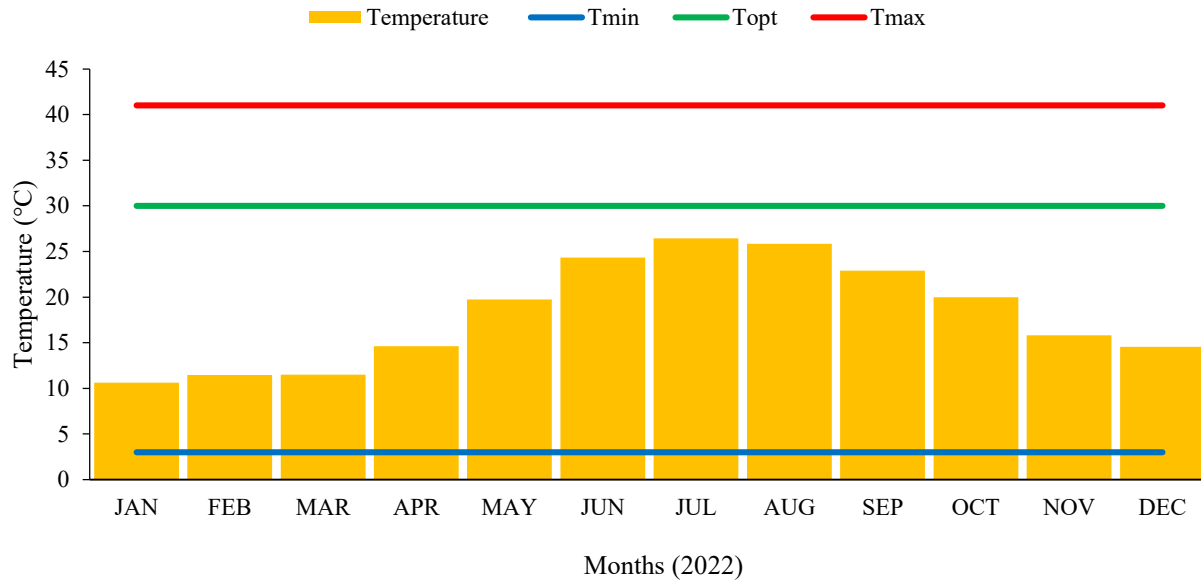


- ❖ The insect can be observed **all year round** if the host plants are present.
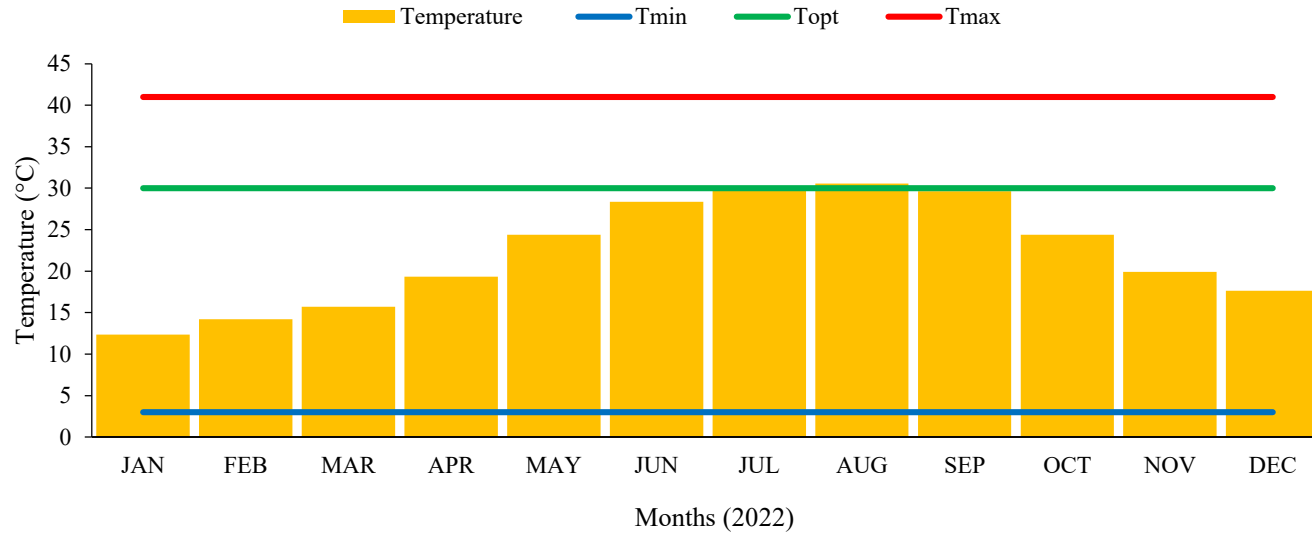
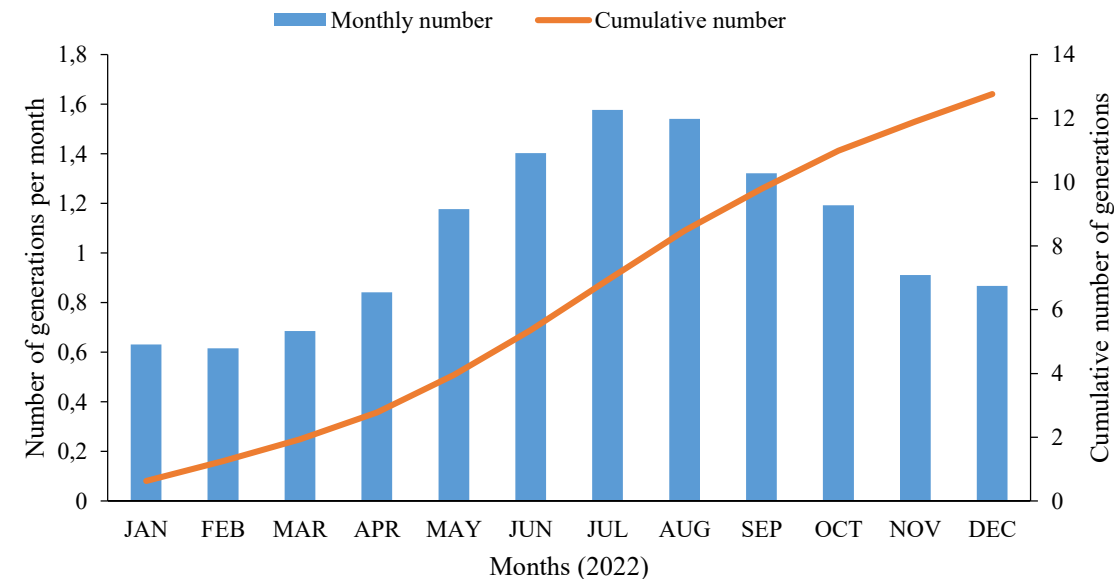- ❖ **12 generations** may have taken place in the year 2022

# Climatic data and pests and diseases development

**Example: *Tuta absoluta* in Tunisia**



- ❖ The insect can be observed **all year round** if the host plants are present.
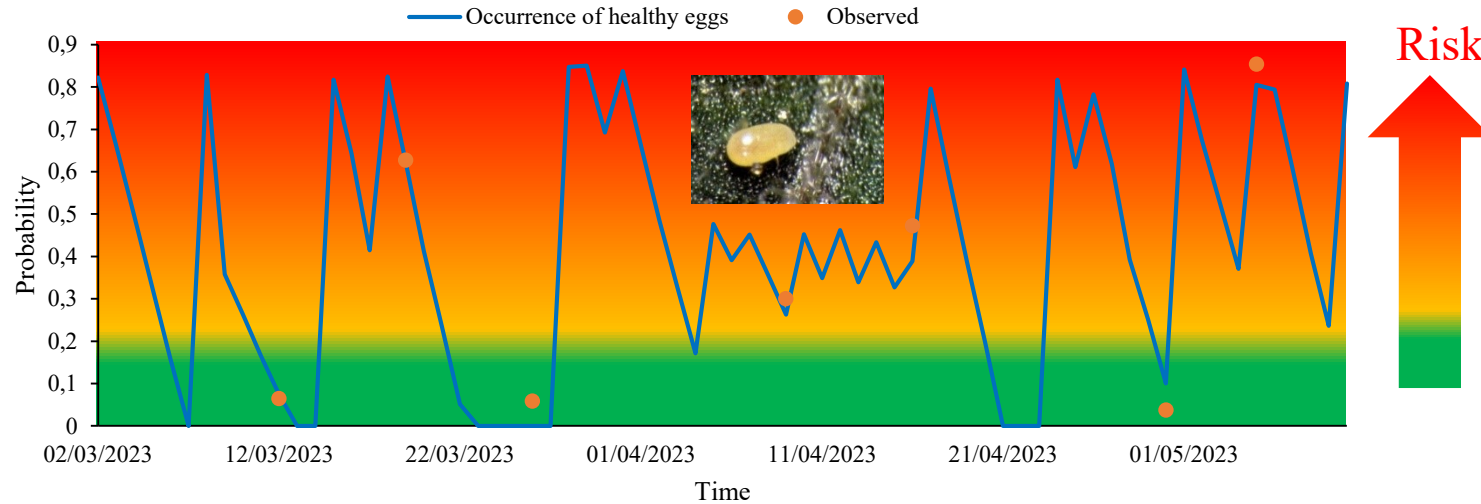- ❖ **13 generations** may have taken place in the year 2022

# First application of a predictive model for *Tuta absoluta* occurrence under greenhouse conditions

❖ La Maison de l'Oasis is a Tunisian-Dutch company located in the region of el Hamma in the governorate of Gabes.

❖ Beefsteak tomatoes for export.

❖ Soilless cultivation in glazed greenhouses (4.5 ha).

❖ Climatic data acquisition.

❖ Direct and indirect control of the different development stages of *Tuta absoluta*.

# First application of a predictive model for *Tuta absoluta* occurrence under greenhouse conditions



❖ The temperature based model allowed estimating the occurrence of larvae and eggs with precision.
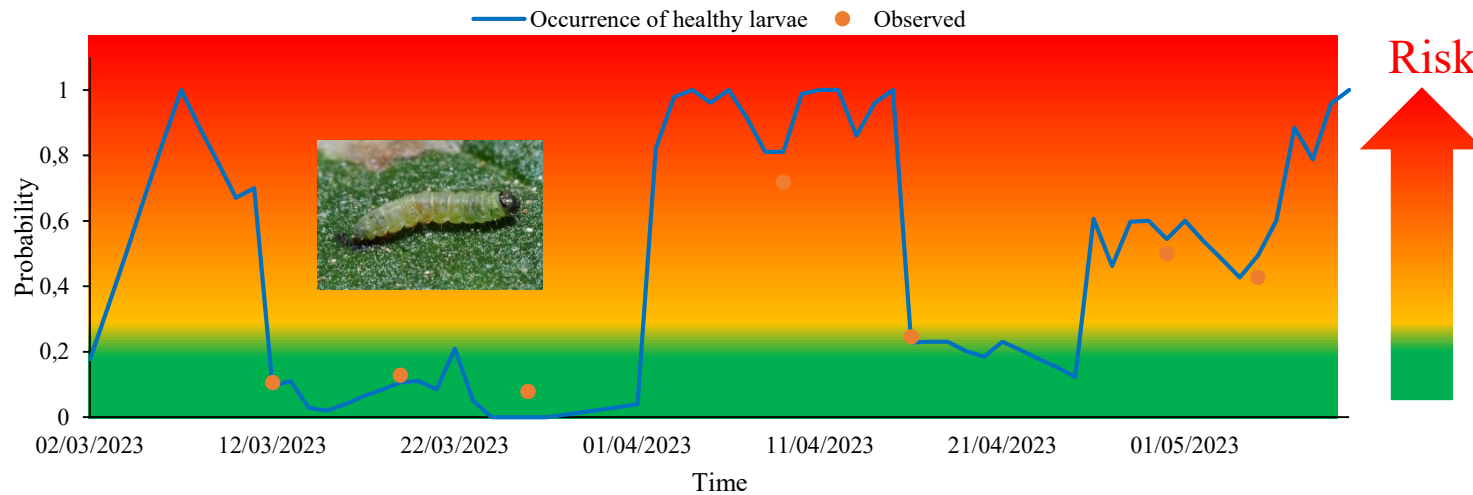
❖ The model considered the treatments performed by the farmer and remained accurate.

# First application of a predictive model for *Tuta absoluta* occurrence under greenhouse conditions
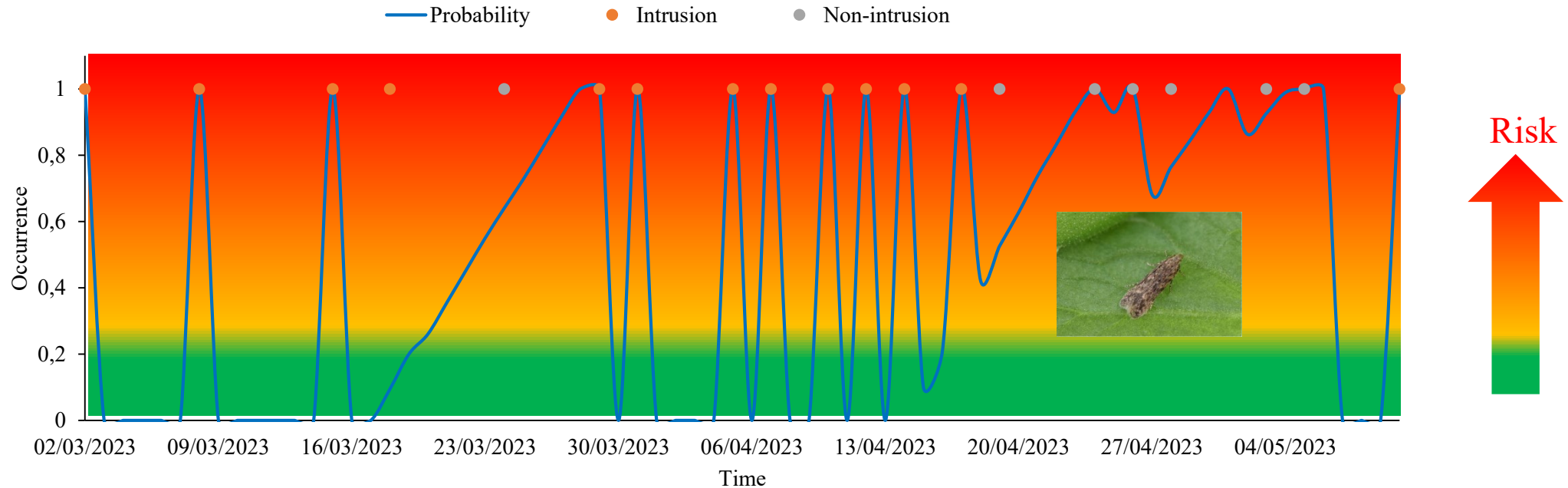


- ❖ The flights were detected by the model with precision.

- ❖ The model not only detected the flights, it was also able to identify the adults who came from outside the greenhouse.

# Thank you !

# Contact

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- ✓ Scholar: https://scholar.google.com/quotes?user=xqcRe44AAAAJ&hl=en