



# Assess cabbage stem flea beetle (*Psylliodes chrysocephala* L.) and rape winter stem weevil (*Ceutorhynchus picitarsis* G.) risk by integrating an agronomical and a pest risk.

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# Context

- The cabbage stem flea beetle (CSFB) and the rape winter stem weevil are the two main pests of WOSR in France, in the autumn.
- Management involving only insecticides is showing its limits : resistance to pyrethroids, reduction of available active ingredients.
- Harmfulness of these two pests is reduced when plant biomass and plant growth are optimal.



**Construction of two tactical risk grids and two decision support tools that integrate agronomic criteria in addition to pest pressure indicators**



*Psylliodes chrysocephala*  
(adult and larvae)



*Ceutorhynchus picitarsis*



# Historical decision rules

- Flea beetle larvae can be reached by insecticides when they change leaves.

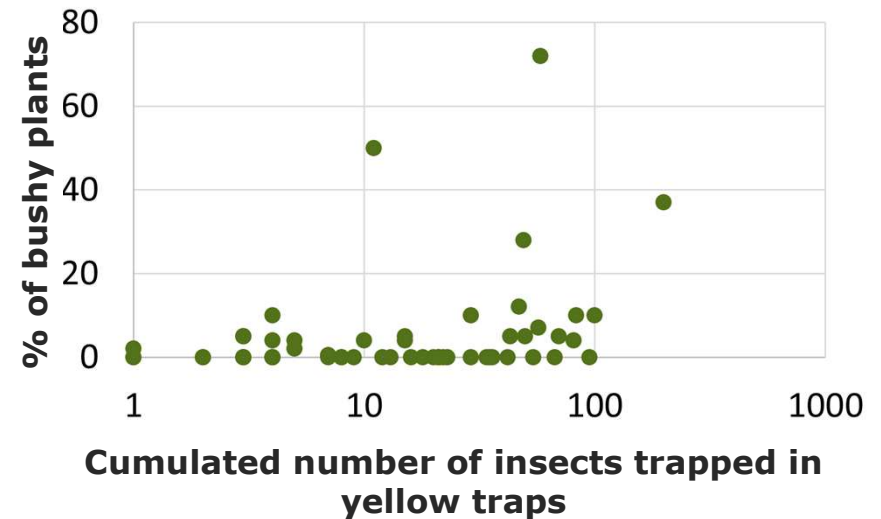


**Threshold : 7 plants / 10 with at least one larvae OR  
2-3 larvae per plant.**

- Discreet insect, difficult to see on plants (yellow traps are essential).
- The number of trapped insects is not representative of the real infestation in the fields, and even less of the damage.
- Eggs and larvae are protected by the plant and are difficult to observe in the field.



**The strategy aims at destroying adults before the start of egg laying which is estimated at 8-10 days after the first captures in yellow traps.**

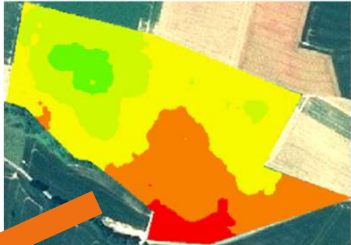


# Plants with important biomass and dynamic growth are less susceptible to autumn pests

Carte de biomasse

Biomasse de matière verte (kg/m <sup>2</sup> )	% Surface
0.0 - 0.2	0.0
0.2 - 0.4	0.0
0.4 - 0.6	5.7
0.6 - 1.0	27.3
1.0 - 1.5	40.9
1.5 - 2.0	21.1
2.0 - 2.5	5.1
2.5 - 3.0	0.0
> 3.0	0.0

Biomasse moyenne produite  kg/m<sup>2</sup>  
Azote moyen absorbé  Unités



Maps « Farmstar » biomass

Harmfulness is highly dependent on the growth dynamics of the plant !

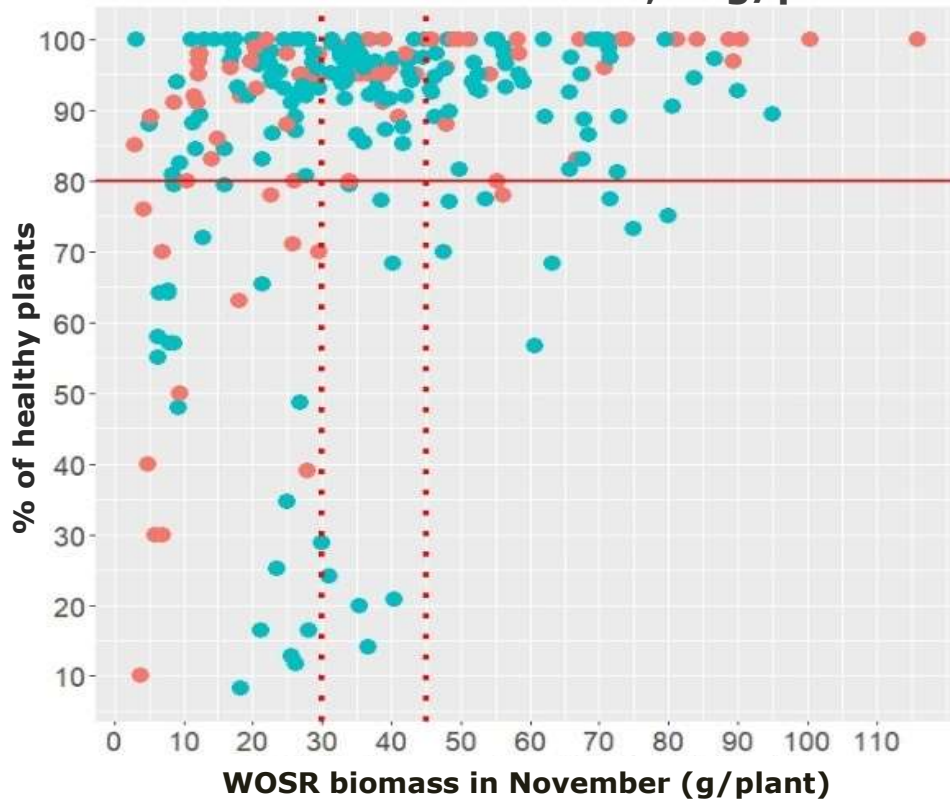


The decision to spray need to be modulated according to agronomic criteria



# Criteria to assess growth dynamics

% of healthy plants according to fresh biomass at the end of November, in g/plant



**Fresh biomass** at the time of the decision :

**Mid-October :**

**25 g/plant** -> 800 g/m<sup>2</sup> for 30 plants/m<sup>2</sup>

**End of November :**

**40-45 g/plant** -> 1.2 – 1.5 kg/ m<sup>2</sup> for 30 plants/ m<sup>2</sup>

- Harmfulness is reduced when plants have a **high fresh biomass**.
- However, a high biomass is not enough: **plants must grow in a continuous way in the autumn and start growing again early at the end of the winter**

(Robert et al., 2019)

## Criteria to assess growth dynamics

- **Rooting quality** (main root of 15 cm before winter and not bent) (*Hébinge*, 2013)
- **Reddening** of WOSR
- **Production context** - context favorable or not to nitrogen availability and plant growth in the autumn and at the end of winter (*Sauzet et Cadoux*, 2019)
  - Previous crop
  - Associations with frost sensitive legume crops (*Verret et al. 2017*, *Sauzet et al. 2019*)
  - Fertilization strategies (*Robert et al.*, 2019)



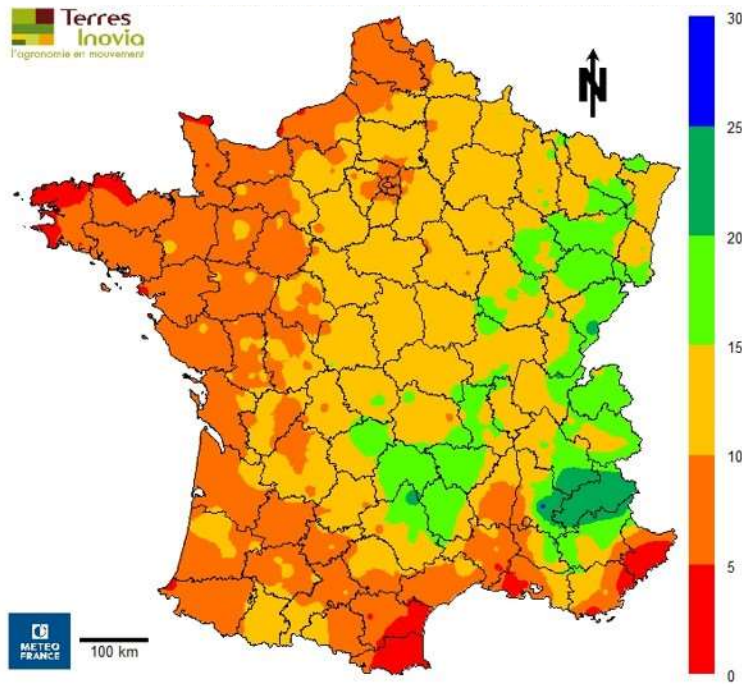
**Biomass comparison between fertilised and unfertilised plots at sowing (end of November).**



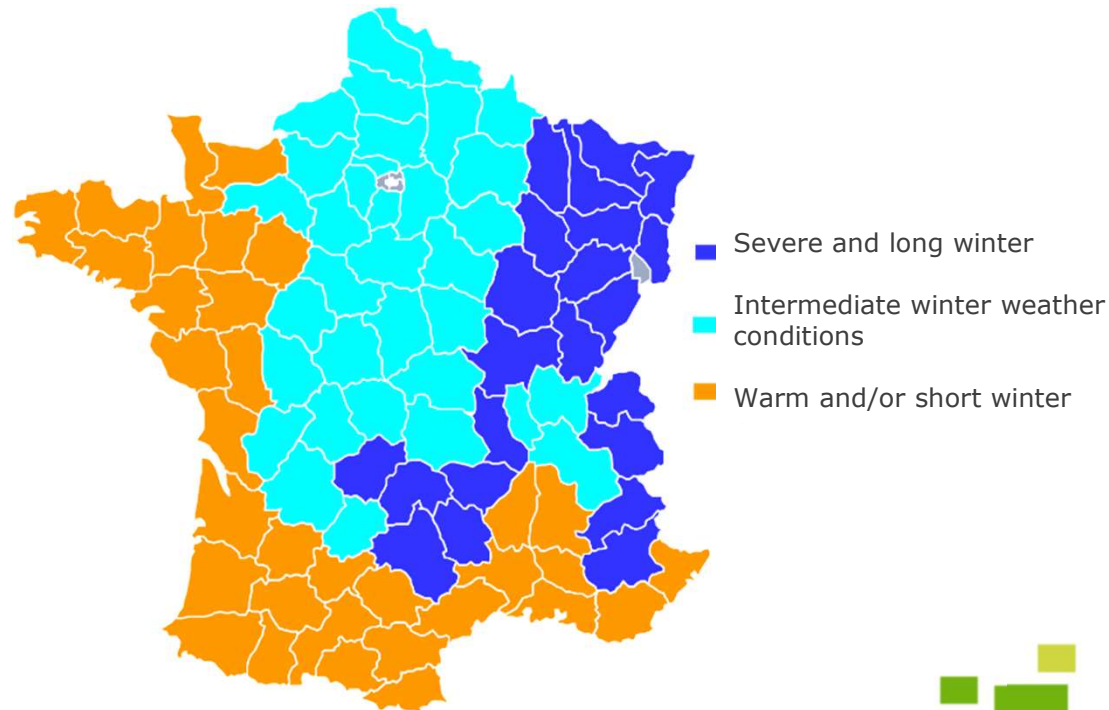
# Criteria to assess growth dynamics

## Winter weather conditions and growth dynamics of WOSR at the end of the winter

Number of days with temperature below 0°C between the 1<sup>st</sup> and the 28<sup>th</sup> of February (1999-2019)



France division considered in the risk grid

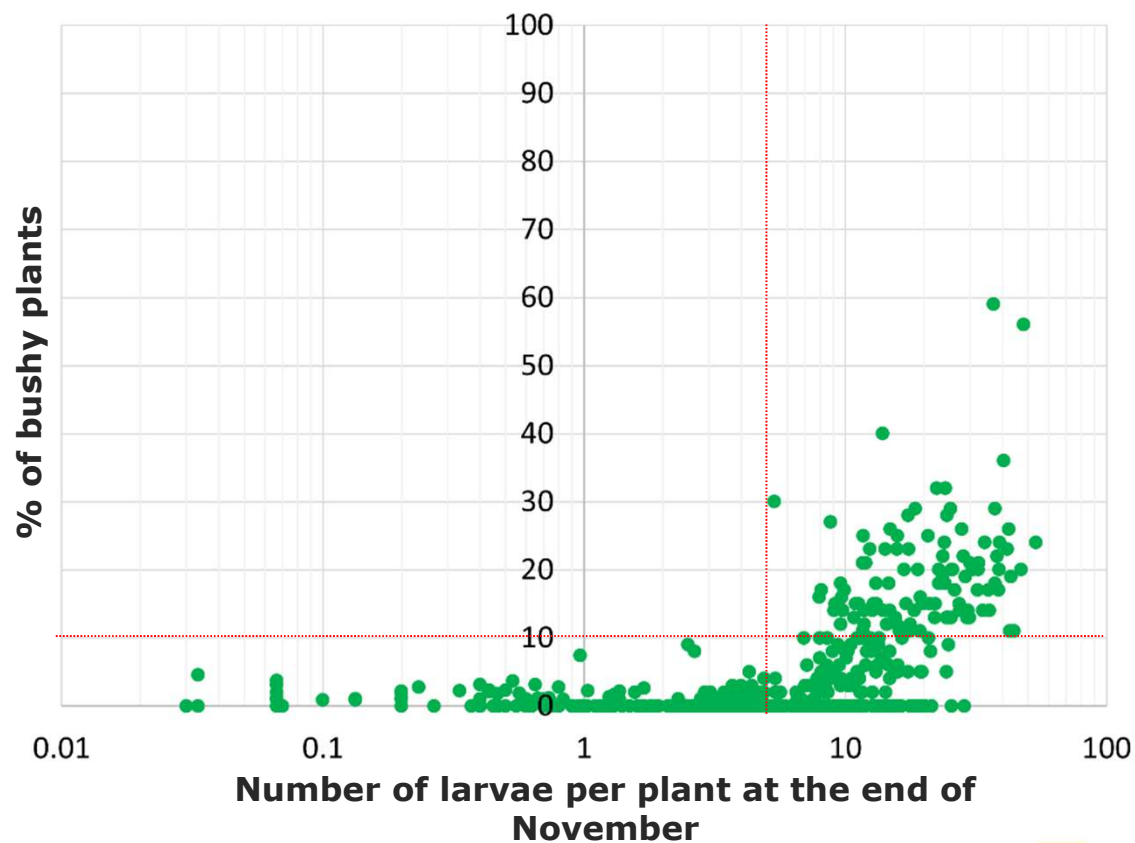


# CSFB pressure is evaluated through the number of larvae per plant at the beginning of winter



Percentage of bushy plants according to the number of CSFB larvae per plant at the beginning of winter in Western and Northern France (logarithmic scale) (2013-2019).

Below 5 larvae per plant, the percentage of damage is reduced, especially in the West of France.



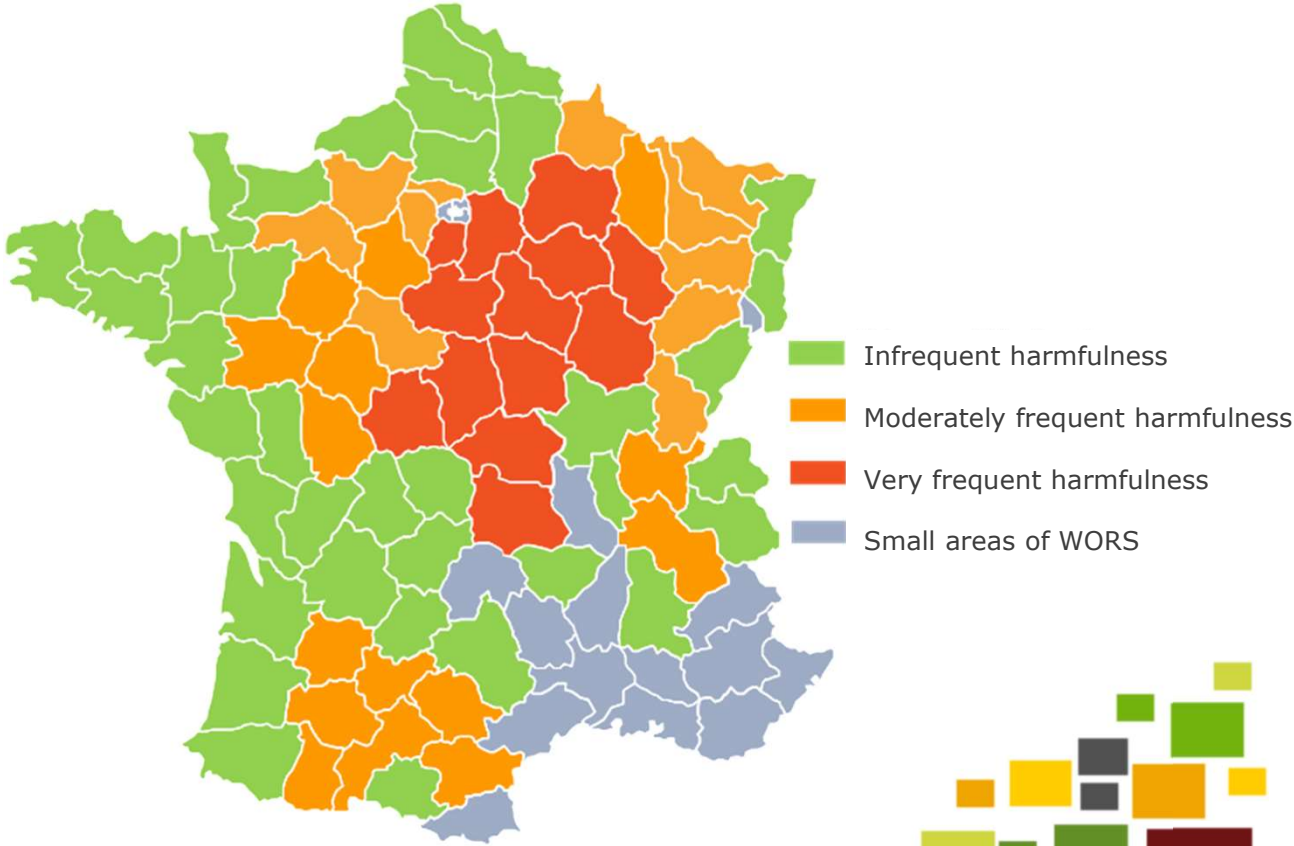


# Consideration of the historical risk related to the presence of the rape winter stem weevil.



- There is no relationship between the number of weevils trapped and the intensity of damage.
  - The pressure and the harmfulness of these insects are variable according to the sectors.
- ↓
- The risk evaluation considers the frequency and the intensity of damage the previous years.

Frequency of the harmfulness of the rape winter stem weevil (Terres Inovia expertise)



# Examples of risk evaluation



When the agronomic risk is low and the number of larvae per plant is lower than 5 larvae per plant, the risk is considered as low

**-> No treatment recommended**



In sectors where the historical harmfulness is low to medium AND the agronomic risk is low, even if weevils are trapped, the risk is considered as low

**-> No treatment recommended**

CSFB Larval infestation	Agronomic risk	Risk assessment
> 5 larvae / plant	Biomass < 45 g/plant OR Limited growth OR Long / intermediate winter	High risk
	Biomass > 45 g/plant AND Continuous growth with good nitrogen availability AND Short/warm winter	Medium risk
Between 5 and 3 larvae / plant	Biomass < 30 g/plant OR Limited growth	High risk
	30 g/plant < Biomass < 45 g/plant AND Continuous growth with good nitrogen availability	Medium risk
	Biomass > 45 g/plant AND Continuous growth with good nitrogen availability AND Long winter	Medium risk
	Biomass > 45 g/plant AND Continuous growth with good nitrogen availability AND Short/warm or intermediate winter	Low risk
< 3 larvae / plant	All situations	Low risk

# The risk grids have been implemented in two Decision Support Tools.

- **Tactical** and **educational** tools.
- **Evolving** tools: adaptation according to the evolution of the context AND knowledge.
- Tools available free of charge online on the Terres Inovia website, **since October 2021.**



# Simple questions -> a detailed risk analysis

- In which department is your farm located ?
- Is WOSR in a favorable context for growth in the autumn (deep soil, favorable previous crop, nitrogen and phosphor availability, association with legume crops...) ?  Yes  No
- Is WOSR well rooted (long and unbent root)?  Yes  No
- Is the WOSR starting to turn red (nitrogen deficiency) ?  Yes  No
- Number of plant / m2 ?
- Fresh biomass (g/m2) ?
- Number of CSFB larvae per plant ?



## Assessment of :

- Agronomic risk (note from 0 to 10)
- Insect risk
- Global risk

The assessment is associated with an explanation.

## Treatment advice according to the pyrethroid resistance context (S1-1, Laurent Ruck)



# Conclusion

- **Pest risk assessment takes different factors into account. These tools facilitate risk analysis AND decision-making.**
- **These tools have also an educational purpose: to draw attention to the importance of agronomic factors in limiting the harmfulness of these insects.**
- **Relying on insecticides, in the current context is not sustainable. It is the implementation of all available techniques in an agroecological approach that will allow farmers to deal with bio-aggressors.**
  - Avoidance strategies
  - Robust oilseed rape with continuous growth
  - Respect and promotion of natural enemies
  - Use of insecticides as a last resort in compliance with decision rules



# References

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**Thank you for your attention !**

