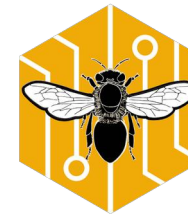


BeeNet



Bees and biodiversity  
in environmental  
monitoring



## Facts behind the SUR

Real-life data using bees as indicators

# Major threats to pollinators in agroecosystems

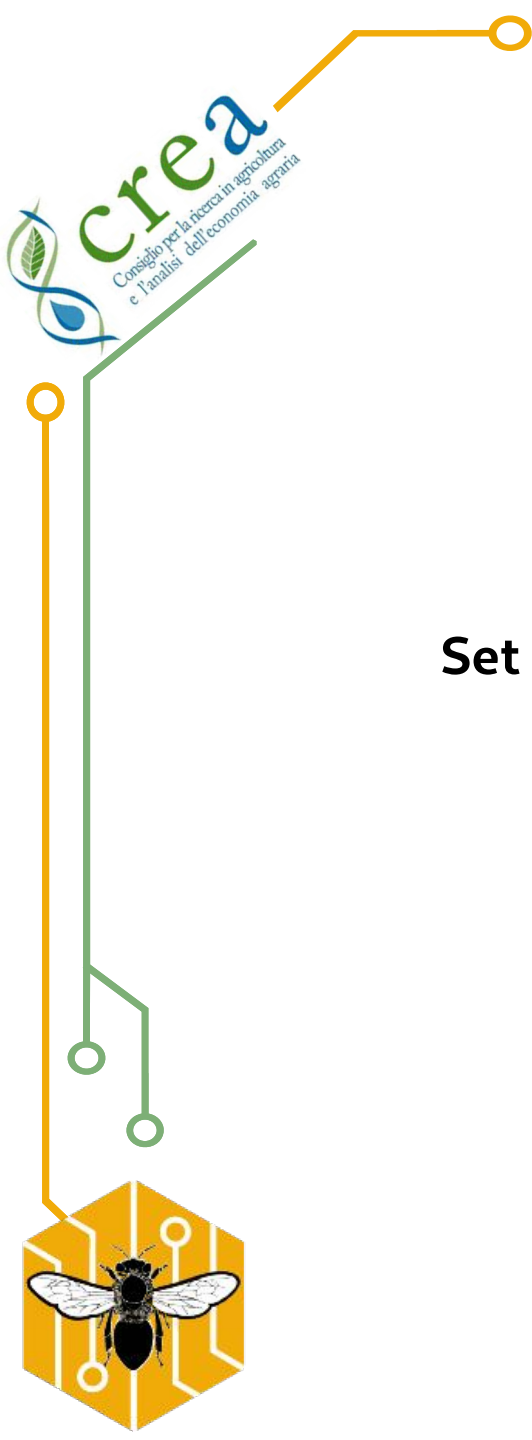


- Low plant diversity
- Short flowering period
- Non-melliferous plants



- Pesticides
- Indiscriminate mowing
- Modern cultivars:
  - barely proteic pollen
  - scarce nectar production





BeeNet



**Set and maintain a nation-wide network for monitoring bee health status**

**Evaluate the quality of Italian agroecosystem through bees**

# BeeNet



## WILD BEES

- 11 regions
- total 24 sites:
  - 12 intensive agroecosystems
  - 12 semi-natural ecosystems
- transects 200x2m
- once a month – bee and plant species



## HONEY BEES



- 20 regions
- 370 apiaries, 5 colonies each
- 4 times a year – colony inspection and pathology
- twice a year – bee bread sampling
- 1/3 high-tech hives



# BeeNet

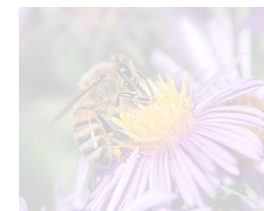


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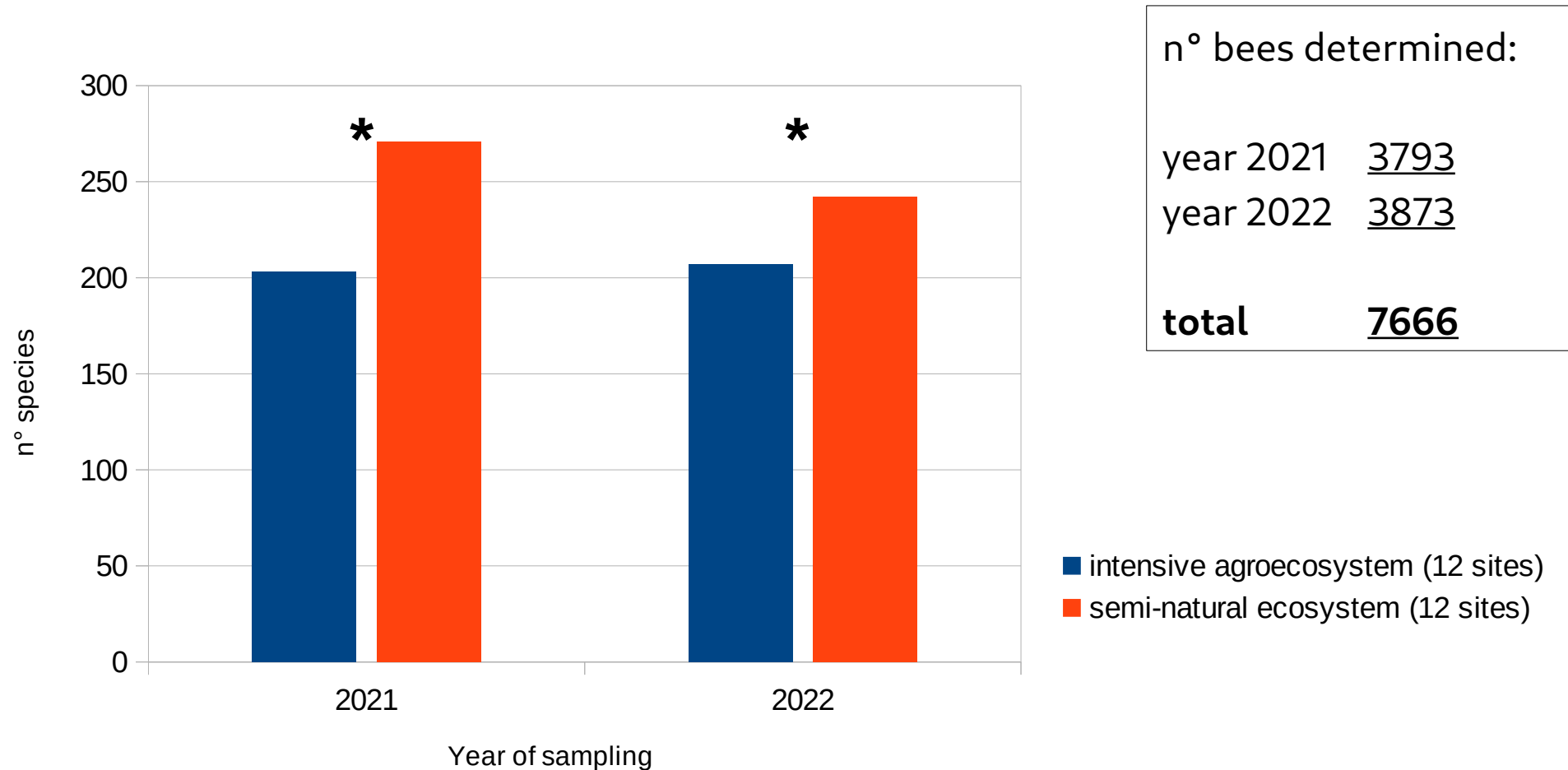
## HONEY BEES



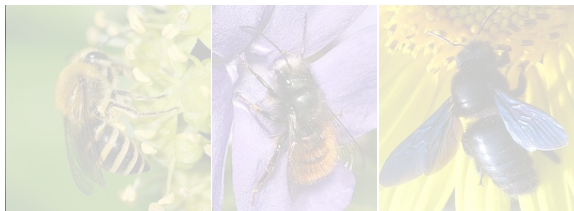
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# Species richness in different environments

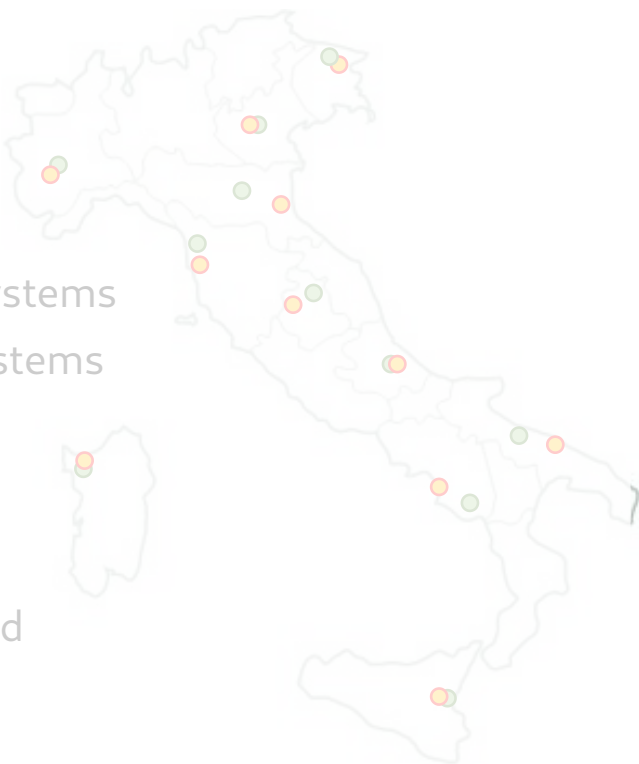


# BeeNet



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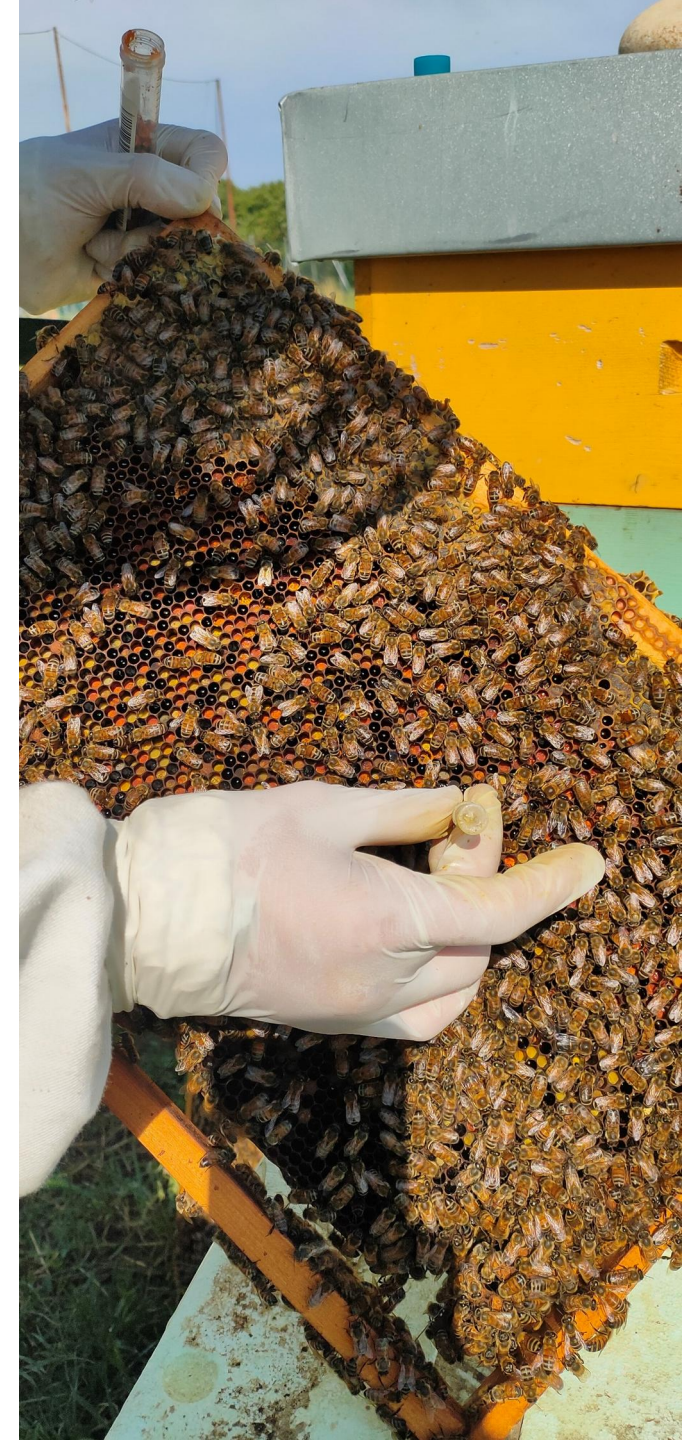


# Beebread sampling

- **Twice a year:** March and June
- Minimum: 10mL (approx. 5g) of beebread from each apiary
- From at least 3 points in 3 different frames of each of the 5 hives (min **45 points per apiary**)
- Research of **514** different active ingredients
- Analysis of the **protein content**

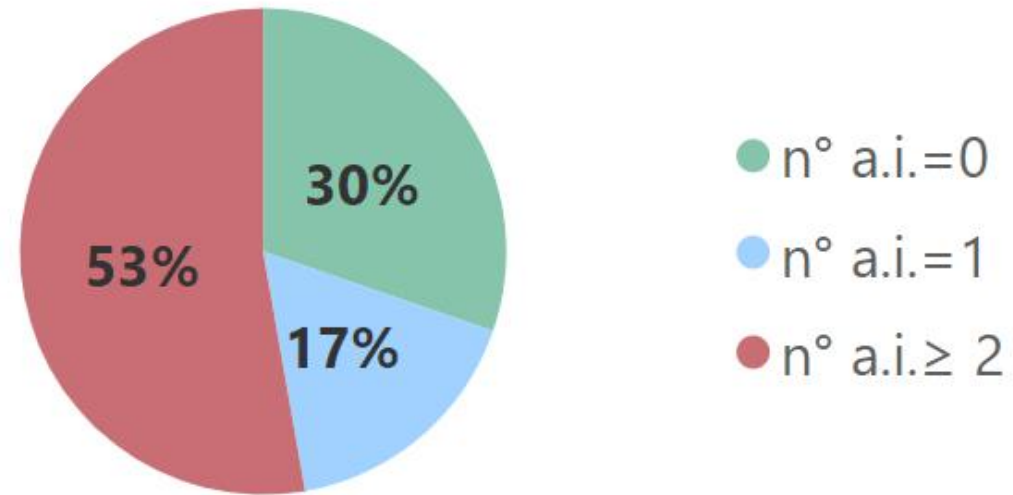


*Beebread collector*

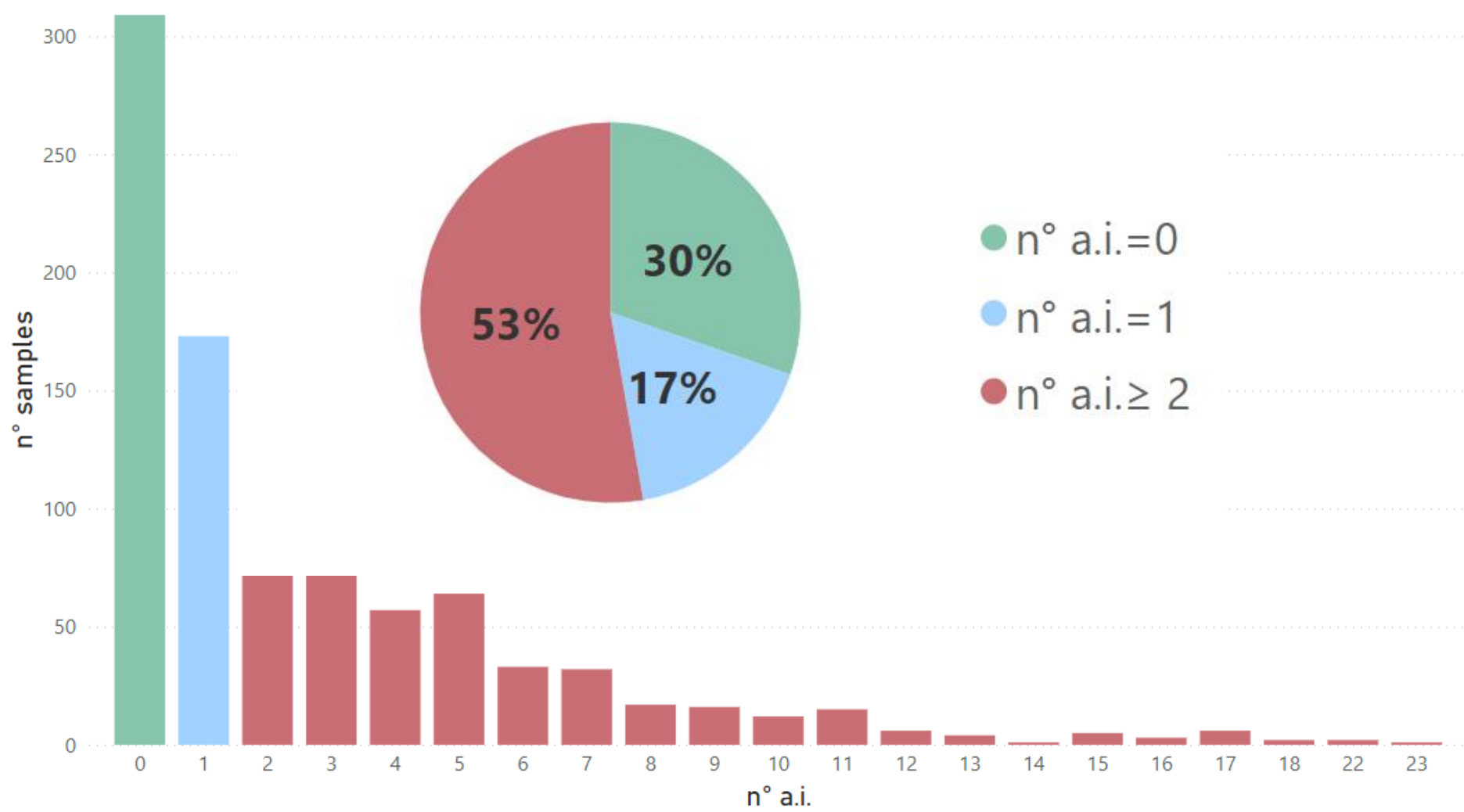




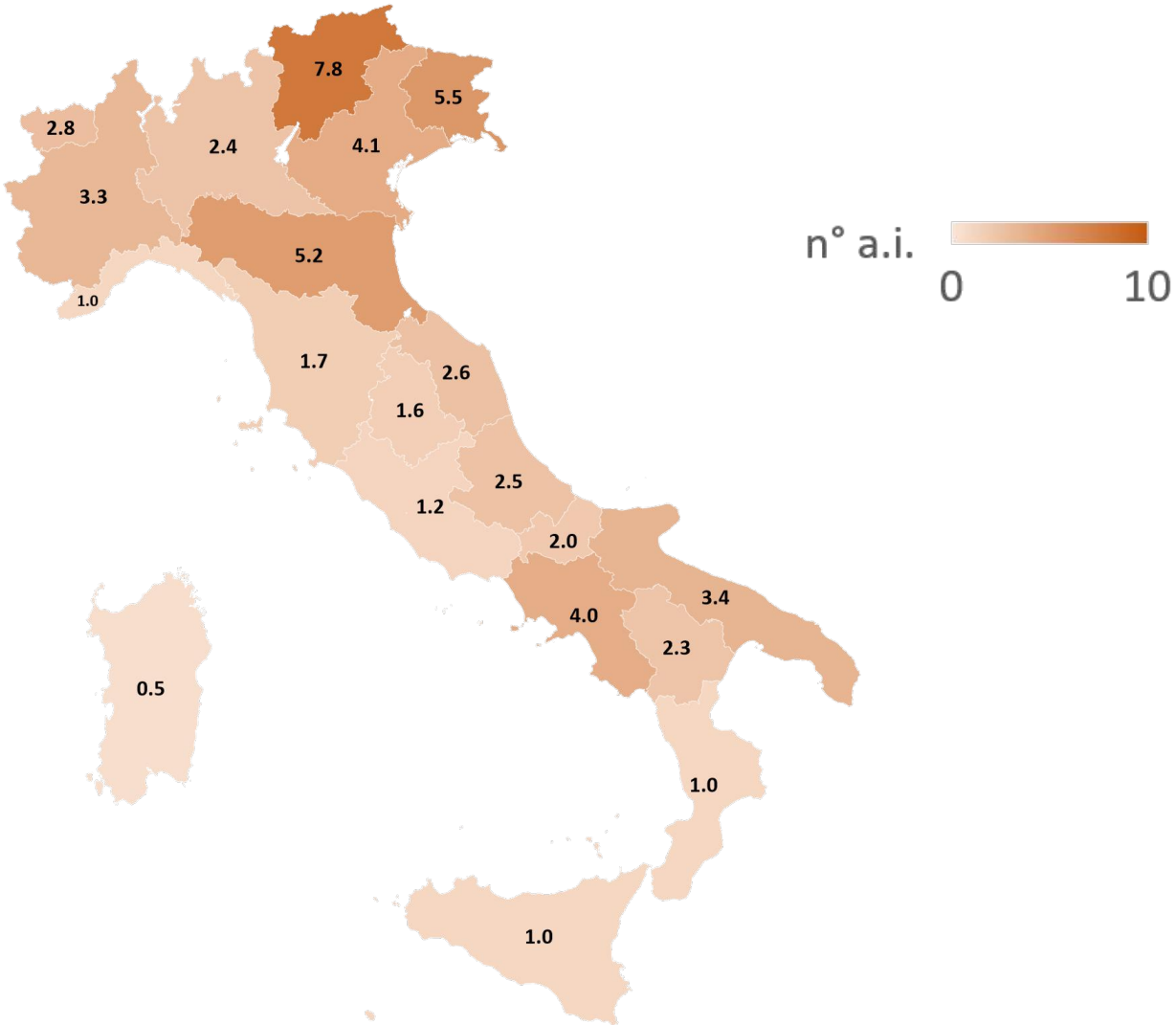
# Number of active ingredients per sample



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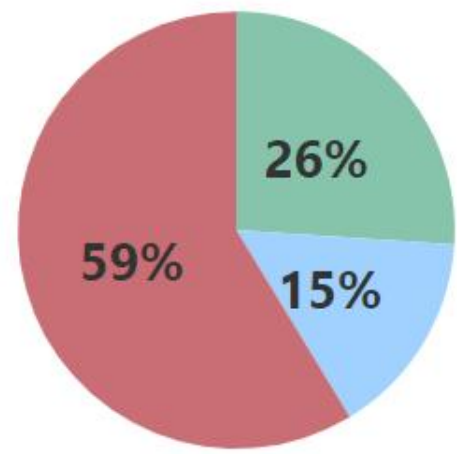


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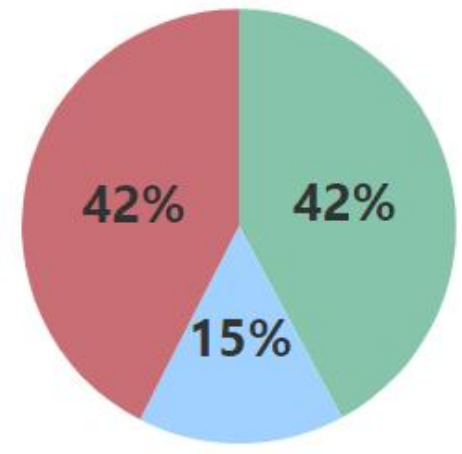


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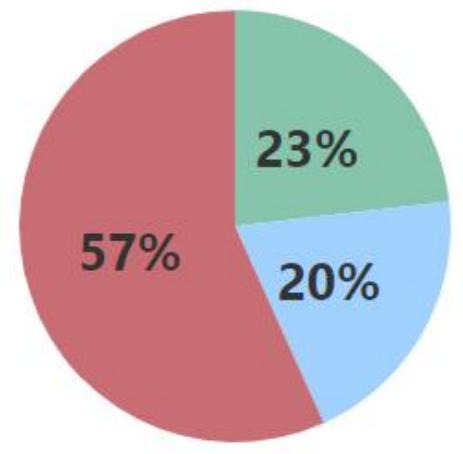
June 2021



March 2022



June 2022



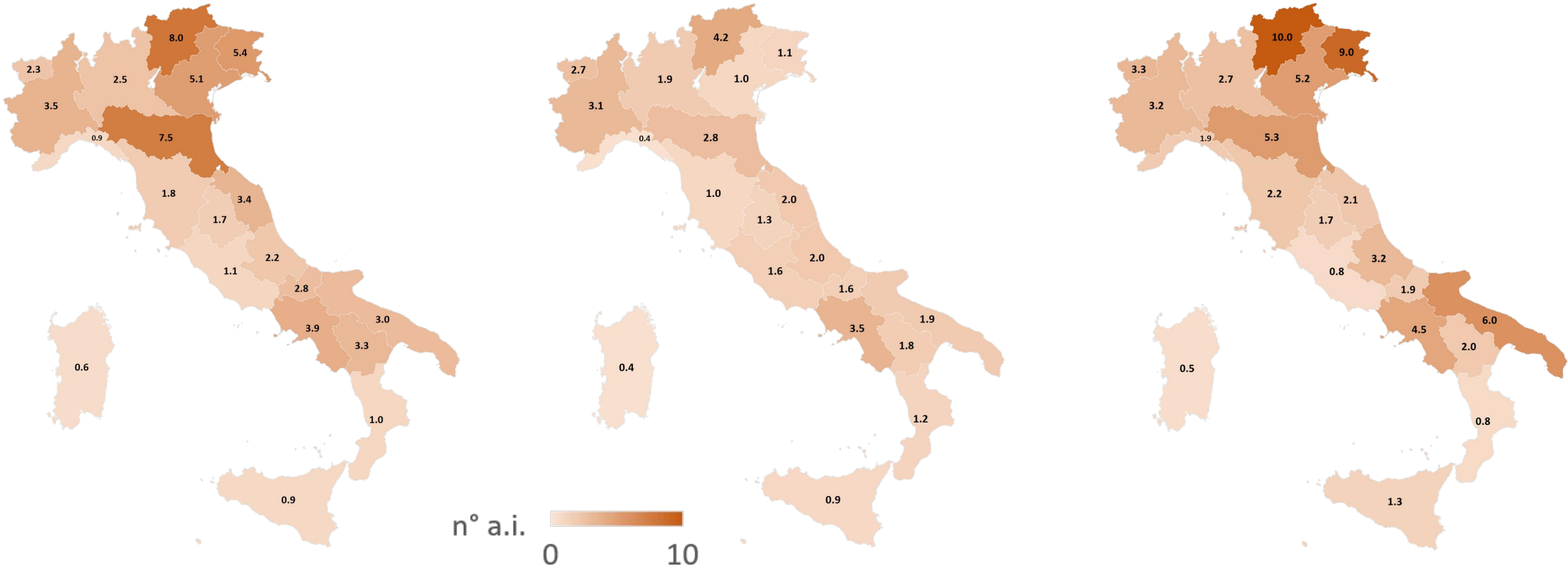
- n° a.i. = 0
- n° a.i. = 1
- n° a.i. ≥ 2

# Number of active ingredients per sample

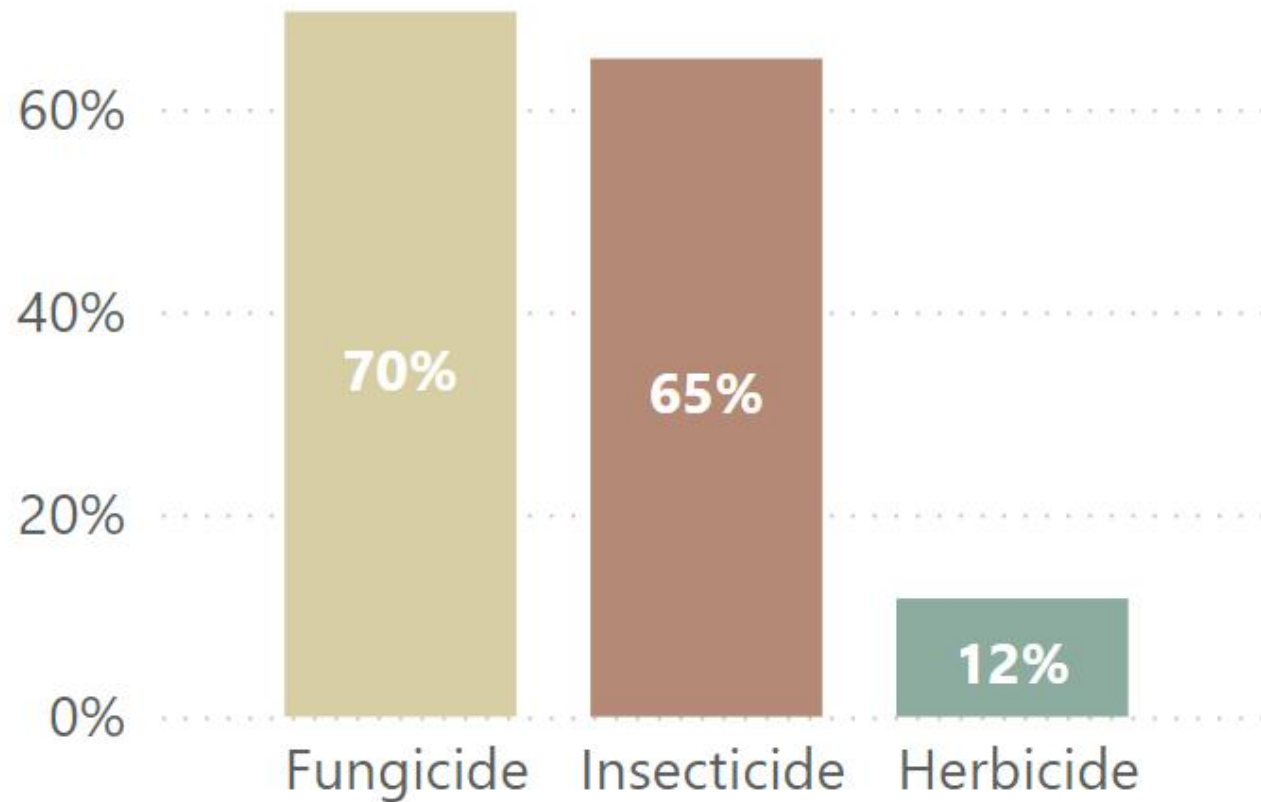
June 2021

March 2022

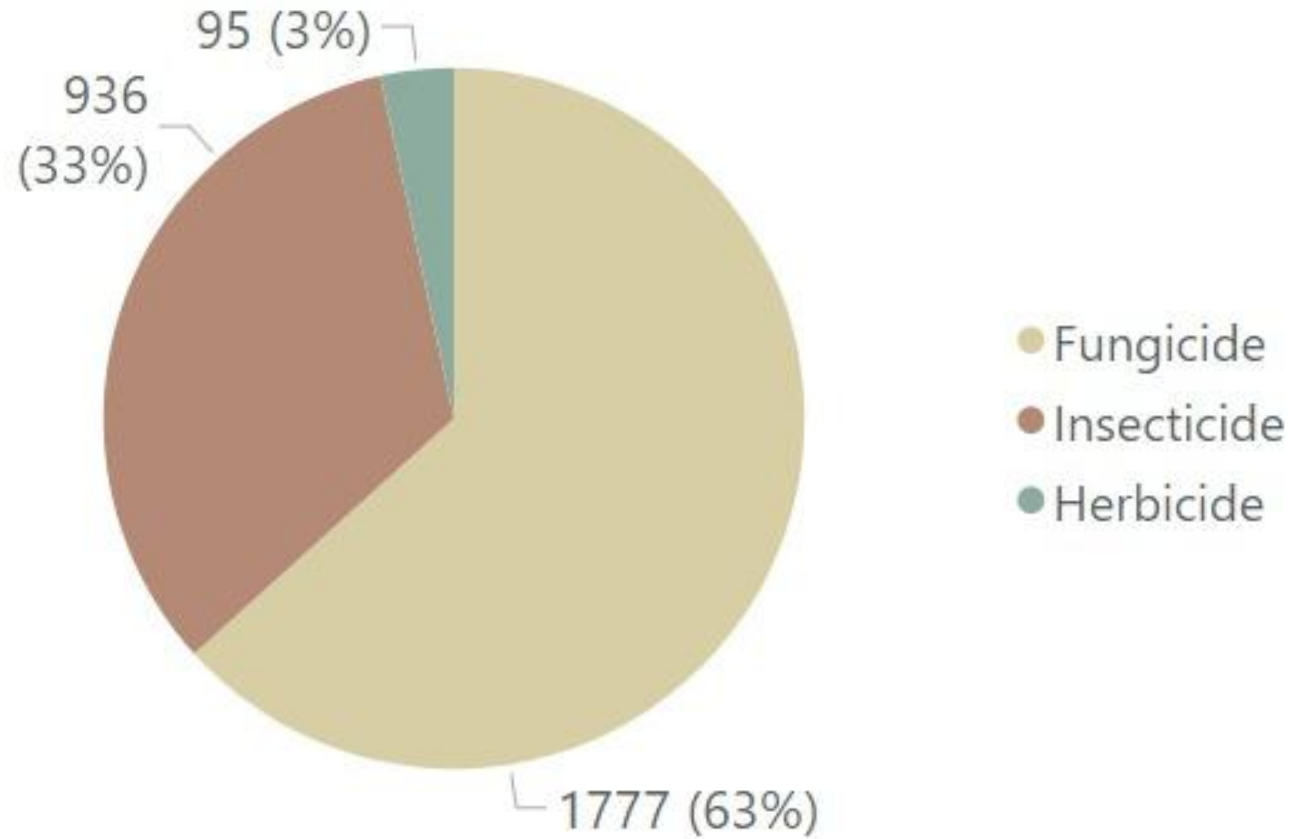
June 2022



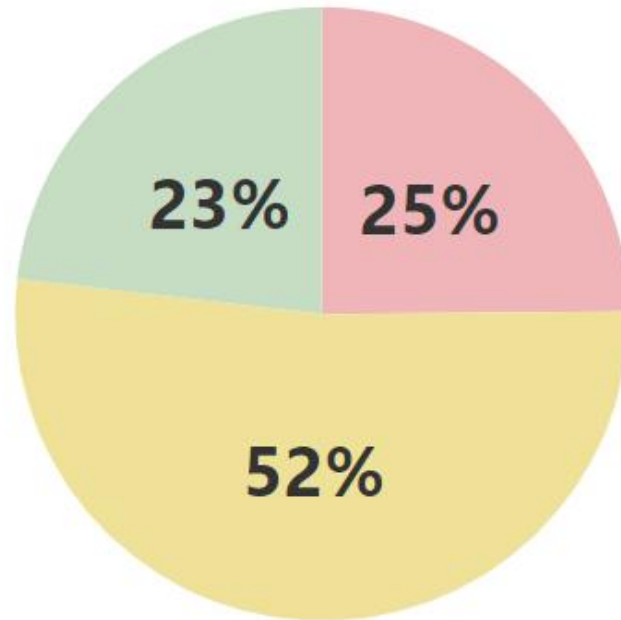
# Class of active ingredients in positive samples



# Class of active ingredients in all the analyses



# Toxicity of active ingredients in positive samples



- High < 1
- Medium 1 - 100
- Low > 100

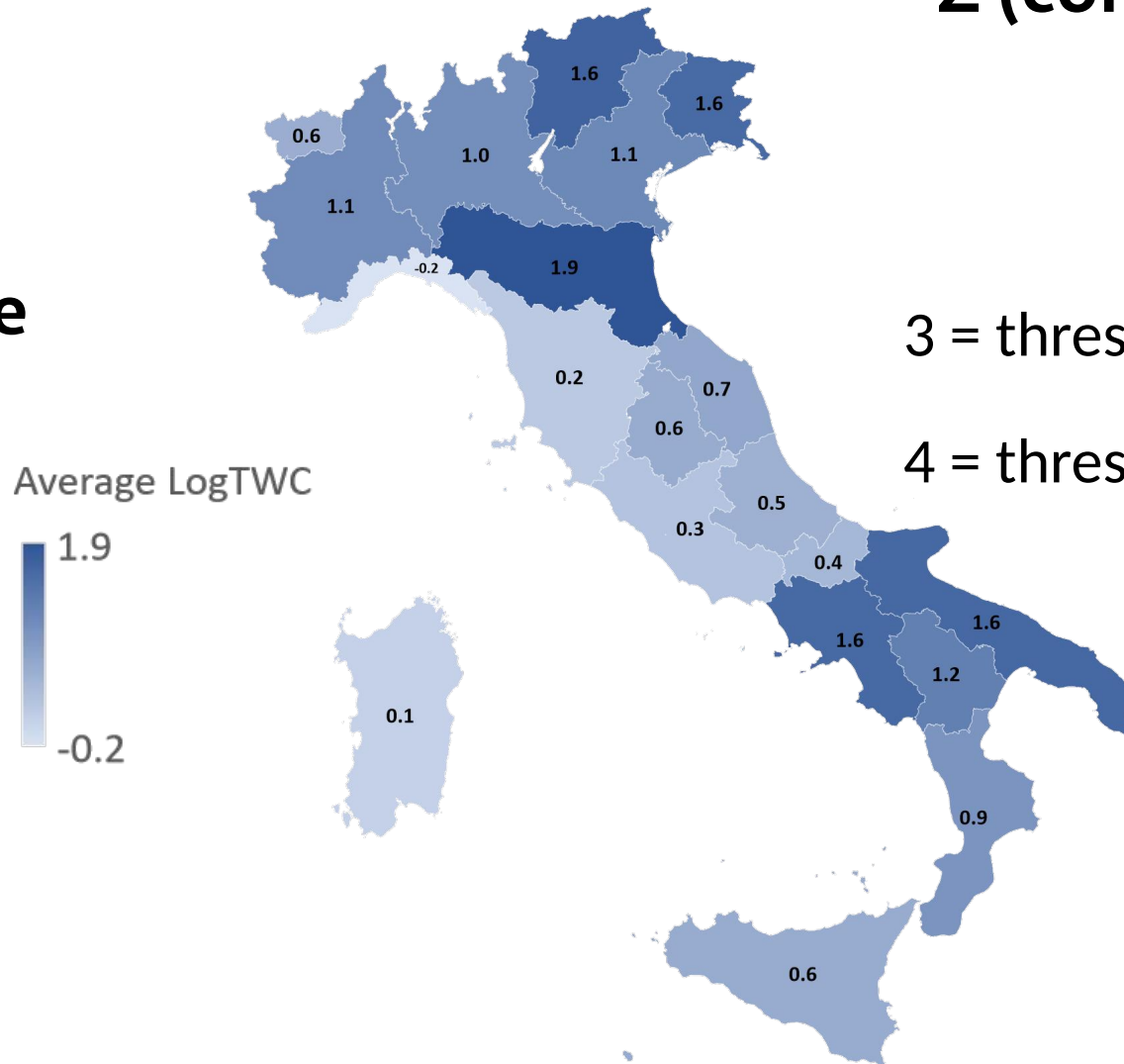
LD50 ( $\mu\text{g}/\text{bee}$ )



# TWC – Toxicity Weighted Concentration

$$\Sigma (\text{concentration} / \text{LD}_{50})$$

Average



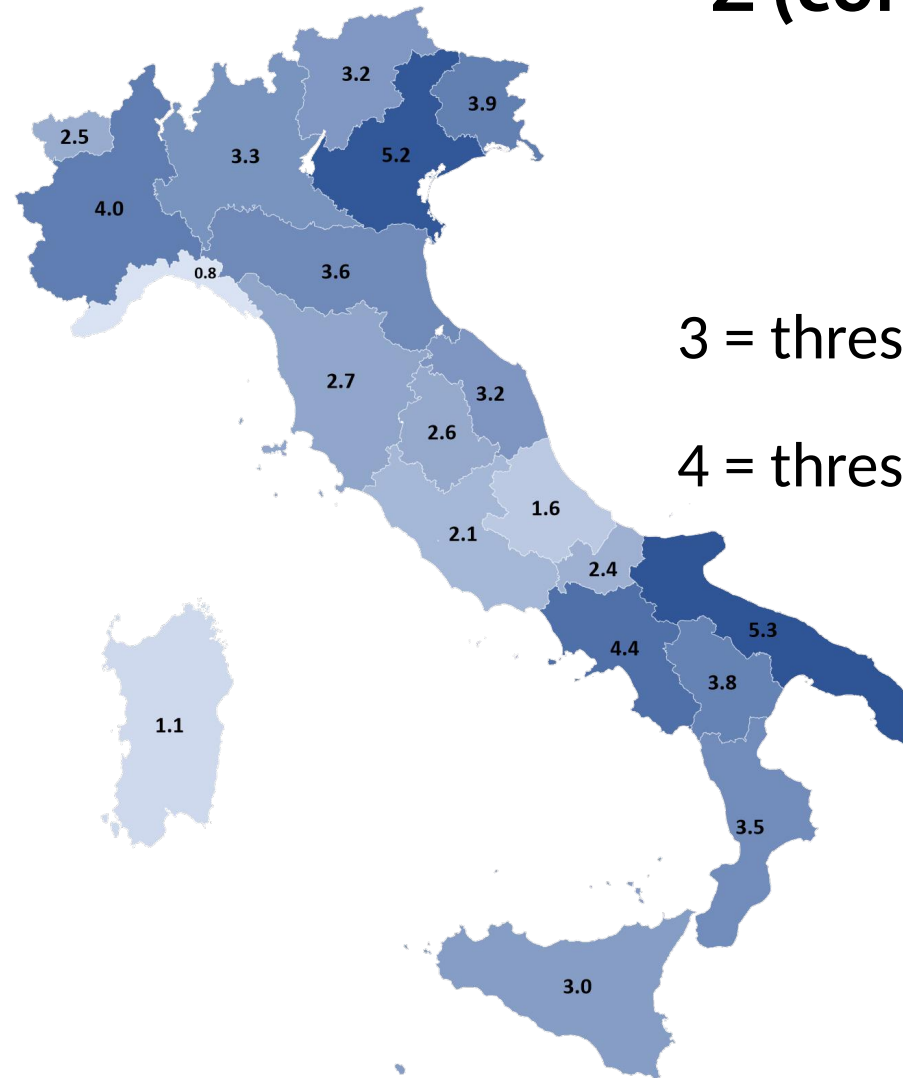
3 = threshold of concern (equals 1/10 LD50)

4 = threshold of sure toxicity (equals LD50)

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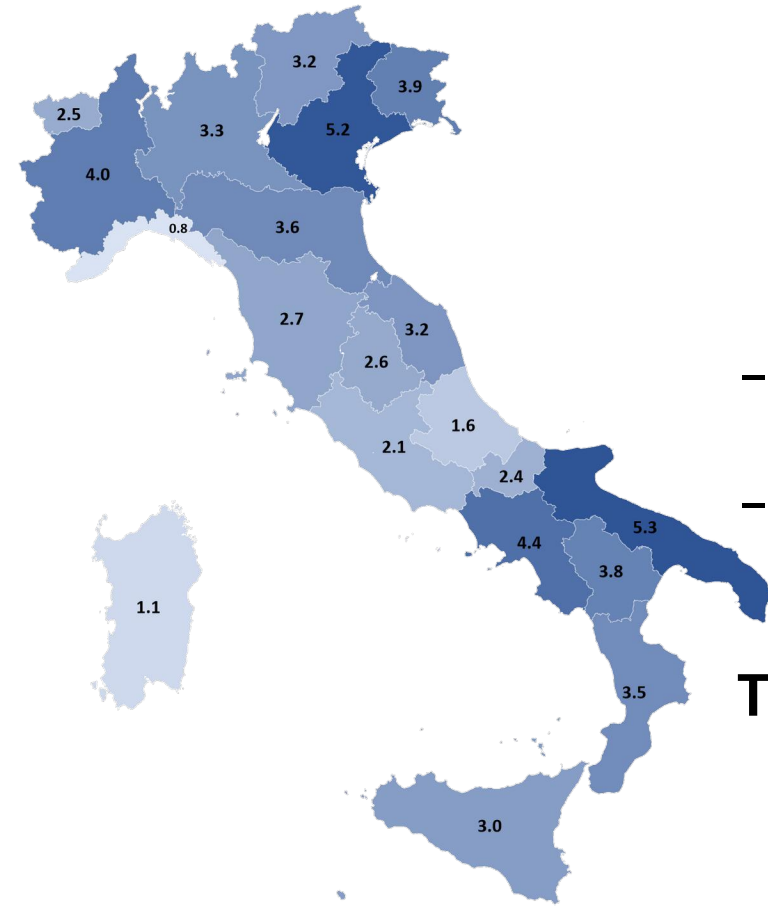
Maximum



3 = threshold of concern (equals 1/10 LD50)

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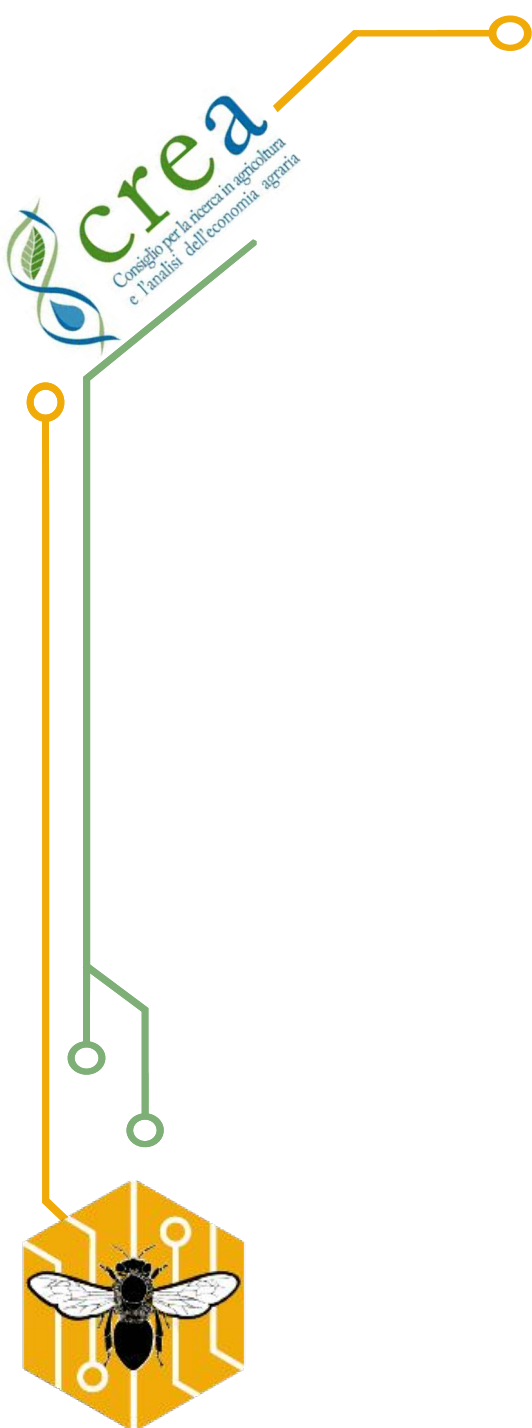
# TWC – Toxicity Weighted Concentration - max

$$\Sigma (\text{concentration} / \text{LD}_{50})$$


## ATTENTION

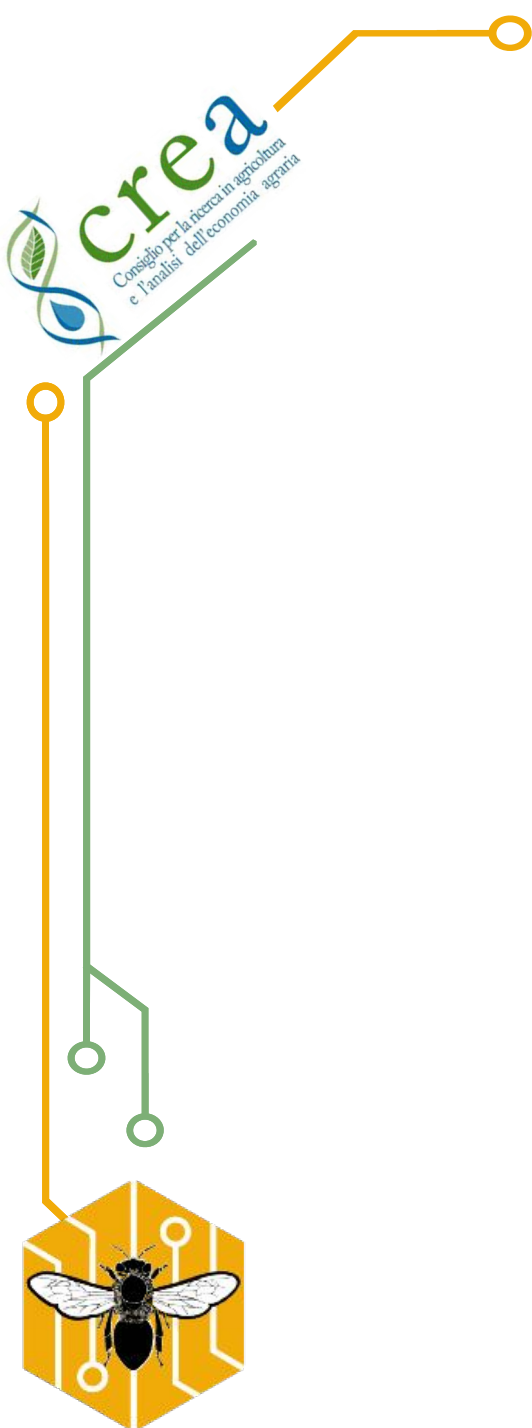
- the concentrations found are lower than at the origin (degradation)
- we ignore possible synergistic effects in this calculation

**Thus the situation is worse than appears from these numbers**



# Take home messages

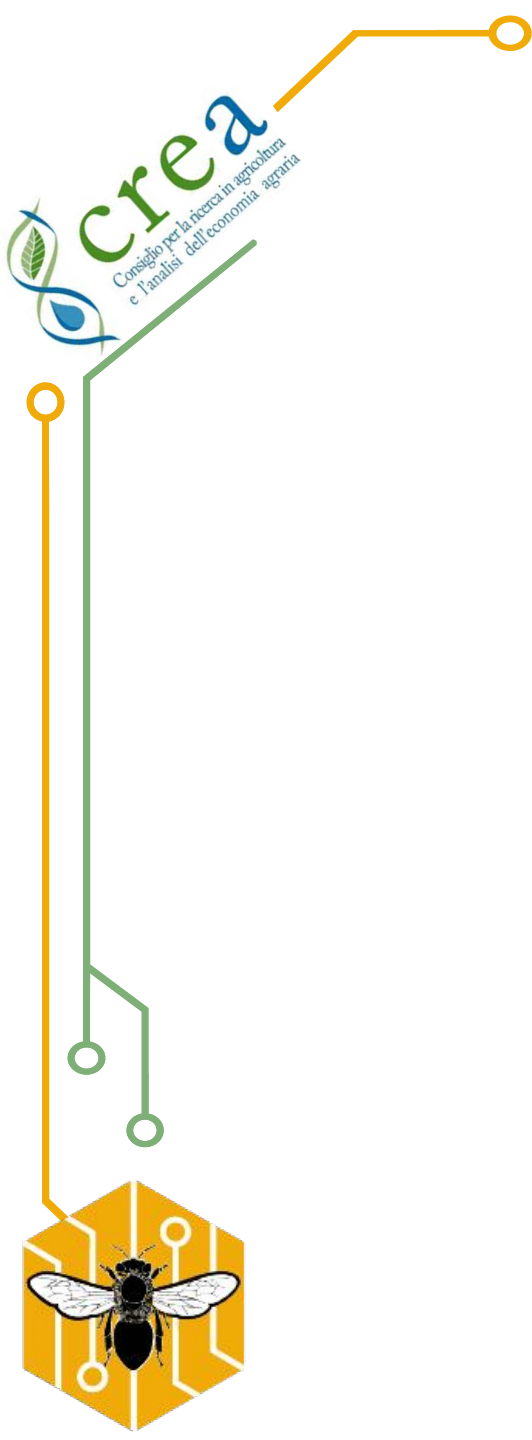
Semi-natural ecosystems host more **bee species** than intensive-agro



# Take home messages

Semi-natural ecosystems host more **bee species** than intensive-agro

**70%** of beebread samples contained pesticide residues

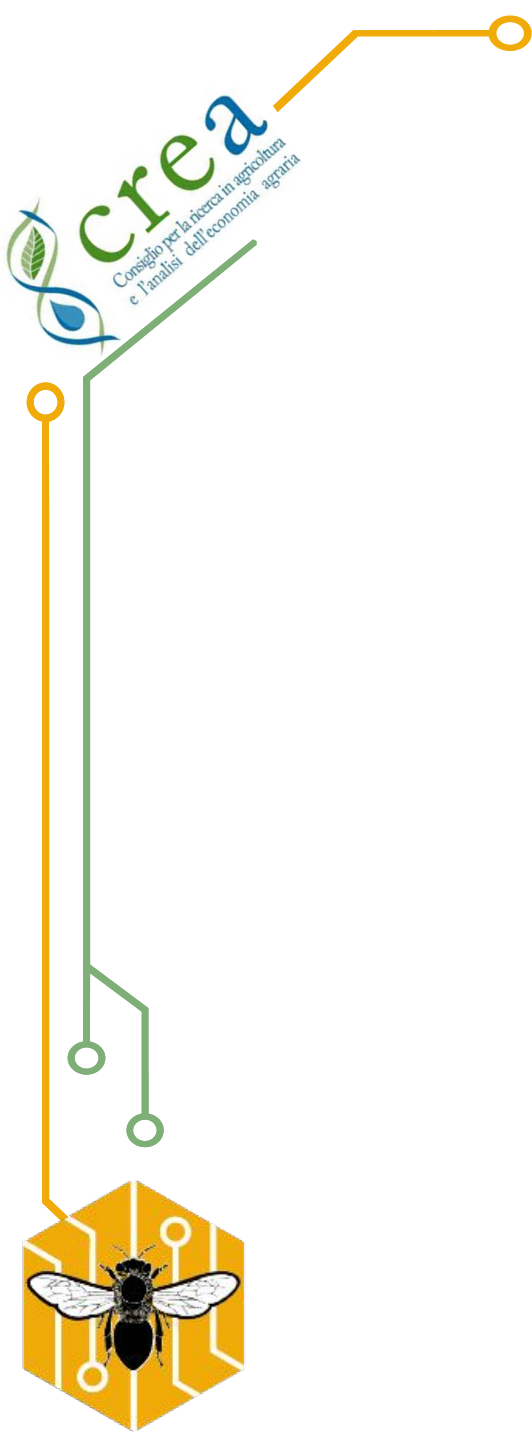


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Majority of samples contained **multiple a.i.** (up to 23) = cocktail effect



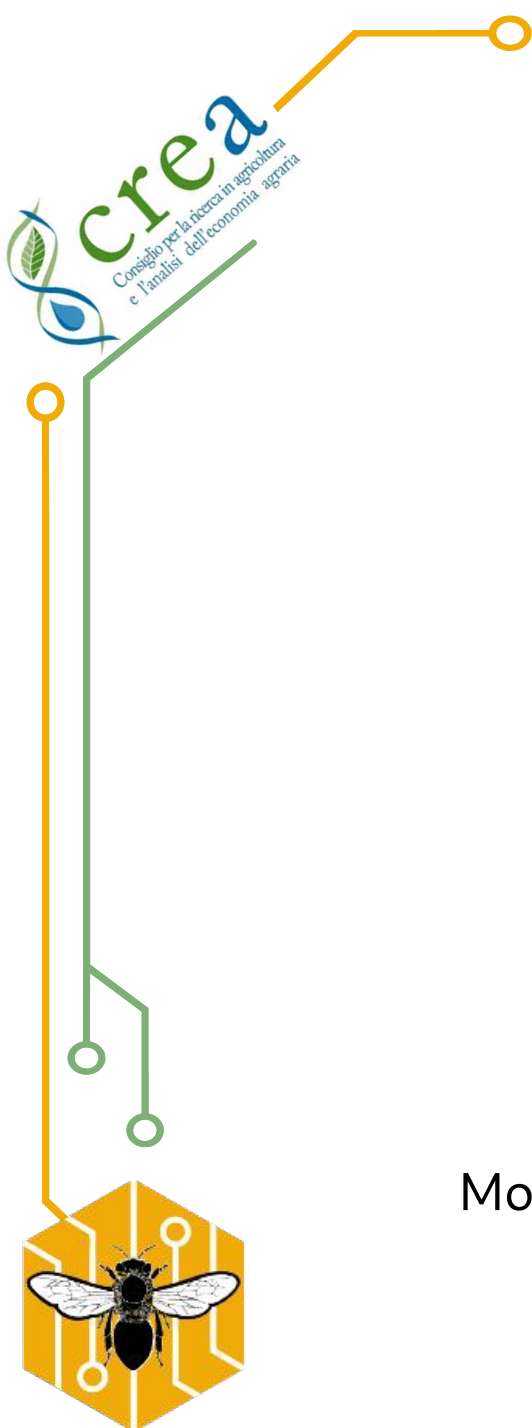
# Take home messages

Semi-natural ecosystems host more **bee species** than intensive-agro

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# Take home messages

Semi-natural ecosystems host more **bee species** than intensive-agro

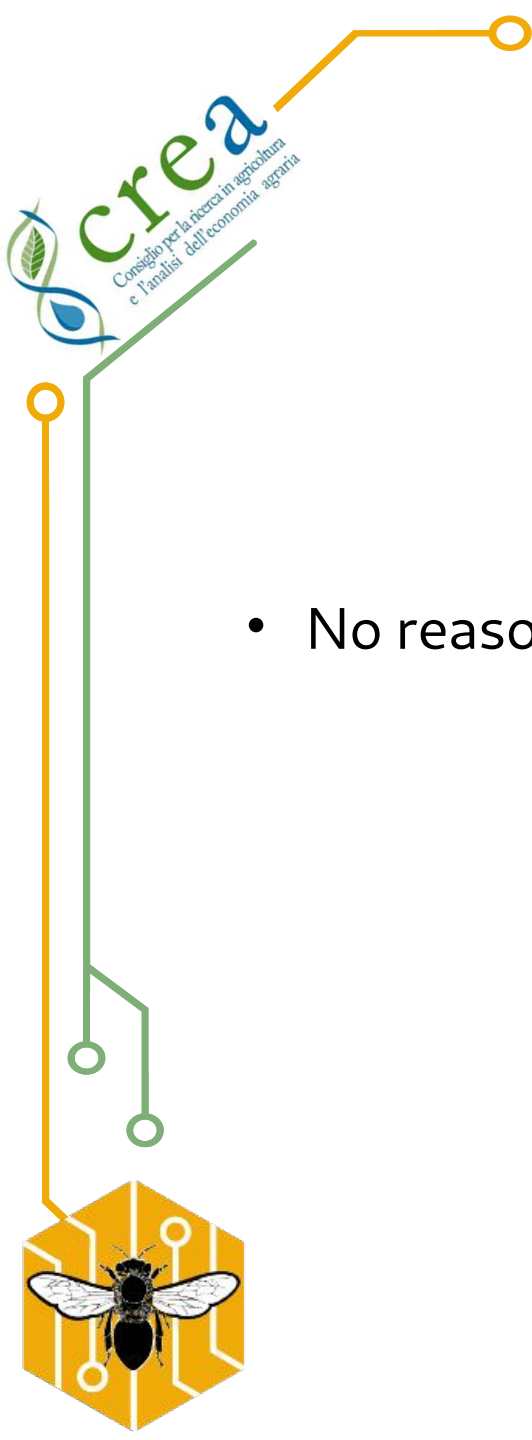
**70%** of beebread samples contained pesticide residues

Majority of samples contained **multiple a.i.** (up to 23) = cocktail effect

More than half of the positive samples contained **at least 1 insecticide**

More than 3/4 of positive samples contained at least one **honeybee-toxic a.i.**





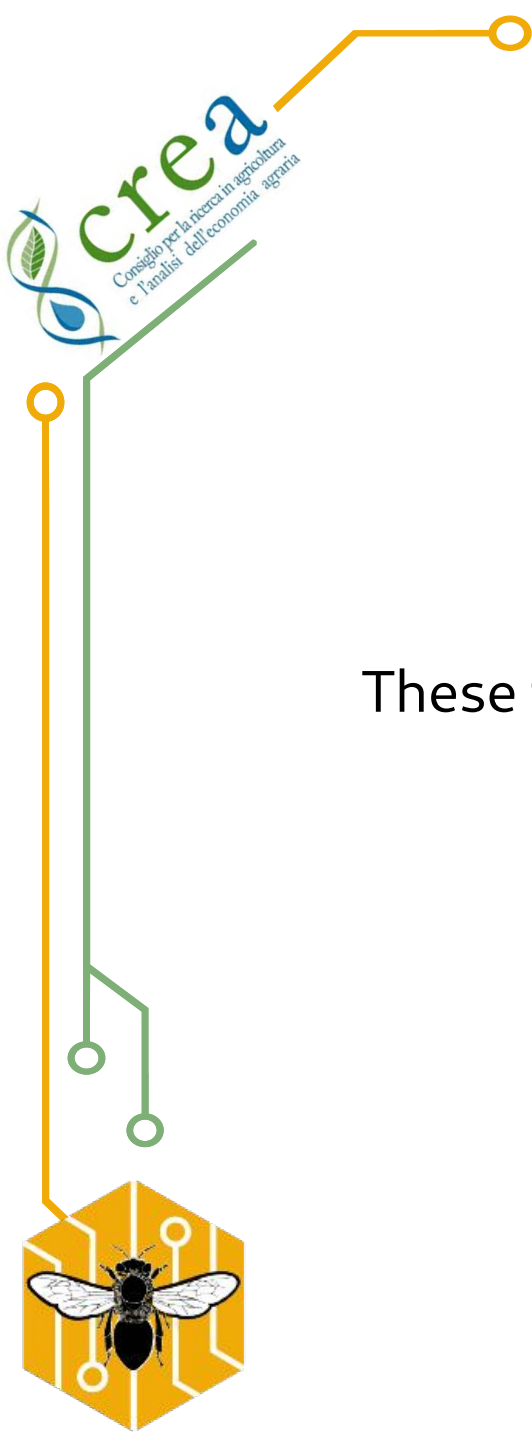
# Conclusions

- No reason to suppose that Italian agriculture is particularly pesticide-contaminating

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- No reason to suppose that Italian agriculture is particularly pesticide-contaminating
- The “cocktail effect” may be very dangerous and very difficult to assess. It is easy to test the effects of a single chemical, but it is impossible to test all the combinations of 2 or more substances





# Conclusions

## ATTENTION:

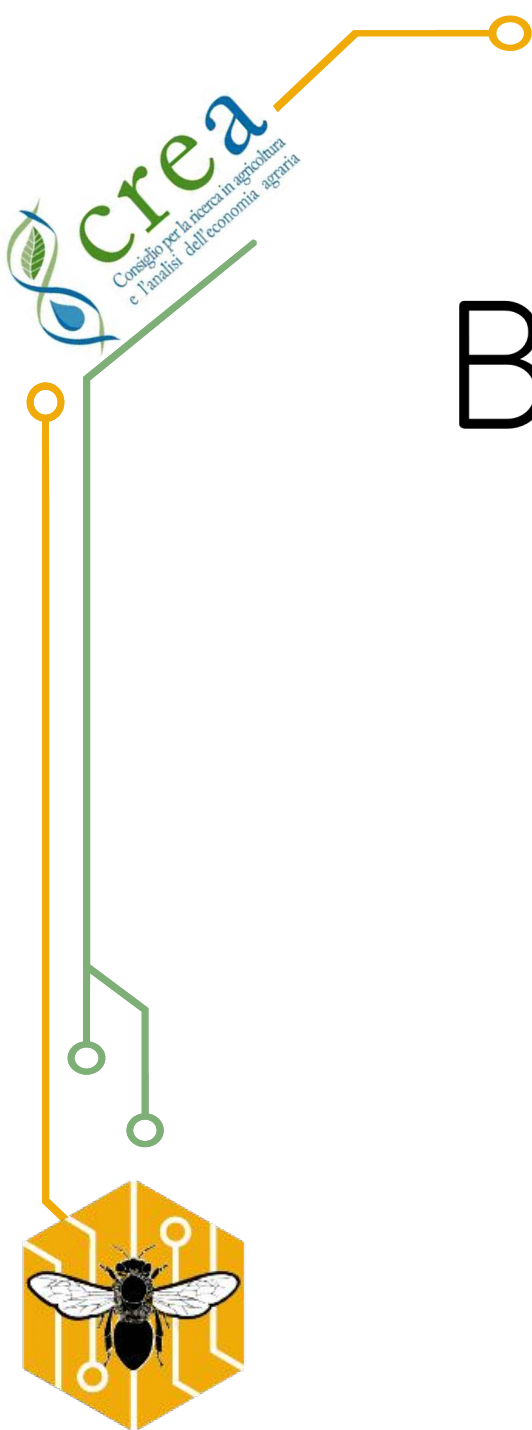
These findings are not about the hazard to honey bees but about the food they are exposed to

**Wild pollinators share the same fate**

# Conclusions

- **The only reasonable action is to reduce the use of pesticides**
- and to monitor the effects of this reduction using bees as bioindicators





# BeeNet



Monitoraggio  
ambientale  
con le api

*Thank you*

For more info: <https://beenet.crea.gov.it/>