

## 33<sup>rd</sup> Members' Meeting of the «Club of Bologna

### ***The future horizons for Ag-Mechanization***

9-10 November 2024

Bologna, Italy

**Moving towards the preservation and improvement of  
biodiversity in agricultural ecosystems**

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*European Conservation Agriculture Federation (ECAF)*

## About the AUTHORS...



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- Full professor at the University of Évora (PT)
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- Agricultural engineer
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- Secretary General of ECAF



**Julio Roman**

- Agricultural engineer
- Project manager of ECAF

# ECAF – Who are we?

**Federation of European National  
Associations promoting  
Conservation Agriculture**

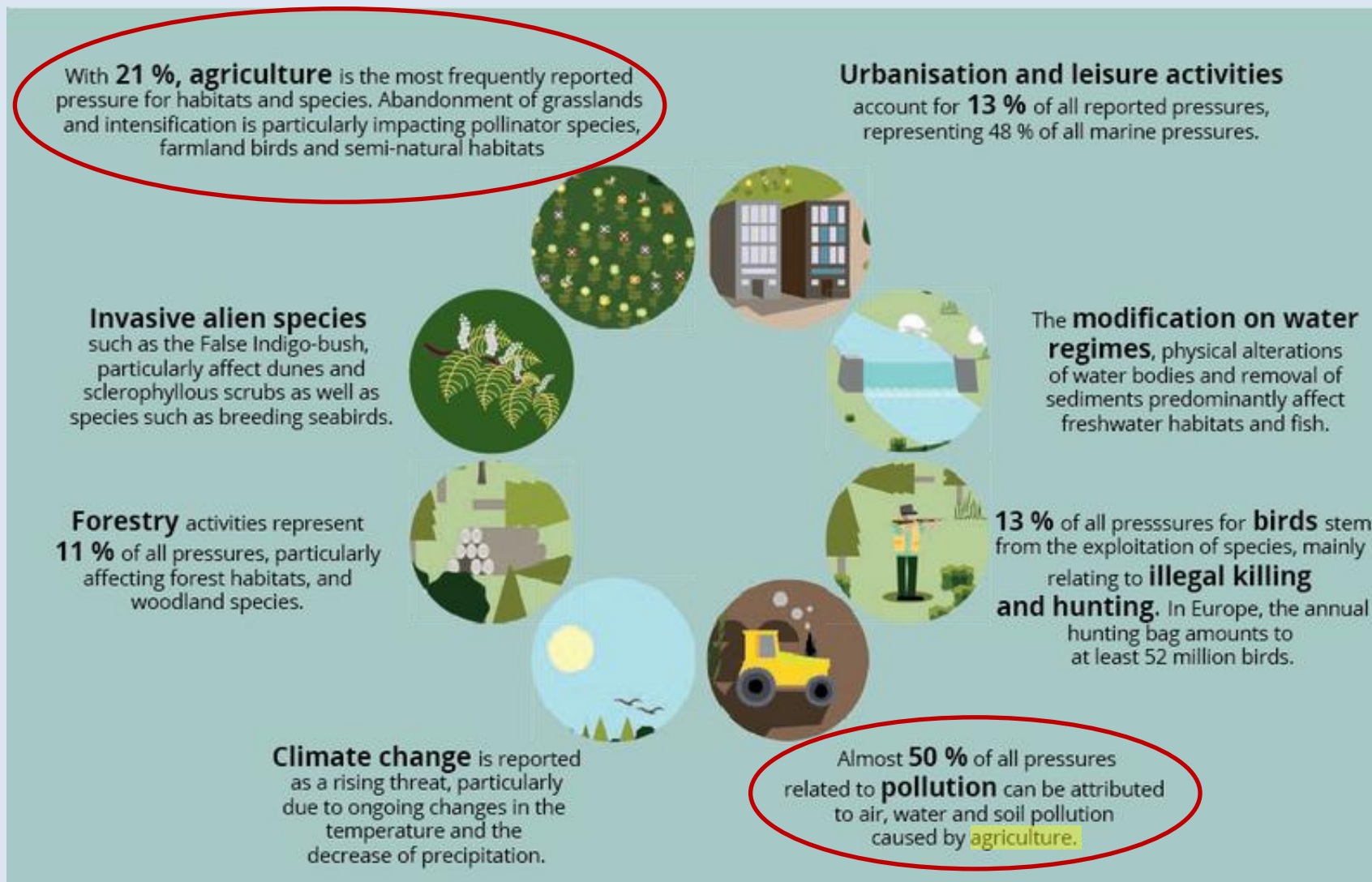
**Non-Profit association  
founded in 1999**

**Based in Brussels**





# What causes biodiversity loss in Europe?



# Restoring our agricultural habitats



**33% of the world's soils are degraded**, with intensive agriculture being one of the main drivers.

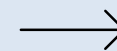
**Biodiversity loss** in agricultural ecosystems is directly linked to the **degradation and loss of functions of agricultural soils**.



The **future of agriculture** depends on how **effectively** this challenge can be addressed.

Estimated **81% of the EU's agricultural habitats being in poor condition.**

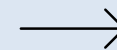
**Agricultural intensification**



**Landscape fragmentation**



**Soil depletion**



are compromising biodiversity conservation in these ecosystems.



# What is needed to do so?

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- ✂ **Extensification of Ag production?**
- ✂ **Increase % of Ecological Focus Areas?**
- ✂ **Plant more hedge rows?**
- ✂ **Enlarge protected areas and nature reserves?**
- ✂ **Achieve the 25% of OF by 2030?**
- ✂ **You name it...**

# But what about the consequences?

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- 🌱 **Land productivity?**
- 🌱 **Where and how to compensate for less production?**
- 🌱 **EU contribution to global food security?**
- 🌱 **Biodiversity restoration only on a small % of Ag land?**
- 🌱 **Are the proposed solutions really effective?**
- 🌱 **...**



# Need to mimic natural ES conditions while producing food

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**No one turns the soil  
upside-down**

**Soil is always covered**

**Plant species diversity**



# What is Conservation Agriculture (CA)?

## CA principles

- 1 Continuous no or minimum mechanical soil disturbance
- 2 Permanent maintenance of a vegetative mulch cover on the soil surface
- 3 Species diversification

FAO: Conservation Agriculture is described as an **ecosystem approach to sustainable regenerative agriculture based on the application of the three interrelated principles** through context-specific and locally adapted practices.



## CA practices:

**Annual crops:** *no tillage*, minimum soil disturbance strip seeding, ***crop residue retention*** at the soil surface, ***crop rotation/diversification***

**Woody crops:** ***Groundcovers*** (interrow space covered with spontaneous or sown vegetation and chopped pruning residues)

# What is Conservation Agriculture (CA)?



**No-tillage**



**Groundcovers**



**1** Minimum mechanical soil disturbance (i.e. No-tillage) through direct seed and/or fertilizer placement



**2** Permanent soil organic cover (at least 30%) with crop residues and/or cover crops



**3** Species diversification through varied crop sequences and associations involving at least three different crops species



**Crop rotations / crop species diversification**



**Cover crops and residues**

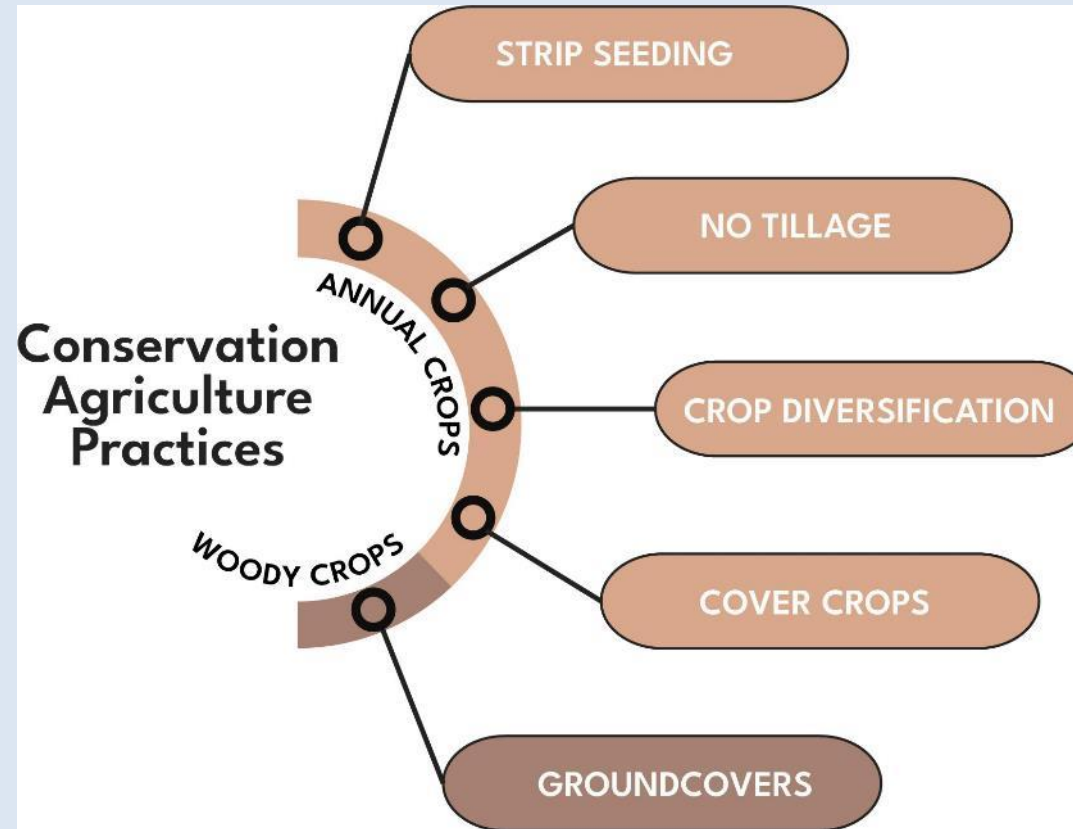


# Conservation Agriculture: The most feasible approach





# Conservation Agriculture: The most feasible approach

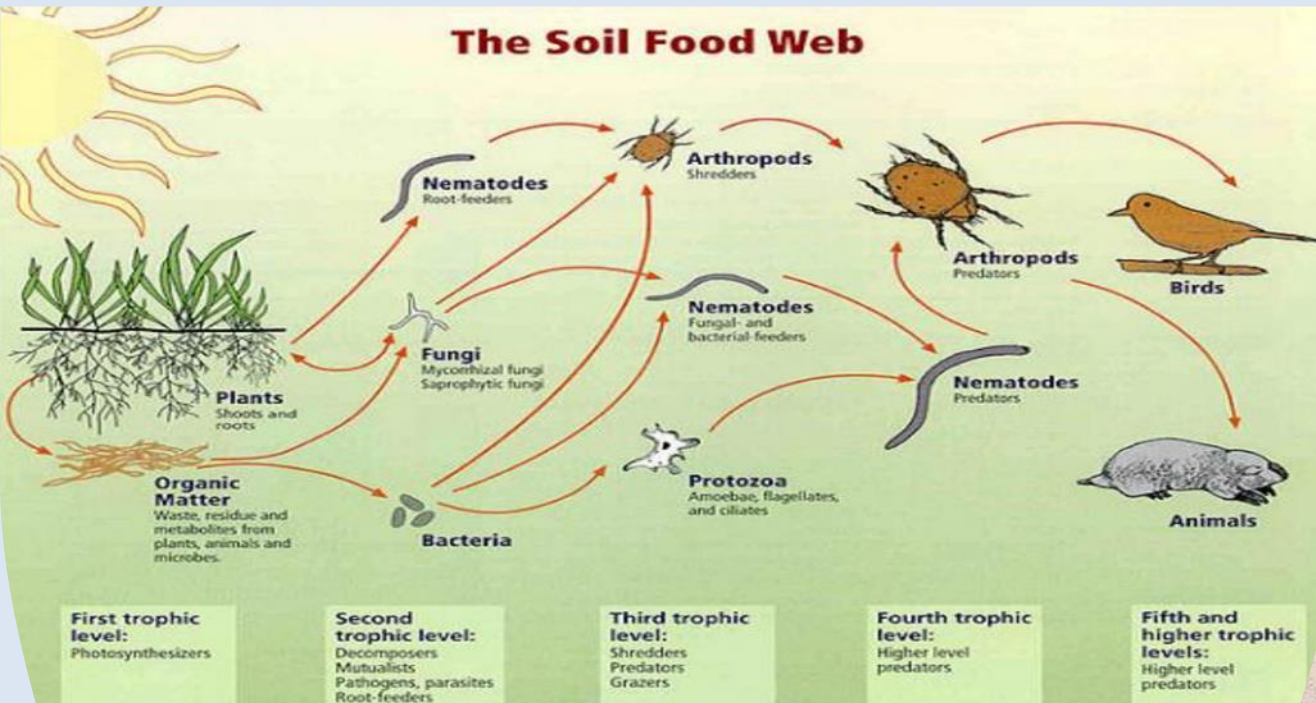


Source: Román-Vázquez J., Moreno-García, M., Repullo-Ruibérriz de Torres, M.A., Veroz-González O., Agüera-de Pablo Blanco, B., Kassam, A., Basch G., González-Sánchez, E.J. 2023. Conservation Agriculture: Moving towards the preservation and improvement of biodiversity in agricultural ecosystems. European Conservation Agriculture Federation (ECAAF). Brussels, Belgium.





# Biodiversity: Below and above-ground





# The root cause of biodiversity decline (turmoil of tillage)



Earthquake



Wildfires



Hurricane



Tsunami



Tornado





## Contribution of Conservation Agriculture to the improvement of soil fauna biodiversity



Soil Mites



**35%**  
No tillage

**85%**  
Groundcovers



Bacteriophage  
Nematodes



**14-21%**  
No tillage

**70%**  
Groundcovers



Springtails



**x10**

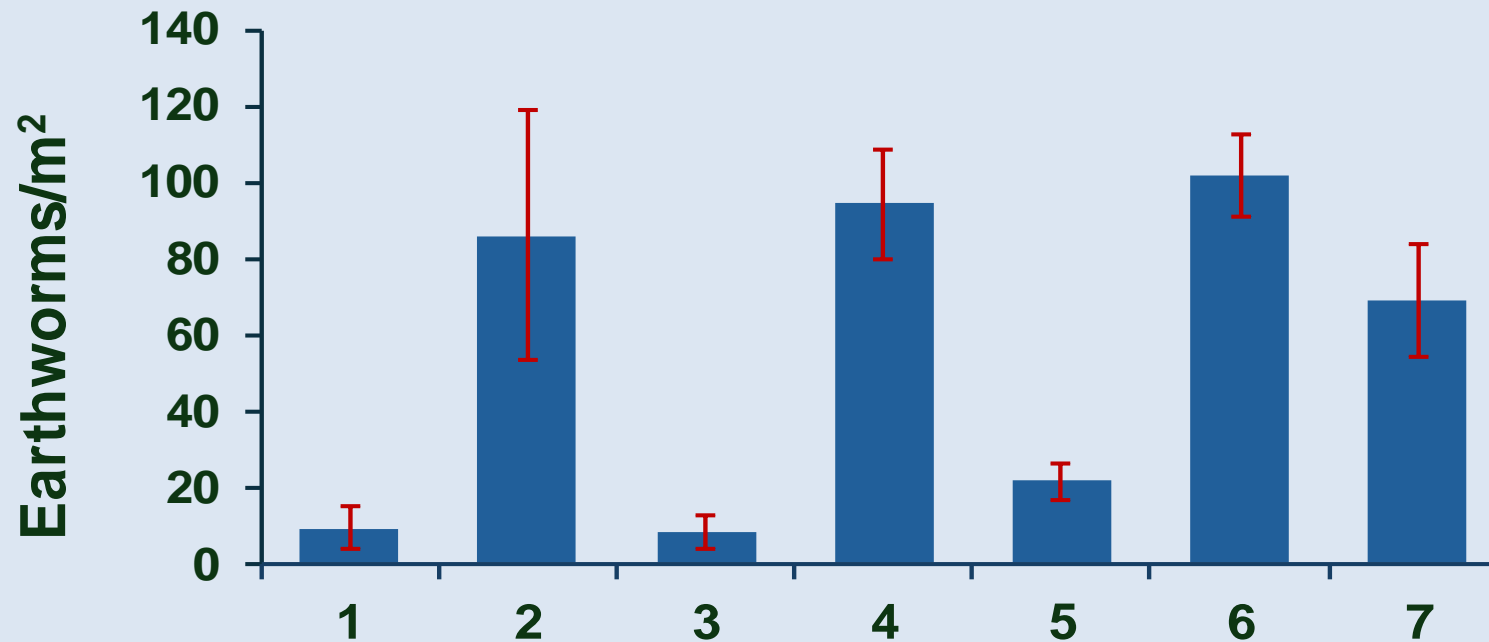


Earthworms



**25-300%**

# Earthworms as indicators for soil biodiversity...



*(Jill Clapperton, 2012)*

The number of earthworms per square metre in different crop rotations:

- organic minimum tillage rotations: 1, 3, 5
- no tillage low input rotations: 2, 4, 6
- continuous no till wheat rotation: 7



# Enhancement of epigeal fauna biodiversity

## Arthropods

**14,5%**  
No tillage

**16%**  
Groundcovers



**ANTS**  
**300%**  
CA practices



**EARWIGS**  
**10%**  
CA practices



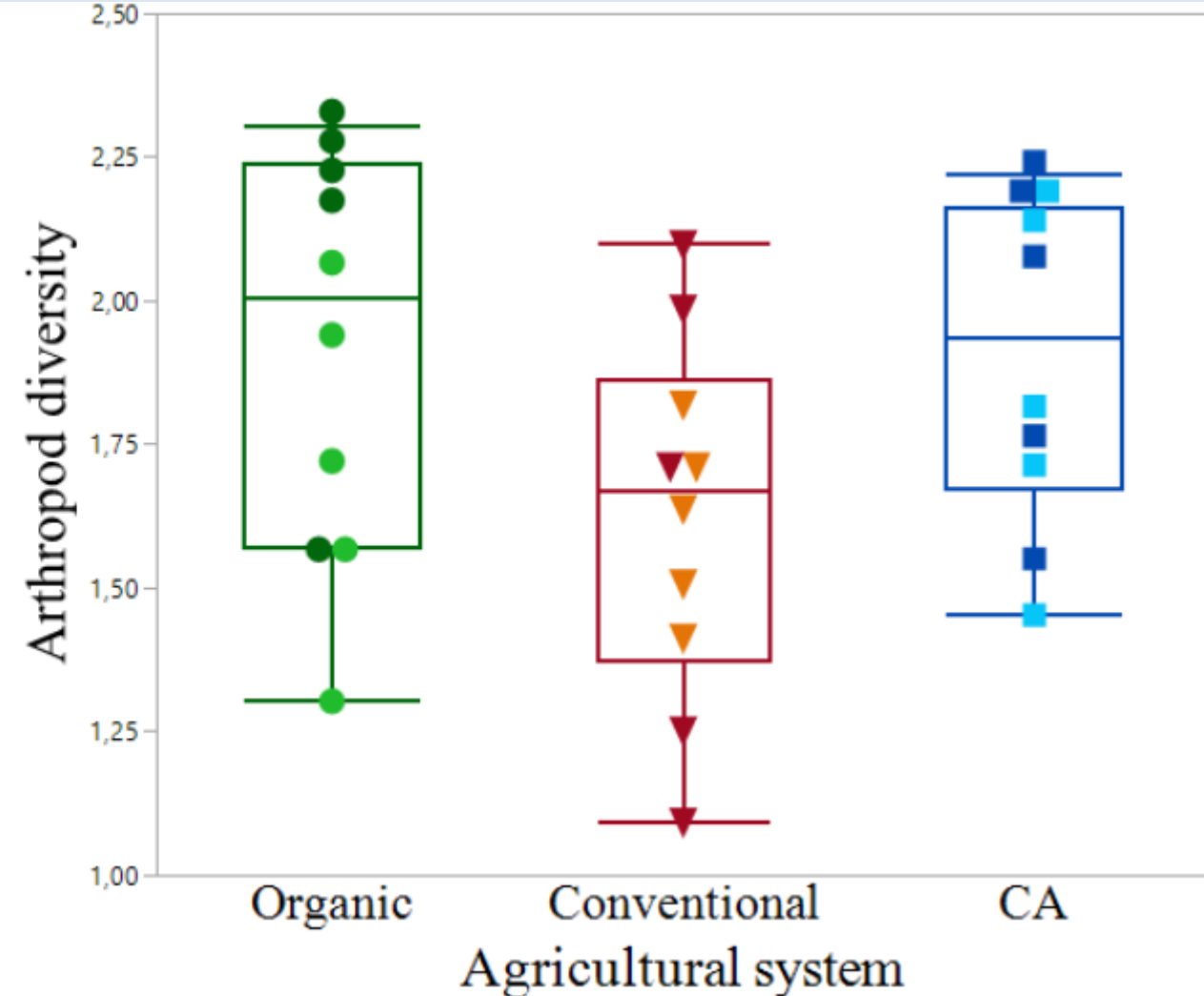
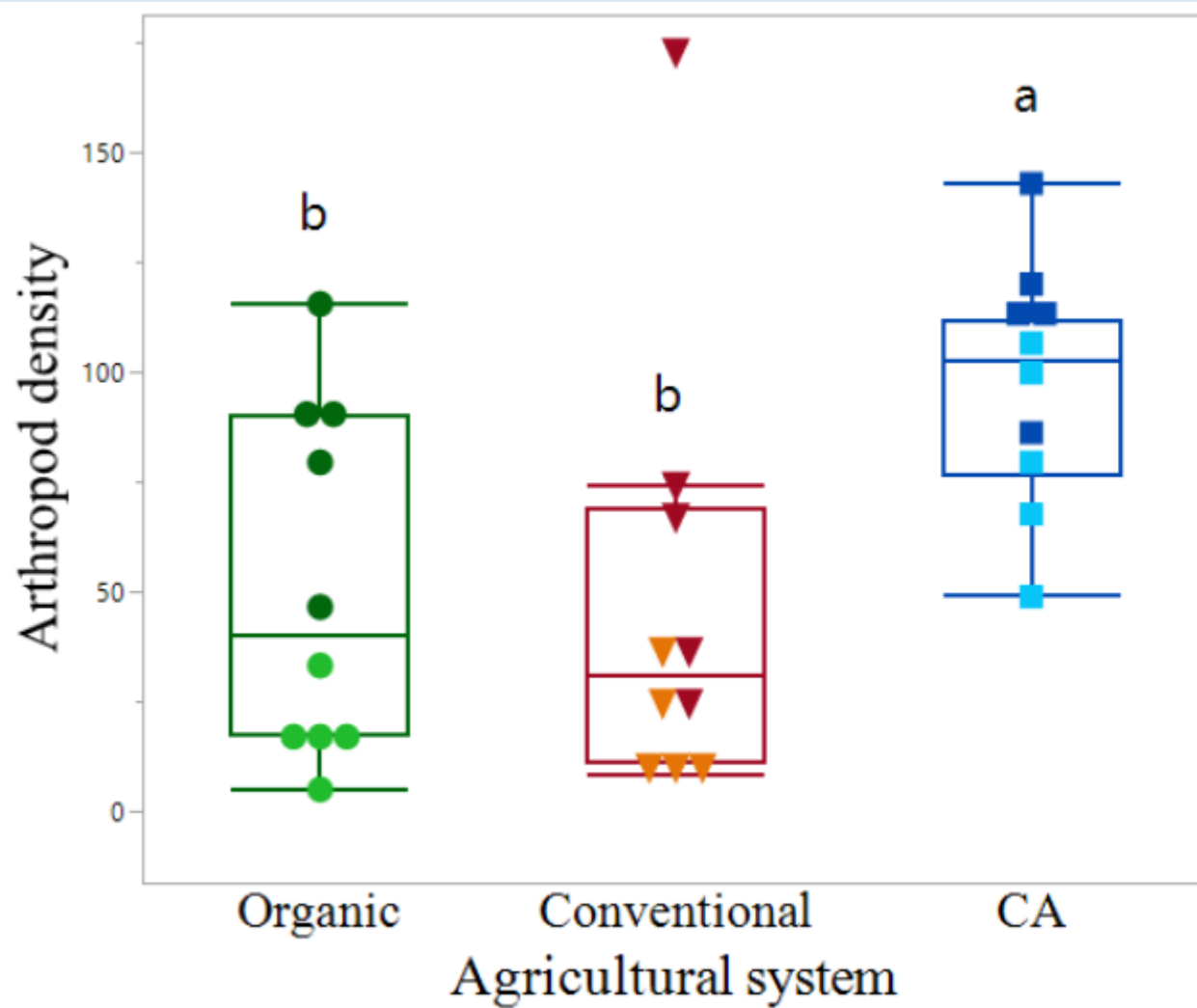
**BEATLES**  
**500%** **x3**  
CA practices Groundcovers

**SPIDERS**  
**60-300%**  
No tillage

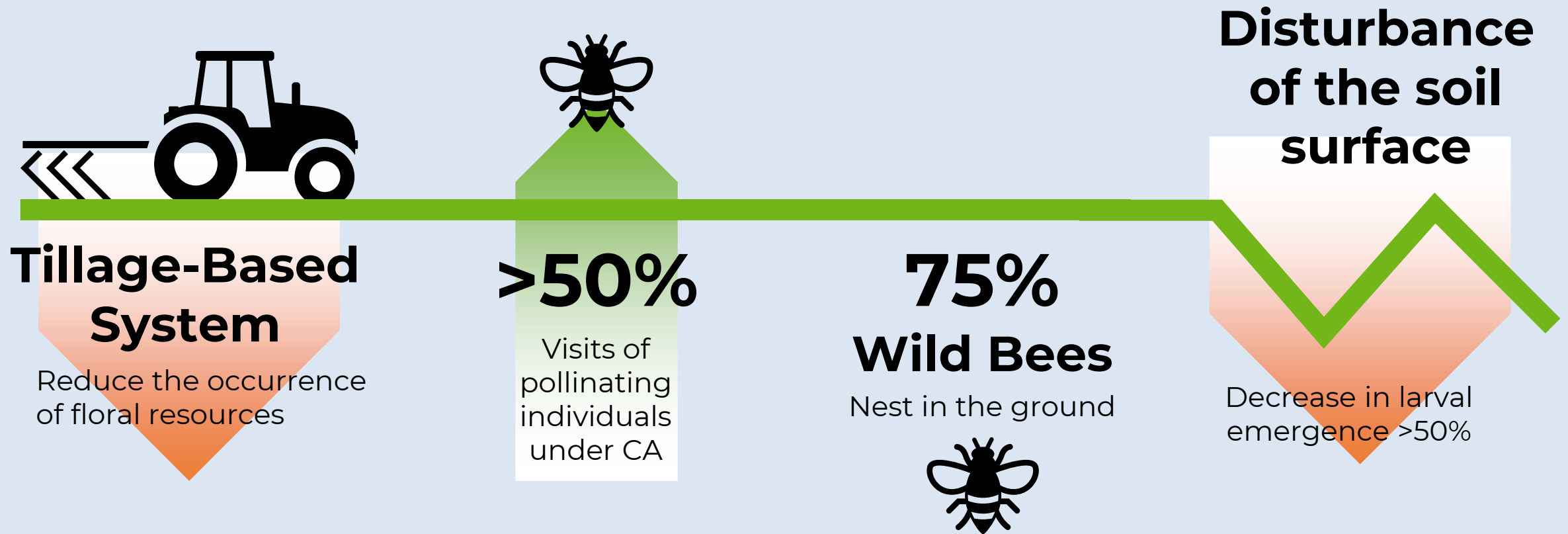
## Reptiles

**x2,5**  
Groundcovers

# Arthropod density & diversity observed in Denmark

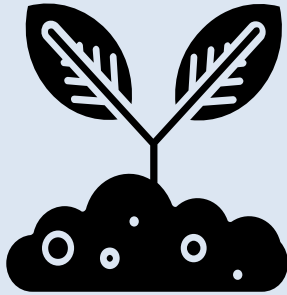


# CA and quantity and variety of pollinating insects



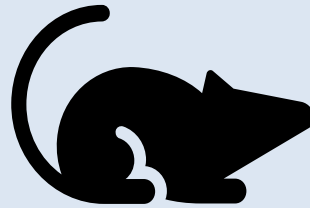
# CA and small mammal biodiversity

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Undisturbed soil, more above-ground biomass, and scattered fallen seeds, benefiting their populations.



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Weed and worm infestation control

>>consumption of up to 64% of annual weed seed production



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Maintain a pest-predator balance.



# CA and avifauna biodiversity



**60%**

## Birds Population

Linked to agricultural ecosystems in Europe


**29%** **>300%**

Bird species  
diversity

Birds density

## CA Managed Fields

CA increase the  
occurrence and  
survival of nest

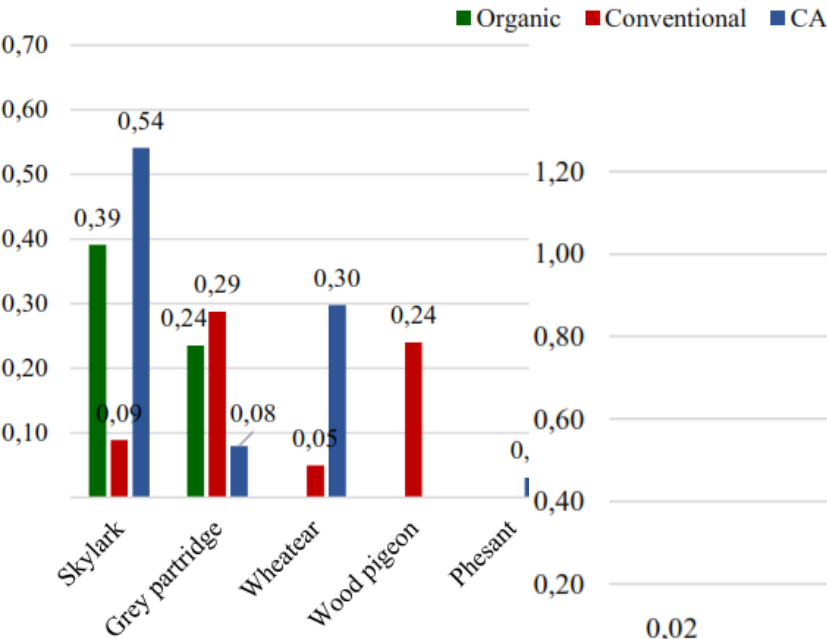


**x2-5**

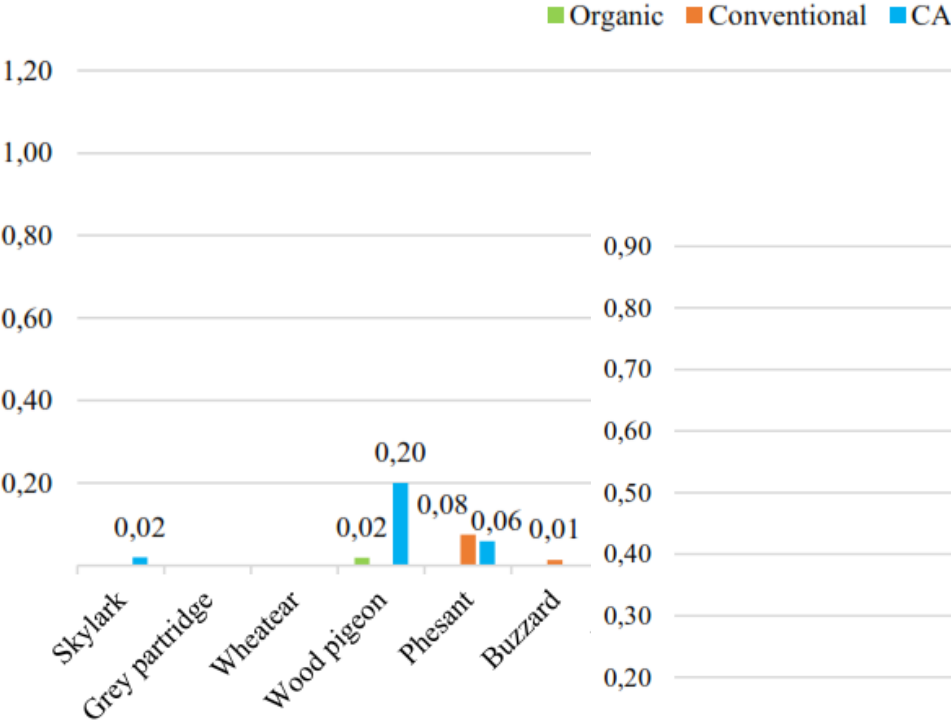
## Ground-Nesting Birds

# Birds' density observed in Denmark

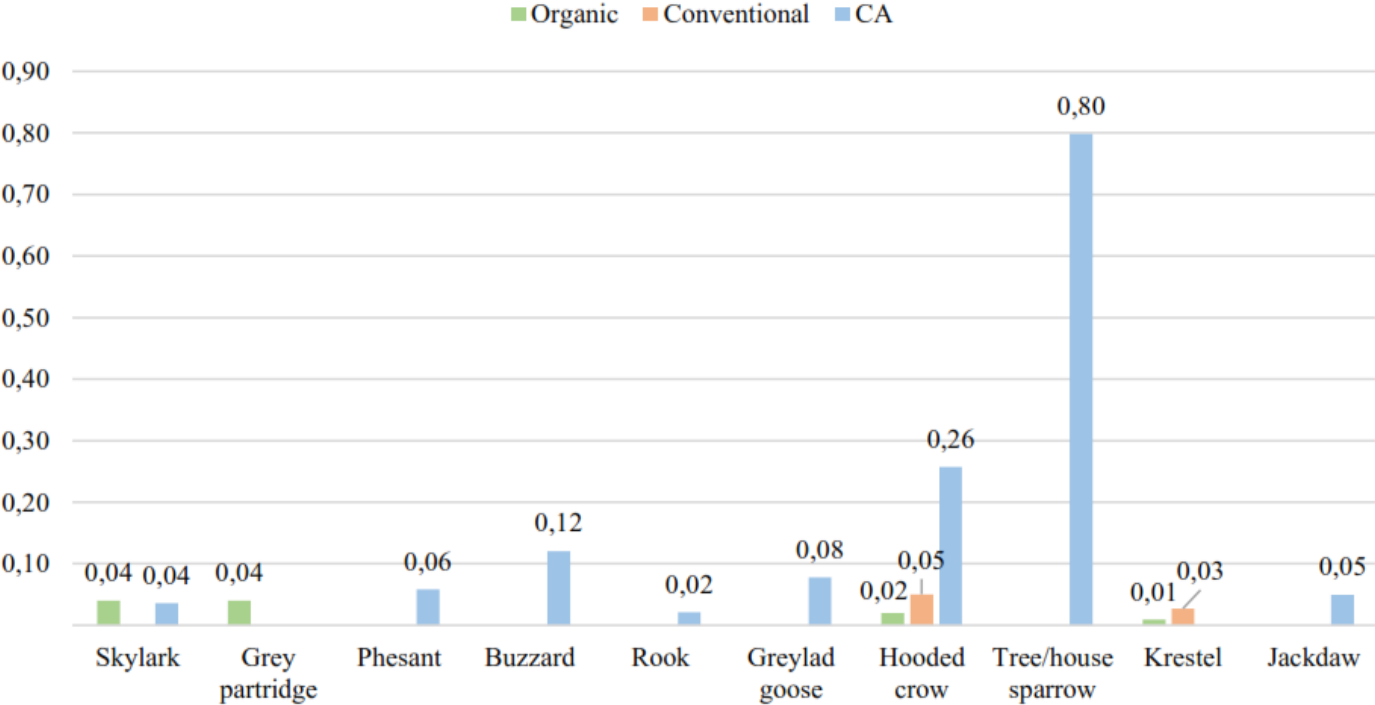
Densities of birds observed before sowing/tillage



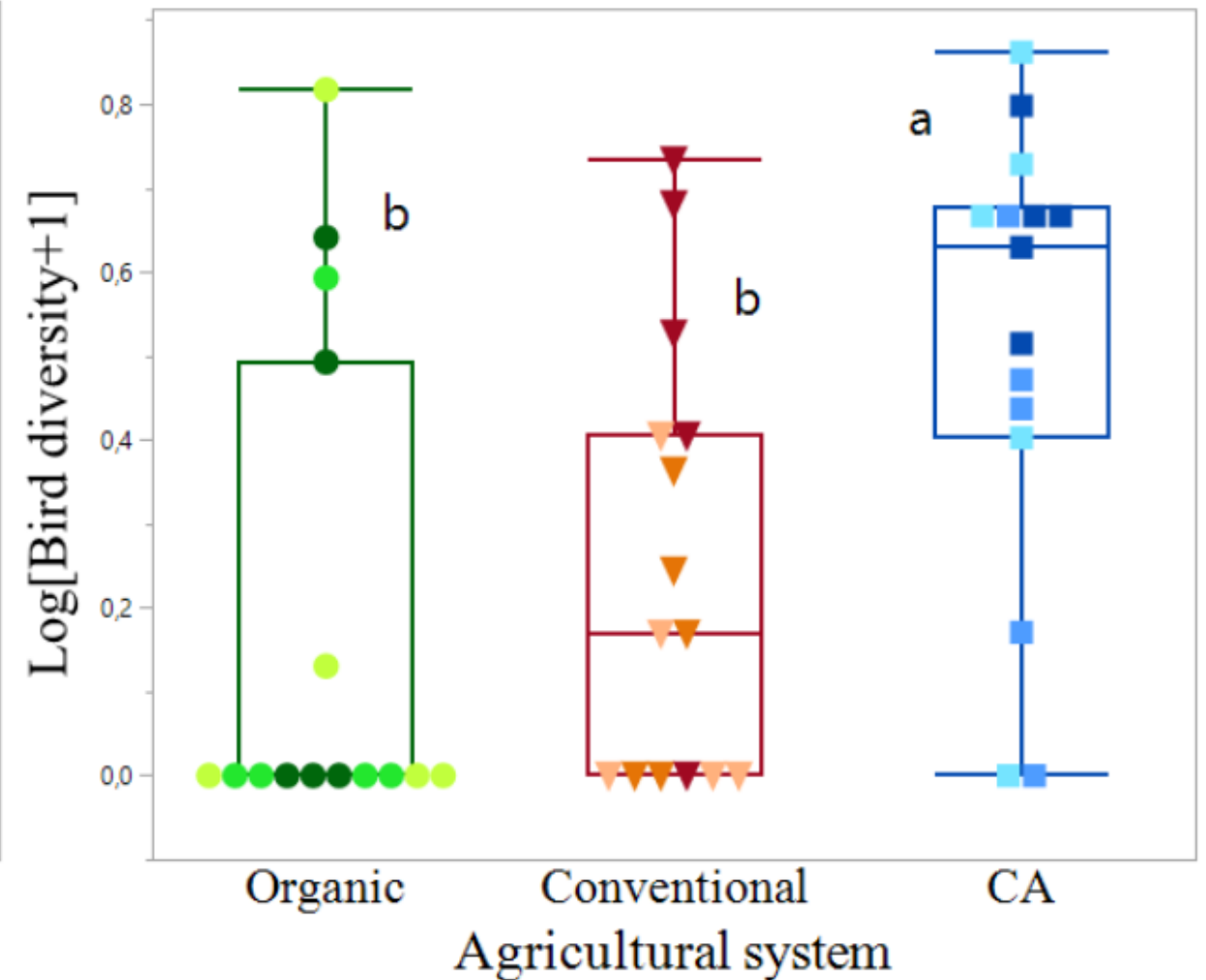
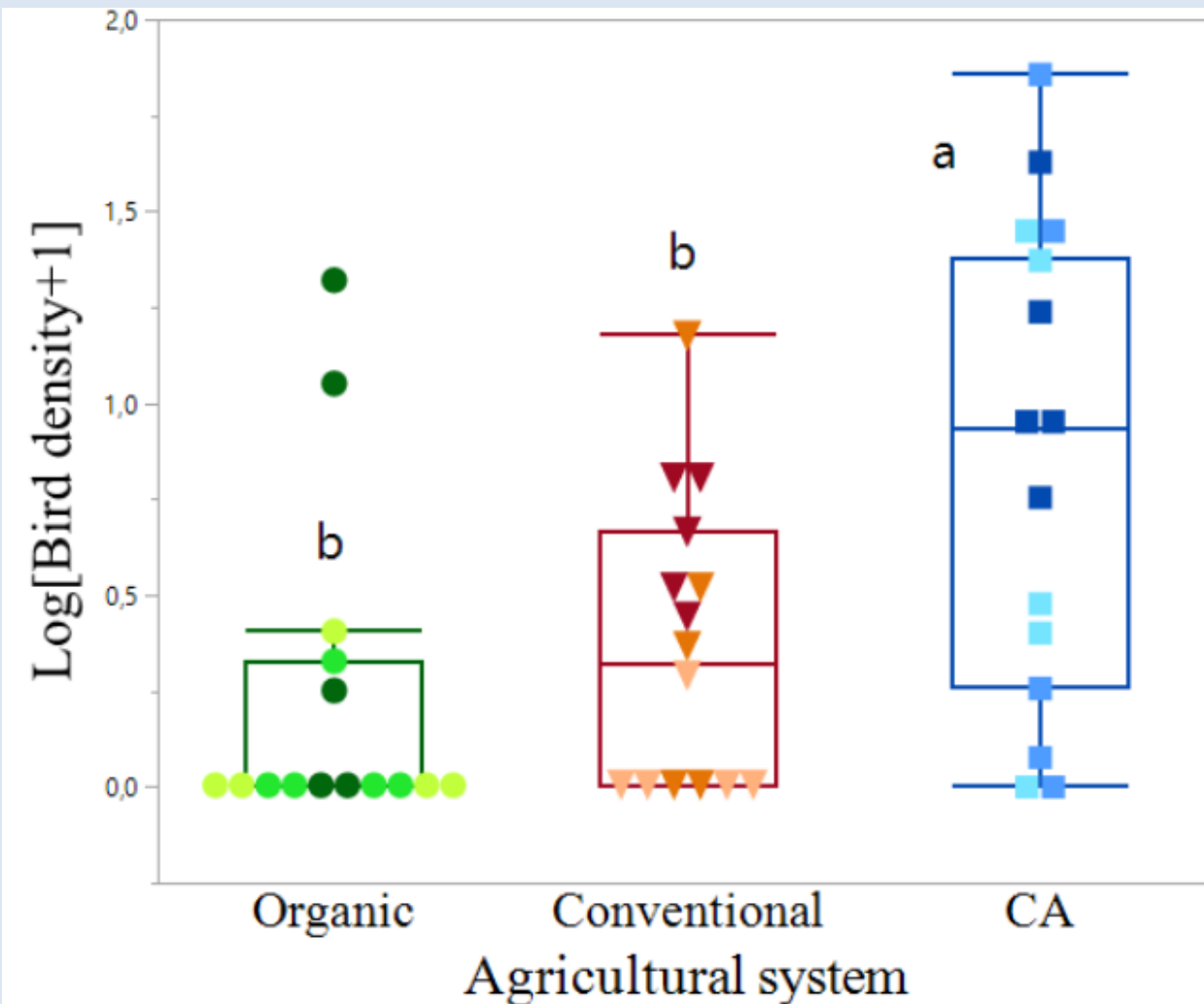
Densities of birds observed after sowing/tillage



Densities of birds observed in February



# Bird density & diversity observed in Denmark





# No habitat...

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# No biodiversity...





# Final remarks



Agricultural ecosystems  
cover about 40% of EU land

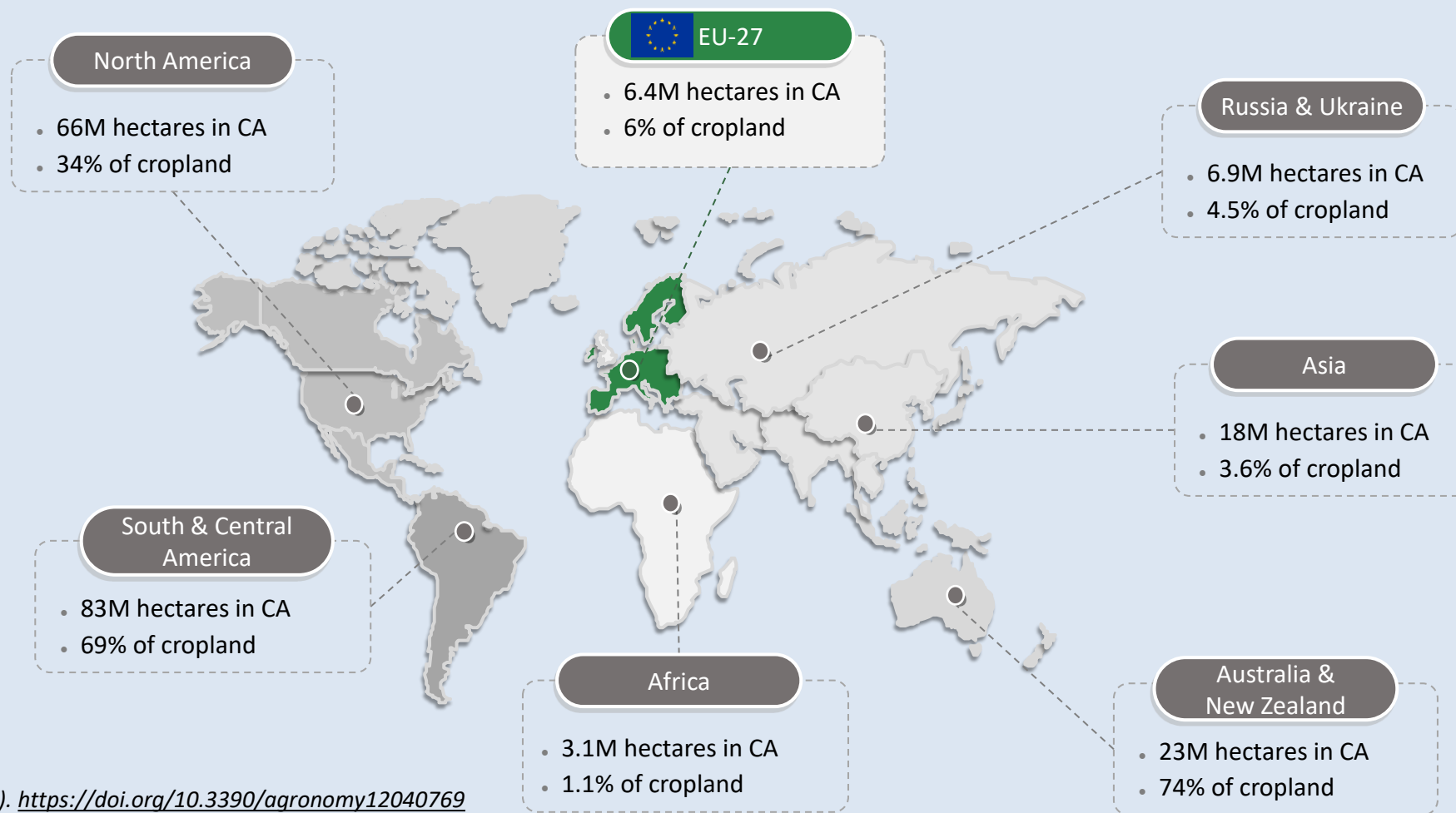


Farmers practicing Conservation  
Agriculture (CA) play a crucial role  
in achieving the European Green  
Deal objectives



CA a priority for the Common  
Agricultural Policy to ensure  
European agricultural  
sustainability and to improve  
biodiversity

# We need to boost CA in Europe to deliver ESS



Source: Kassam et. al. (2022). <https://doi.org/10.3390/agronomy12040769>