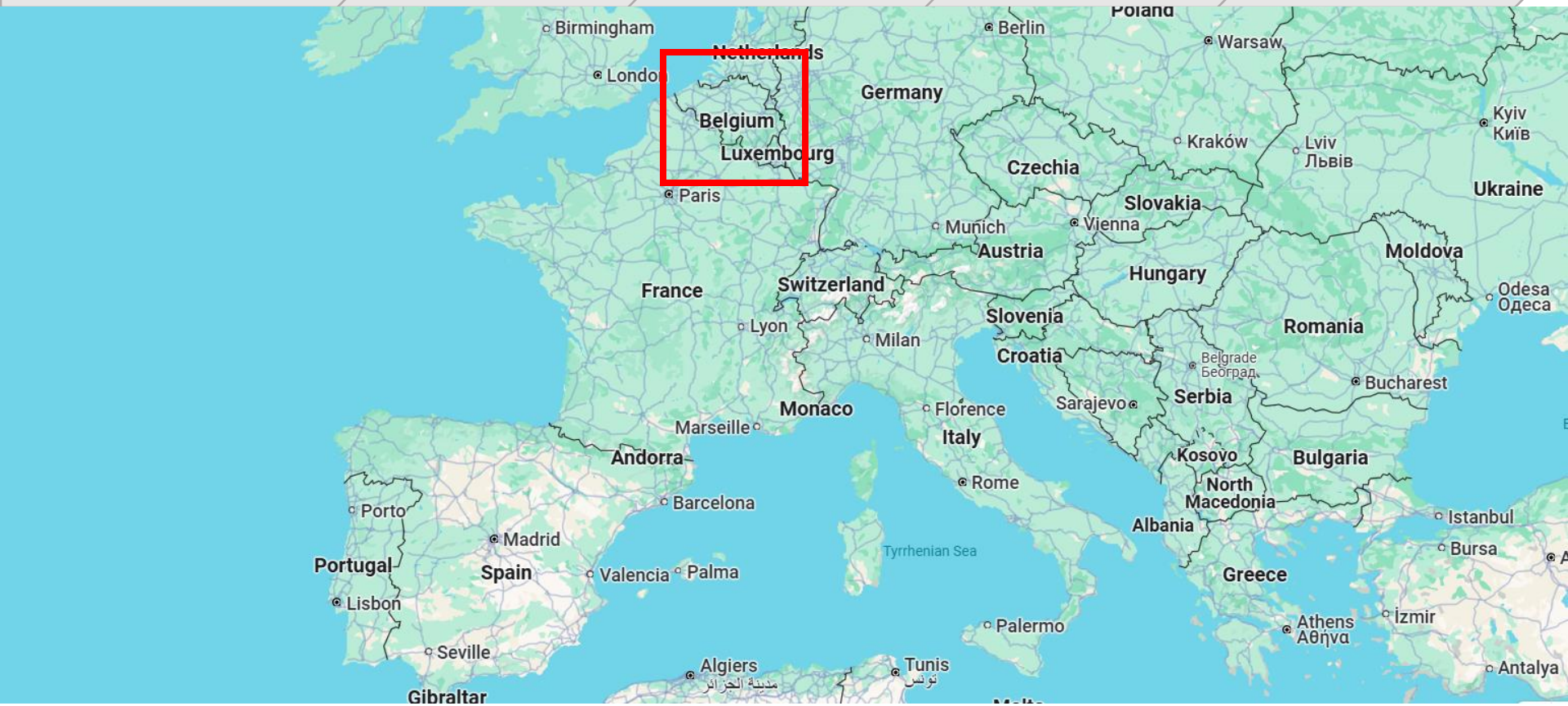
Comparing different soil management techniques under organic farming on their agronomic and ecological values: a weed perspective?

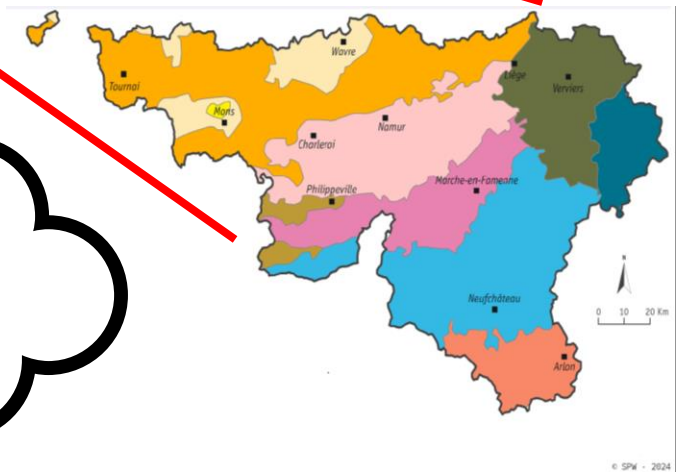


Christophe Lacroix[1], Nina Leclef[2], M. Abras[3], A. Monty[2], B.Dumont[1]

[1]Plant Sicences Axis- Crop Science lab, TERRA Research Center, Gembloux Agro-Bio Tech, University of Liège, Belgium
[2]Biodiversity, Ecosystems and Landscape, TERRA Research Center, Gembloux Agro-Bio Tech, University of Liège, Belgium
[3]Soil, water and integrated production, Sustainability, systems and prospectives departement, Walloon Agricultural Research Center, Belgium


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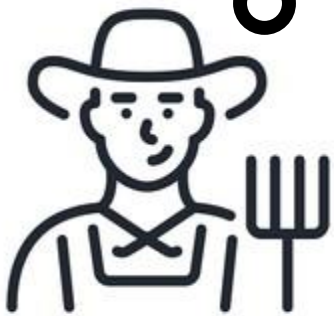



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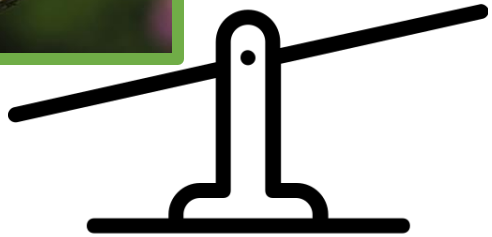


Services



Disservices





Conservation organic farming with low organic fertilizer input could offer a compromise between the beneficial services and the harmfulness of weeds.



Crucial need for studies focusing simultaneously on services and disservices.



Can **reduced tillage** under **low organic fertilizer** input enhance weed diversity and **service-providing weed communities** without compromising **production sustainability** ?

Cropping system

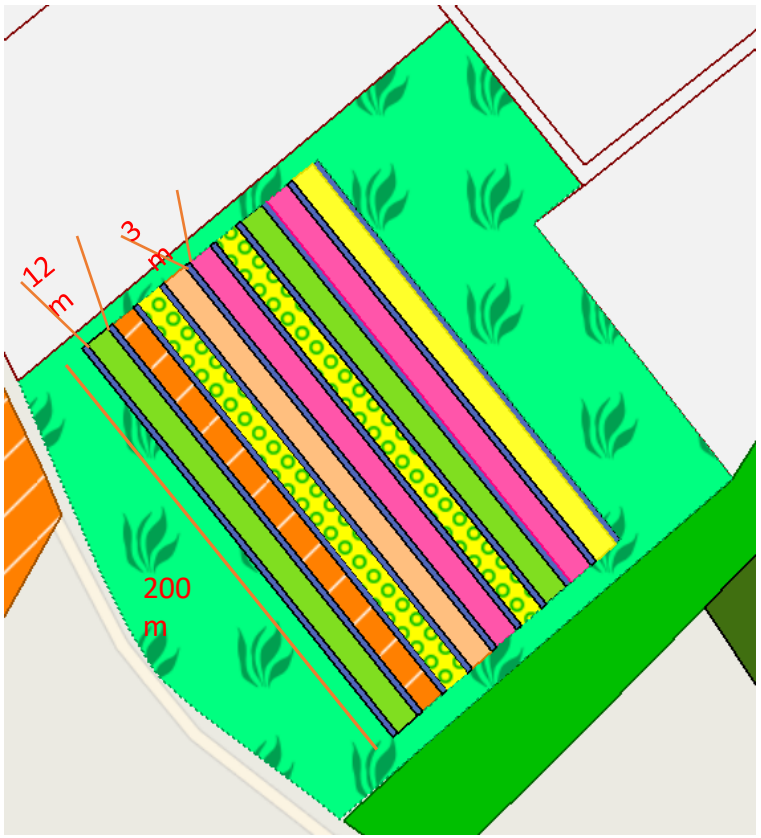
CT 

RT 

Focusing on a spring (**grain maize**) and a winter crop (**wheat-faba bean intercropping**)

Weed survey from 2021 to 2023

Disposition



- **Long term organic farming** experiment at CRA-W (Belgium)
- Converted to organic in **2020**
- Experimental plots : 12*200m
- **Temporal replication** : 3 crops of the rotation present in the same year (n, n+1, n+2)

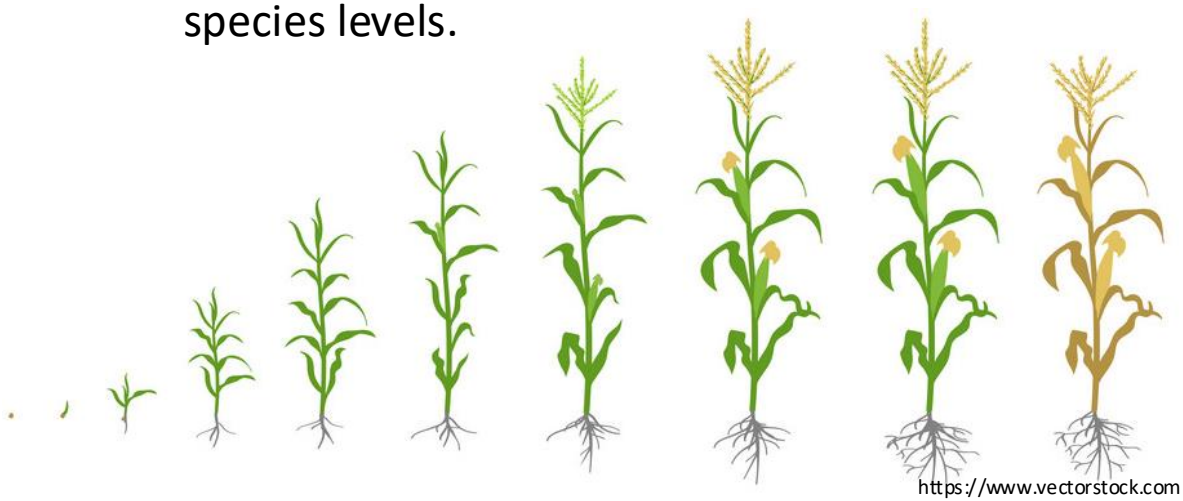


0.75*1m
10/field

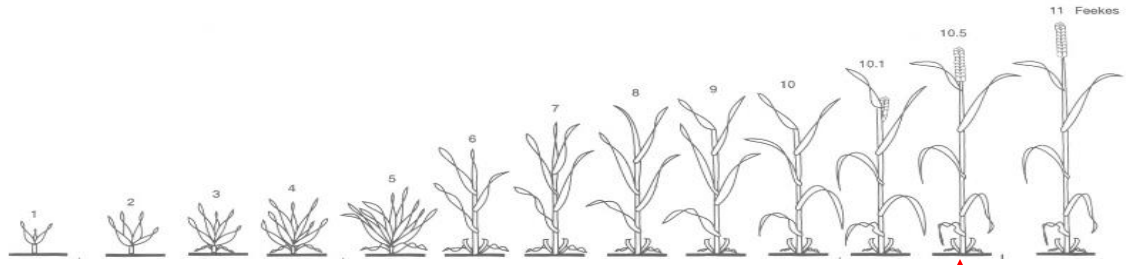


0.50*0.50m
10/field

Density of weeds realised at the species levels.



Counting



Counting

Biodiversity and Conservation (2021) 30:2145–2164
https://doi.org/10.1007/s10531-021-02191-x

ORIGINAL PAPER

Check for updates

An index of ecological value for European arable plant communities

E. Fanfarillo[1] · A. Kasperski[2]

Received: 28 November 2020 / Revised: 25 March 2021 / Accepted: 27 April 2021 /
Published online: 4 May 2021
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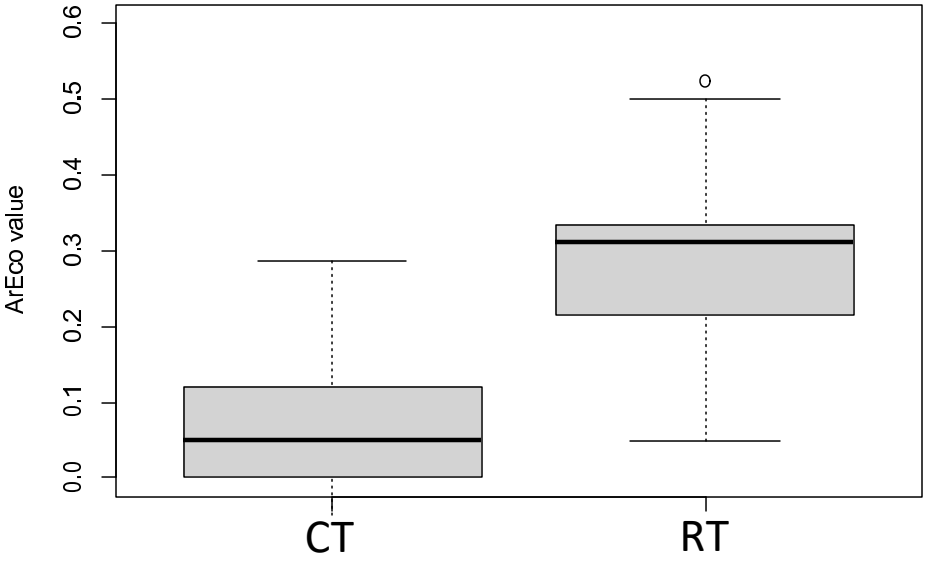
$$ArEco = \sum_{i=1}^{m} weight(i) \cdot criterion(i)$$

ArEco is an index to evaluate the ecological value based on:
1) species richness
2) degree of preservation
3) levels of support for birds and insects.



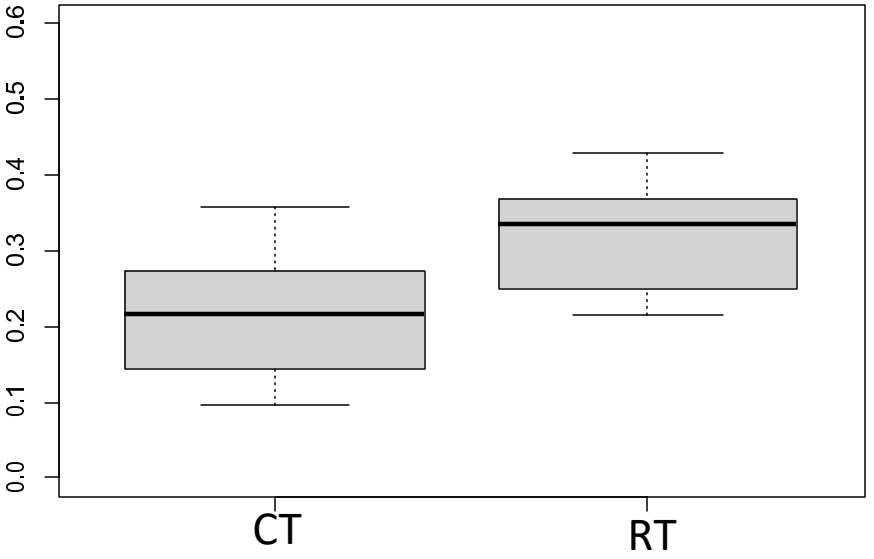
ArEco index

Grain Maize



ArEco value 6 times higher in RT than in CT

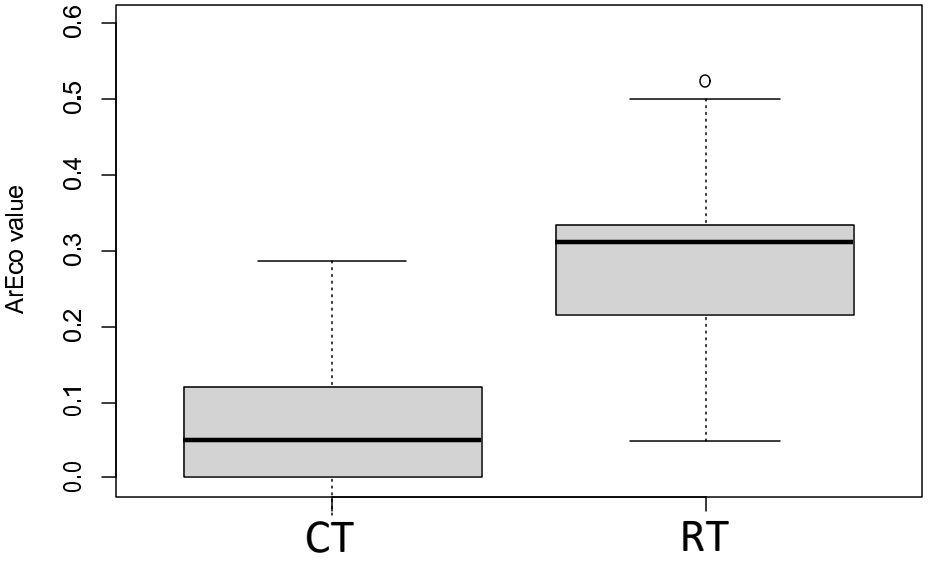
Wheat-faba bean



ArEco value higher in RT than in CT but with less differences than in maize crop.

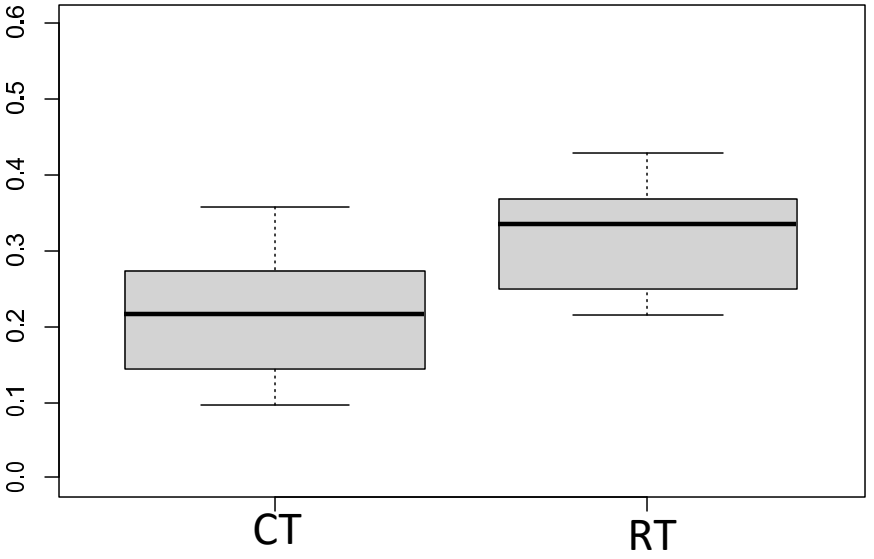
ArEco index

Grain Maize



ArEco value 6 times higher in RT than in CT

Wheat-faba bean



ArEco value higher in RT than in CT but with less differences than in maize crop.

ArEco principaly low ➔ because of beginning of long term experiment only in 2020?

There are differences in ArEco Value, but why, and what does it mean? ➔
Need for more precise indicators more detailled about their significances.

There are differences in ArEco Value, but why, and what does it mean? ➔
Need for more precise indicators more detailled about their significances.

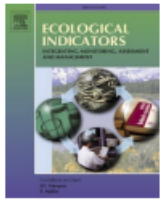
Use of other indicators concerning the contribution of weeds to services and disservices proposed by Yvoz et al. (2021)

Ecological Indicators 132 (2021) 108321

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A framework to estimate the contribution of weeds to the delivery of ecosystem (dis)services in agricultural landscapes

Séverin Yvoz, Stéphane Cordeau, Alexandre Ploteau, Sandrine Petit *

Agroécologie, AgroSup Dijon, INRAE, Univ. Bourgogne, Univ. Bourgogne Franche-Comté, F-21000 Dijon, France

There are differences in ArEco Value, but why, and what does it mean? ➔
Need for more precise indicators more detailled about their significances.

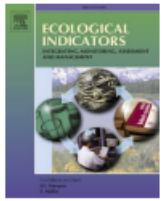
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Agroécologie, AgroSup Dijon, INRAE, Univ. Bourgogne, Univ. Bourgogne Franche-Comté, F-21000 Dijon, France

Based on functional traits

Potential weed contribution to polinators


Pol1: Bees


Pol2: Bumblebees


Pol3: Hoverflies

Potential weed contribution to polinators


Pol1: Bees


Pol2: Bumblebees


Pol3: Hoverflies

Potential contribution to pest natural enemies:


Pcont1: Farmland birds


Pcont2: Carabids


Pcont3: Parasitoid wraps

Potential weed contribution to polinators


Pol1: Bees


Pol2: Bumblebees


Pol3: Hoverflies

Potential contribution to pest natural enemies:


Pcont1: Farmland birds


Pcont2: Carabids


Pcont3: Parasitoid wraps

Harmfullness:

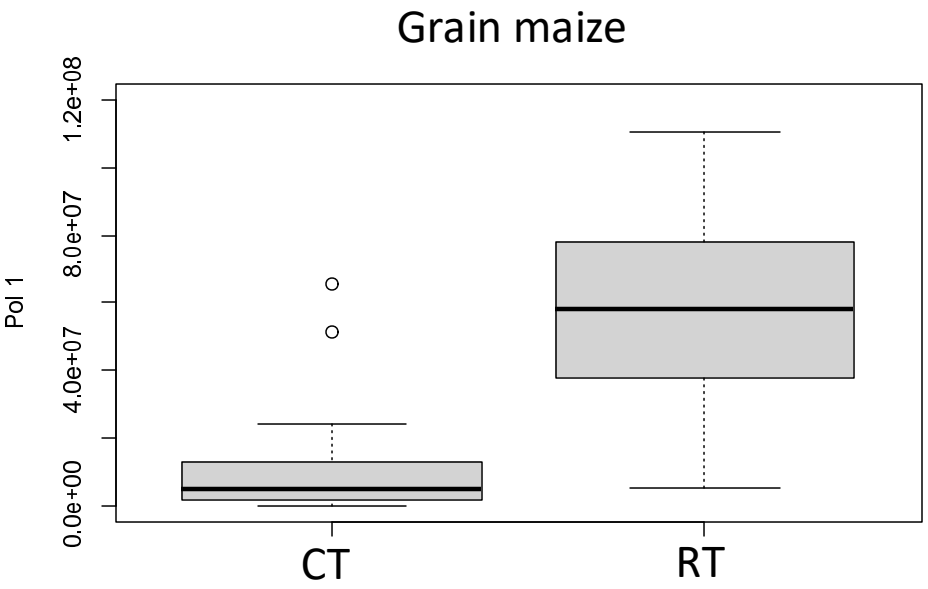

Harm1: Potential weed competition against crop

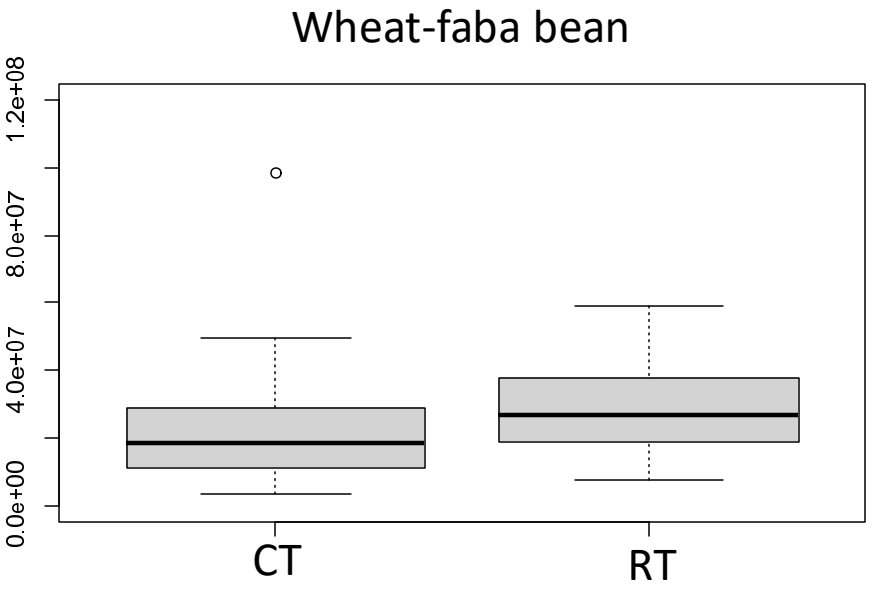
Harm2: Potential weed contribution to harvest difficulties (not used in this study)

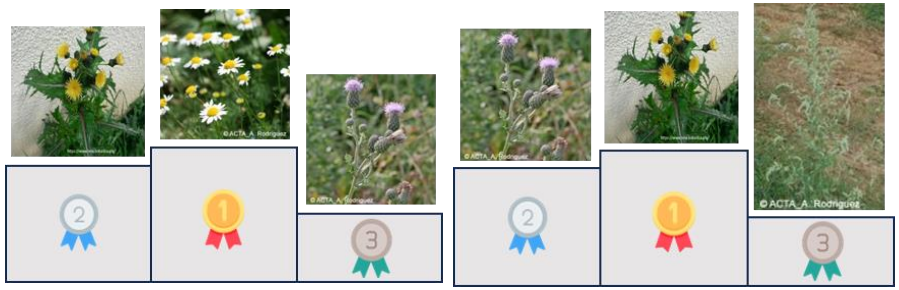

Harm3: Potential weed contribution to future infestation

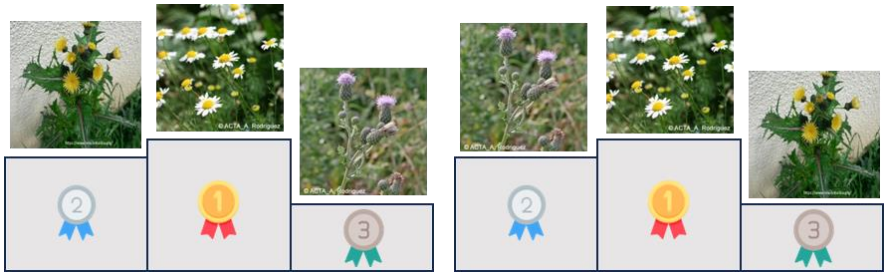
➔ See Yvoz et al (2021) for the detail of equation.

Pol1:





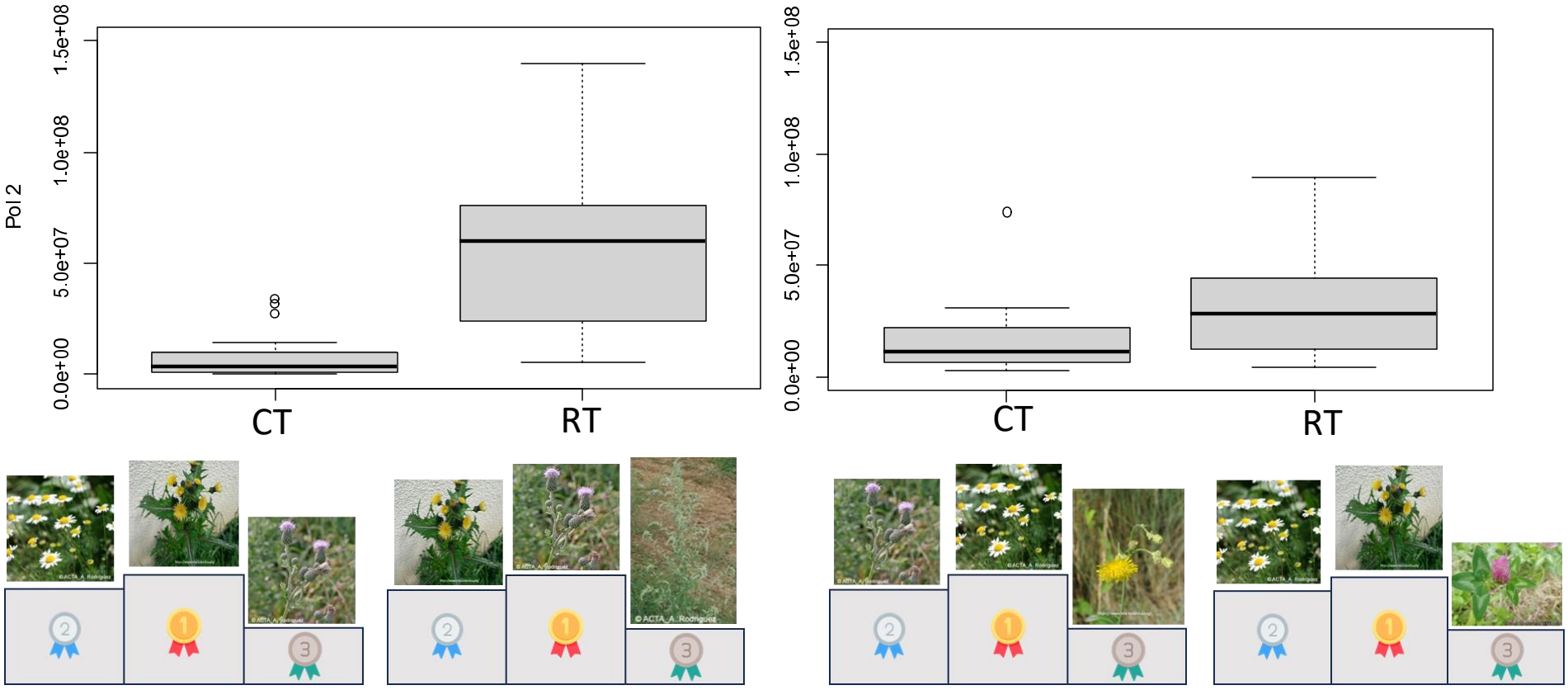




Chenopodium album L.
Cirsium arvense (L.) Scop.
Matricaria chamomilla L.
Sonchus asper (L.) Hill.

Pol2:



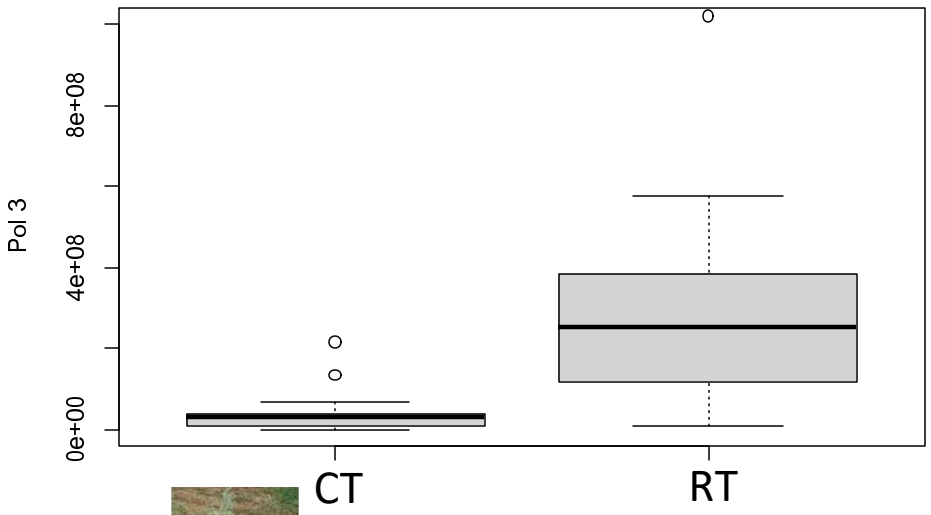


Chenopodium album L. *Sonchus arvensis* L.
Cirsium arvense (L.) Scop. *Sonchus asper* (L.) Hill.
Matricaria chamomilla L. *Trifolium pratense* L.

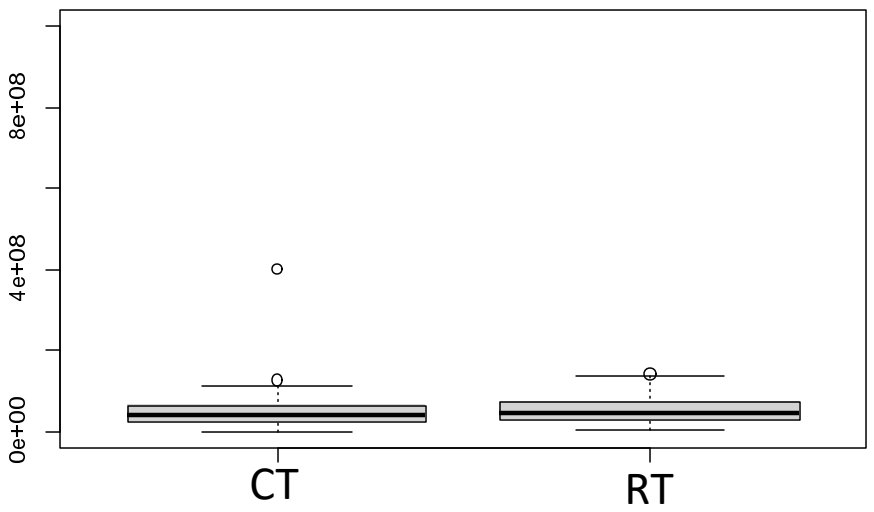
Pol3:

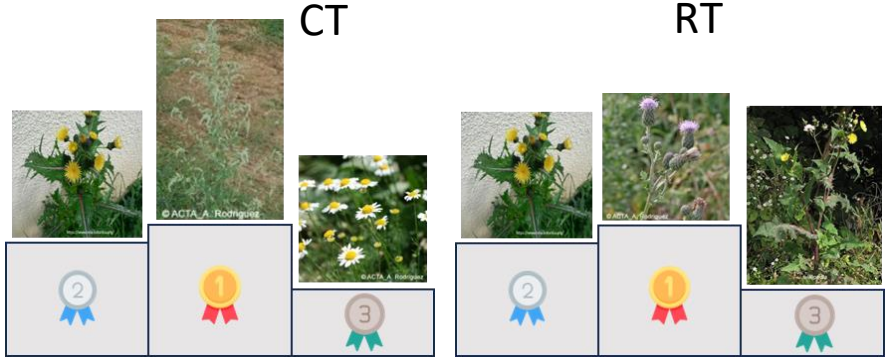


Grain maize



Wheat-faba bean



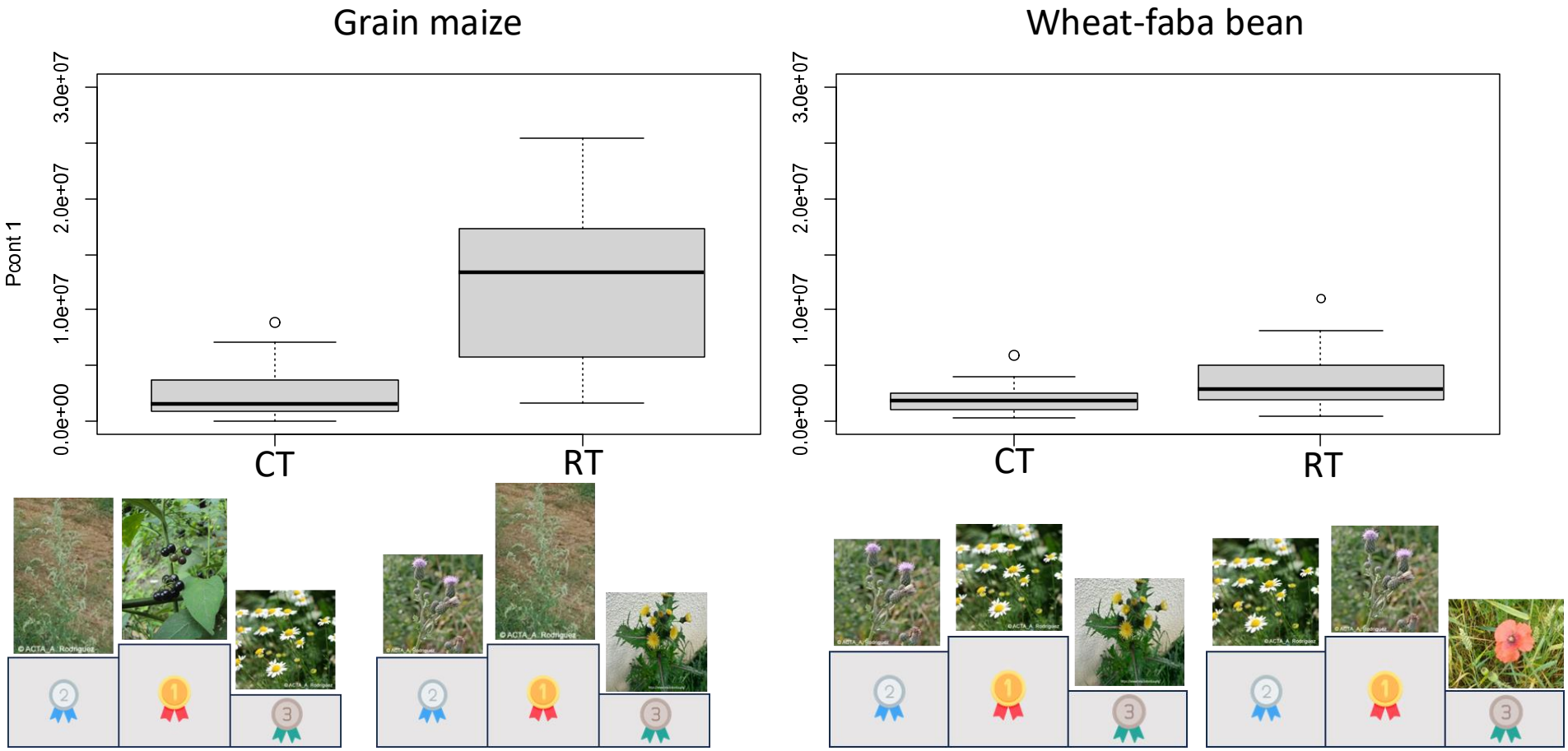




Chenopodium album L.
Cirsium arvense (L.) Scop.
Lactuca serriola L.
Matricaria chamomilla L.
Sonchus arvensis L.
Sonchus asper (L.) Hill.
Sonchus oleraceus L.

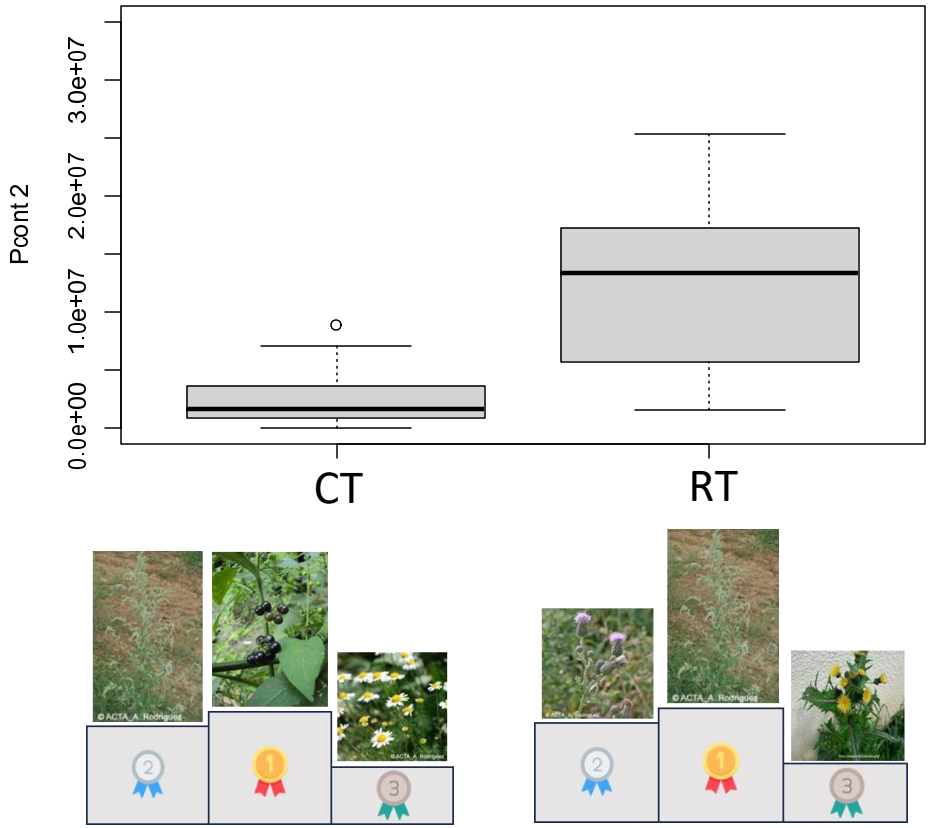
Pcont1:

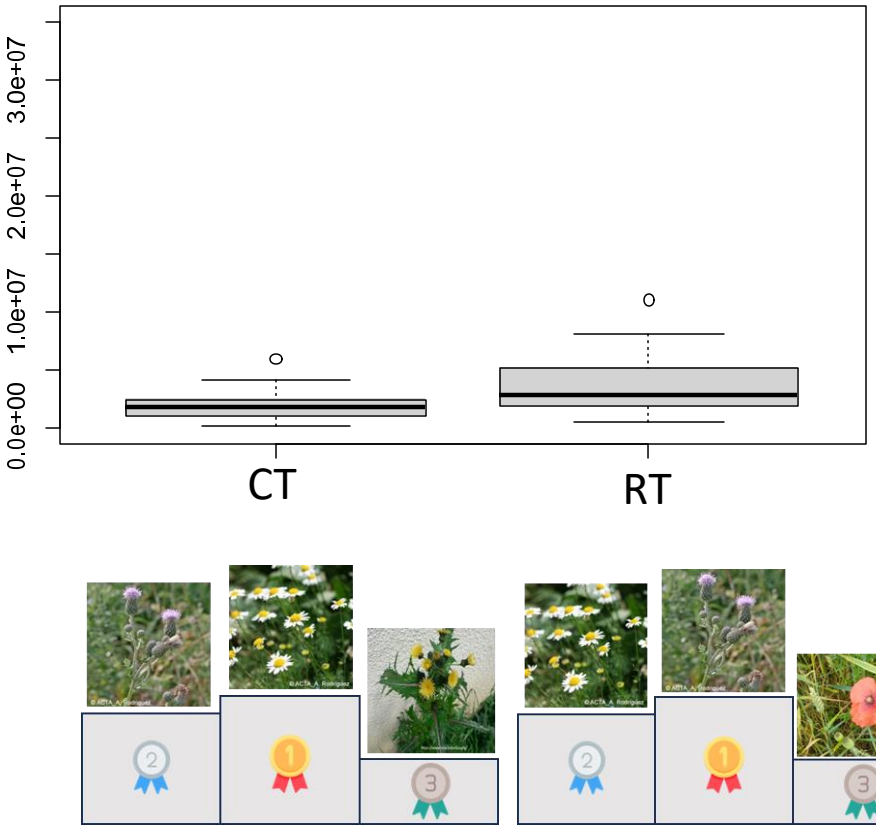




Chenopodium album L.
Cirsium arvense (L.) Scop.
Matricaria chamomilla L.
Papaver rhoeas L.
Solanum nigrum L.
Sonchus asper (*L.*) Hill.

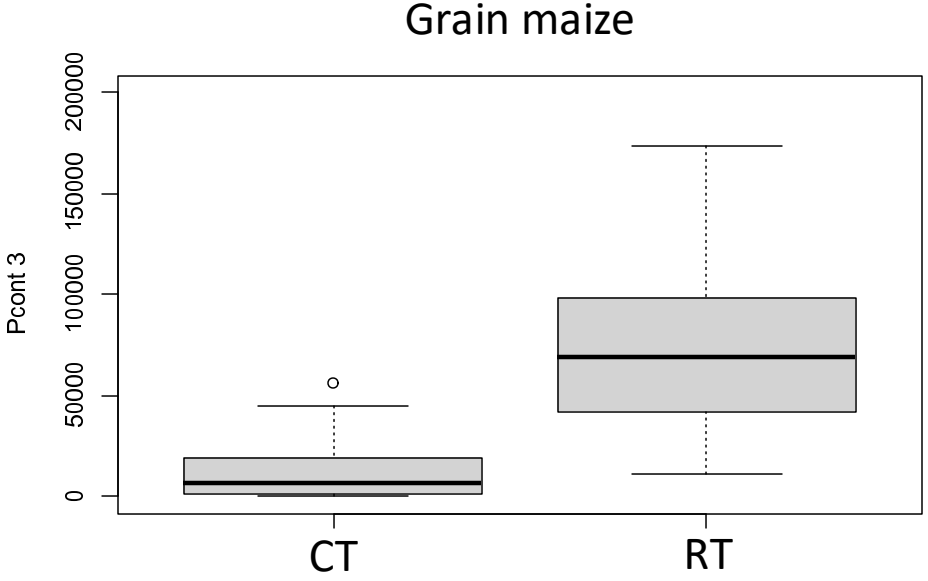
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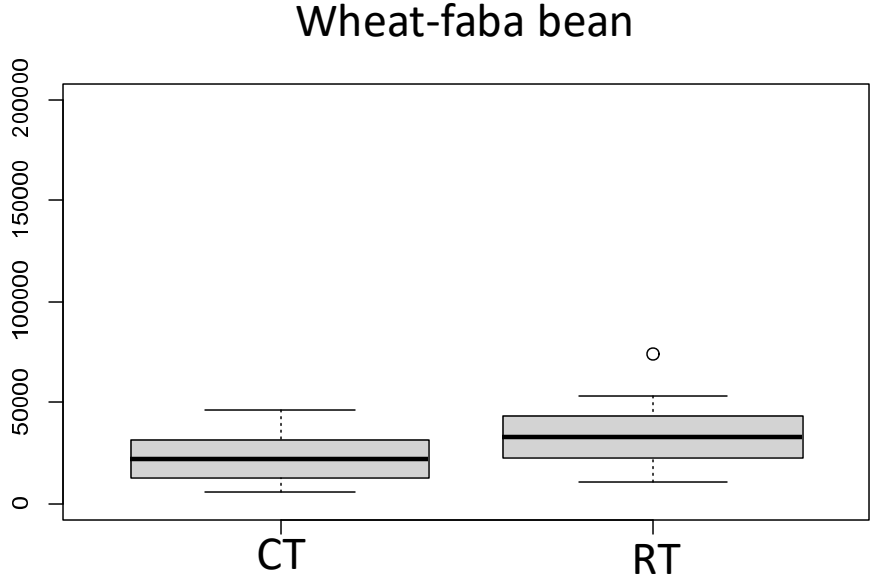


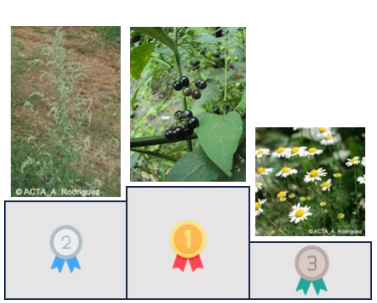


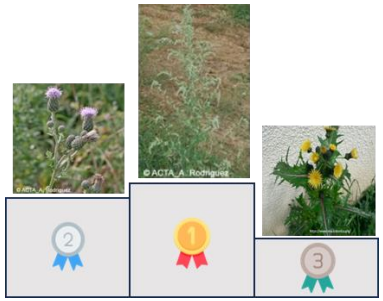
Chenopodium album L.
Cirsium arvense (L.) Scop.
Matricaria chamomilla L.
Papaver rhoeas L.
Solanum nigrum L.
Sonchus asper (*L.*) Hill.

Pcont3:

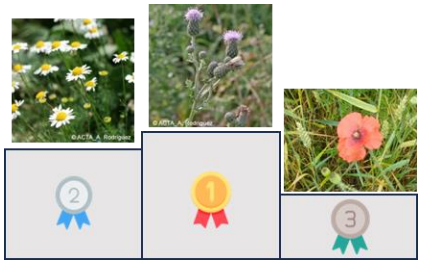








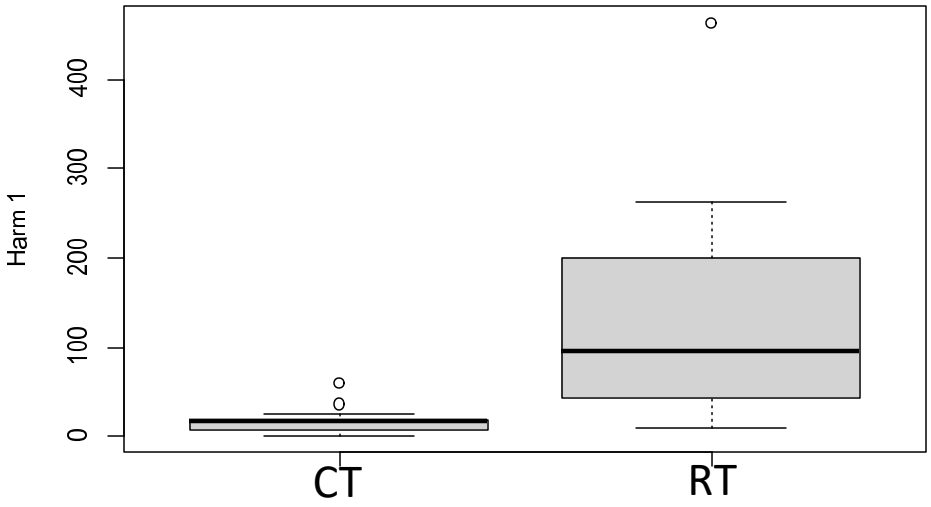


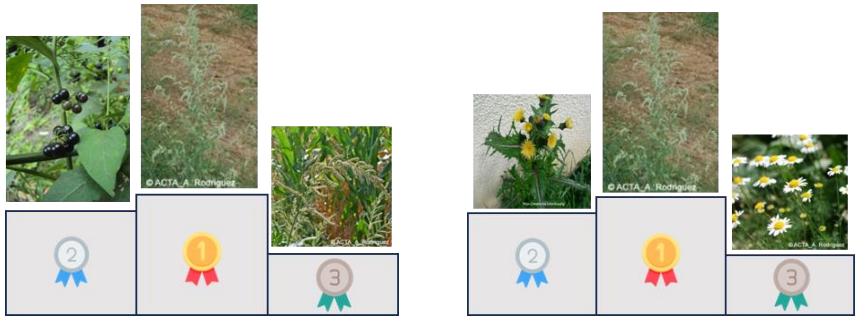


Chenopodium album L.
Cirsium arvense (L.) Scop.
Matricaria chamomilla L.
Papaver rhoeas L.
Solanum nigrum L.
Sonchus asper (*L.*) Hill.

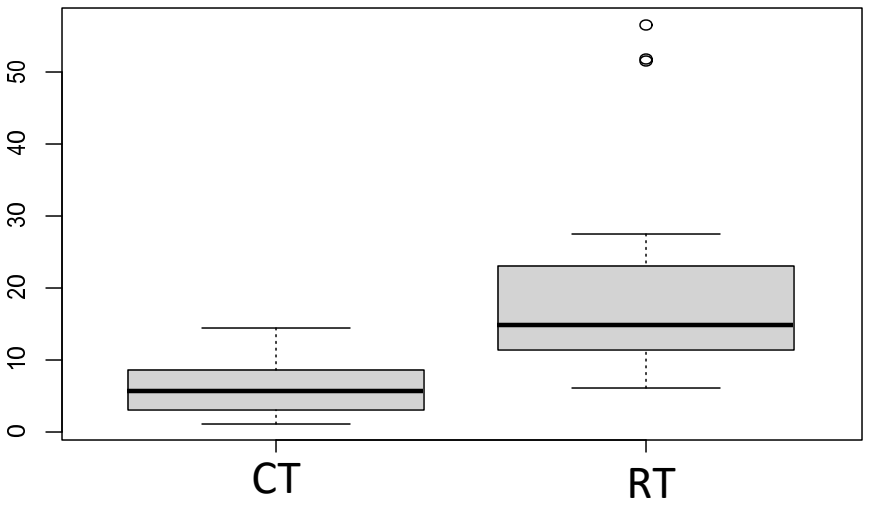
Harm1:

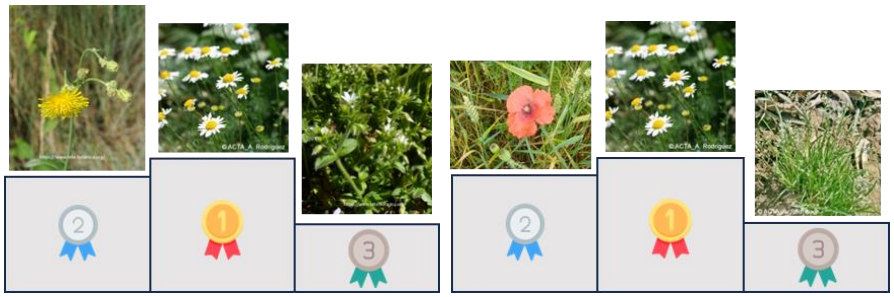
Grain maize





Wheat-faba bean





Cerastium glomeratum Thuill.
Chenopodium album L.
Echinochloa crus-galli (L.) P.Beauv.
Matricaria chamomilla L.
Papaver rhoeas L.
Poa annua L.
Solanum nigrum L.
Sonchus asper (L.) Hill.

Harm1: 



What about the estimation of **real competition**?

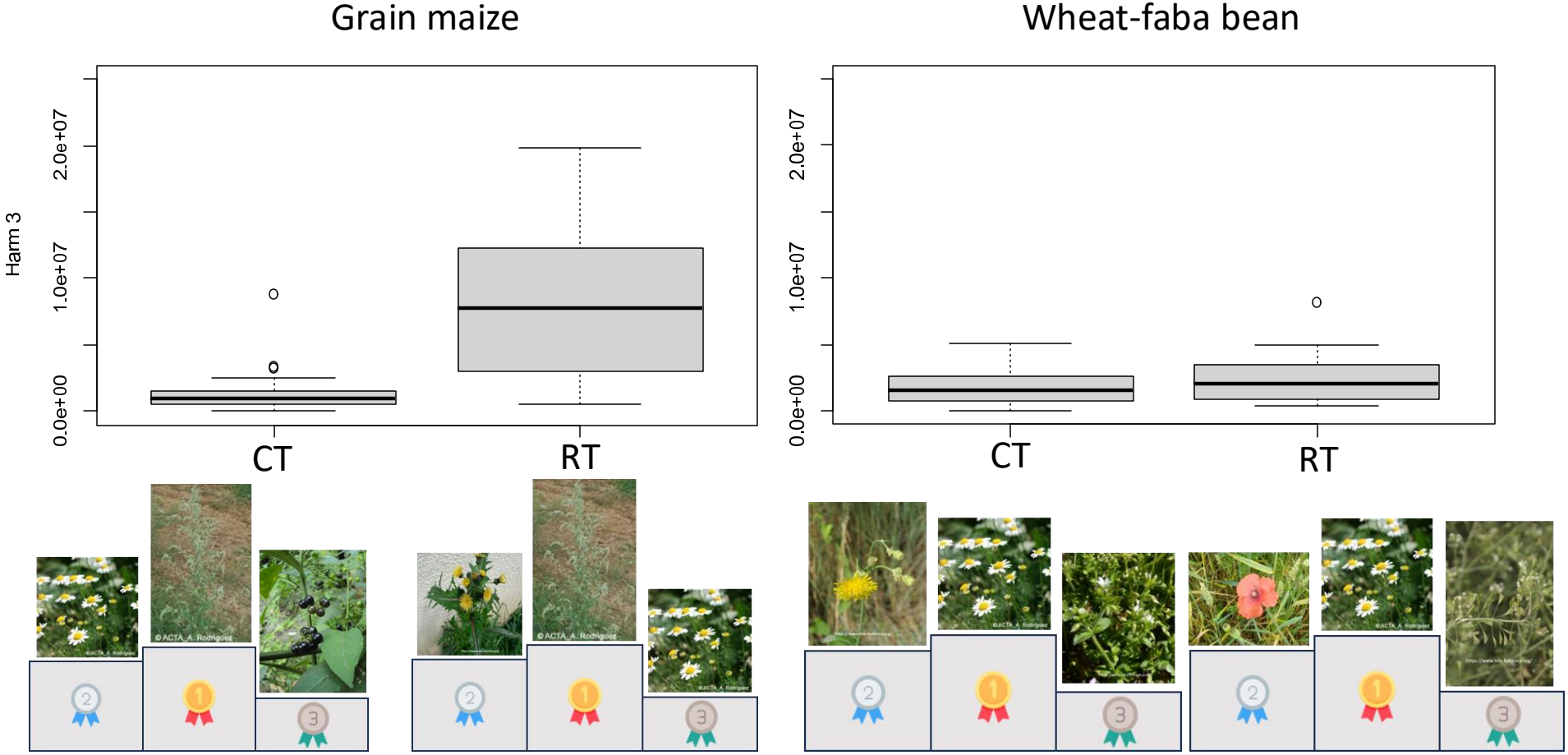
Assessment of **weed harmfulness** in grain maize between 2022 and 2023 based on maize biomass at flowering, comparing **weed-free** and **weedy** quadrats.

Grain maize biomass was **65% lower** in weedy quadrats compared to weed-free quadrats **only under RT**.

	CT	RT
Grain maize	4,76 T/ha	2,48 T/ha

➔ Effect attributable to both **weed competition** and differences in **tillage practices**.

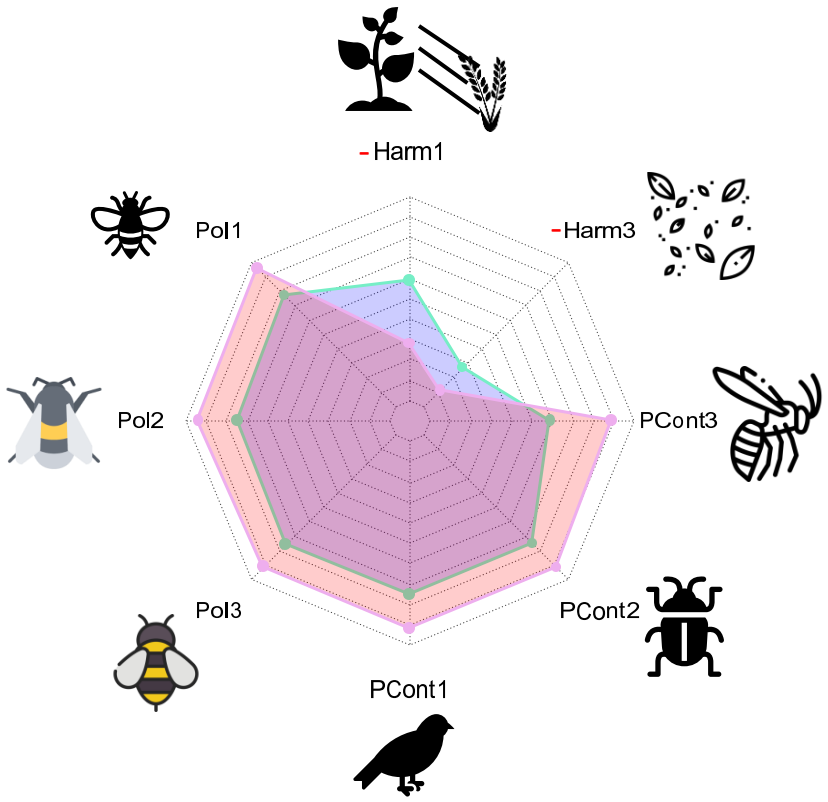
Harm3:



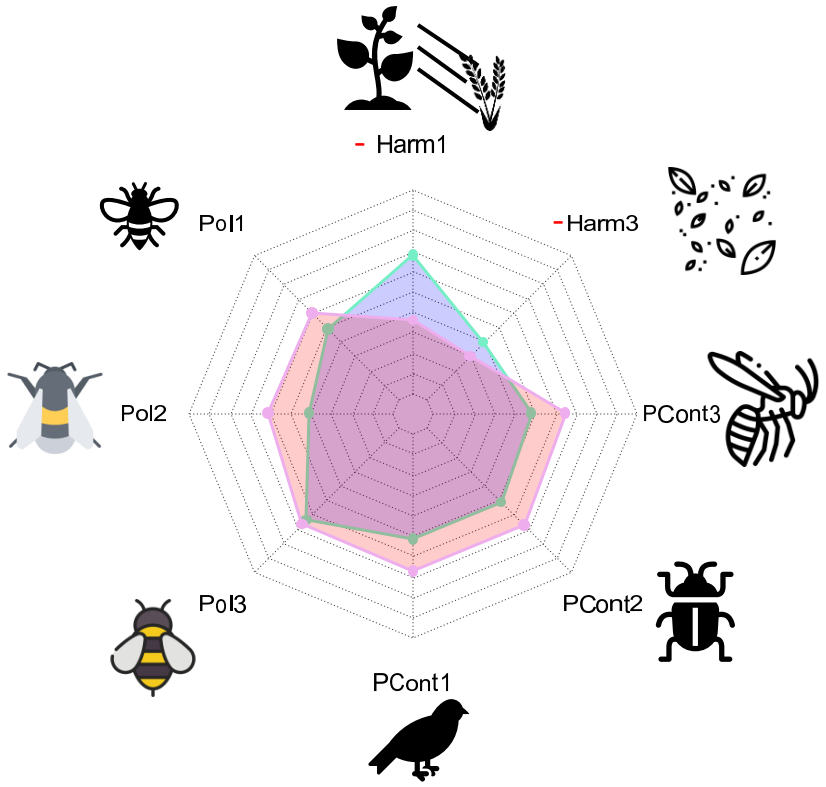
Capsella bursa-pastoris (L.) Medick
Cerastium glomeratum Thuill.
Chenopodium album L.
Matricaria chamomilla L.
Papaver rhoeas L.
Solanum nigrum L.
Sonchus arvensis L.
Sonchus asper (*L.*) Hill.

General overview:

Grain maize



Wheat-faba bean



- More potential **services** in **RT** than in **CT** for grain maize and wheat-faba bean crops
- **RT** is also associated with greater potential weed **harmfulness**

Take home message

- Need to find a balance between **services** and **disservices** provided by weed communities.
- In organic farming, reduced tillage (with low fertility) increases the **potential service** provided by weed communities but also increases their **potential harmfulness**.
- **Potential weed harmfulness**, assessed through a **functional trait-based index**, was **confirmed** by biomass measurements.

➔ **Need to evaluate services and disservices provided by weed communities more systematicaly throughout different cropping systems**



Acknowledgement

This research is part of the project ABCSoil2Weed funded by SPW



Wallonie service public SPW

Wallonie recherche CRA-W

LIÈGE université Gembloux Agro-Bio Tech

Thank you for your attention !



Christophe Lacroix[1], Nina Leclef[2], M. Abras[3], A. Monty[2], B.Dumont[1]

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Nina.leclef@uliege.be

[1]Plant Sicences Axis- Crop Science lab, TERRA Research Center, Gembloux Agro-Bio Tech, University of Liège, Belgium
[2]Biodiversity, Ecosystems and Landscape, TERRA Research Center, Gembloux Agro-Bio Tech, University of Liège, Belgium
[3]Soil, water and integrated production, Sustainability, systems and prospectives departement, Walloon Agricultural Research Center, Belgium