



Research topics in crop diversification literature at the landscape level

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A presentation in 3 parts

- 1. Background:** insight from literature with a landscape perspective
- 2. Aim and method:** define the topic from the literature, by using CorTexT
- 3. Results** and perspectives



1. Background and context

What is crop diversification?



Background questions



Addressed since long time in **literature** (Hufnagel et al., 2020)

- at the agro-ecosystem & cropping system level (e.g., Beillouin et al., 2021)
→ benefits for ecosystem services
- at the farm level (e.g. Behal-Cohen et al., 2020)
→ benefits for farm resilience and robustness



Several **policies** (e.g. eco-schemes) target the diversification, mainly at the farm level.



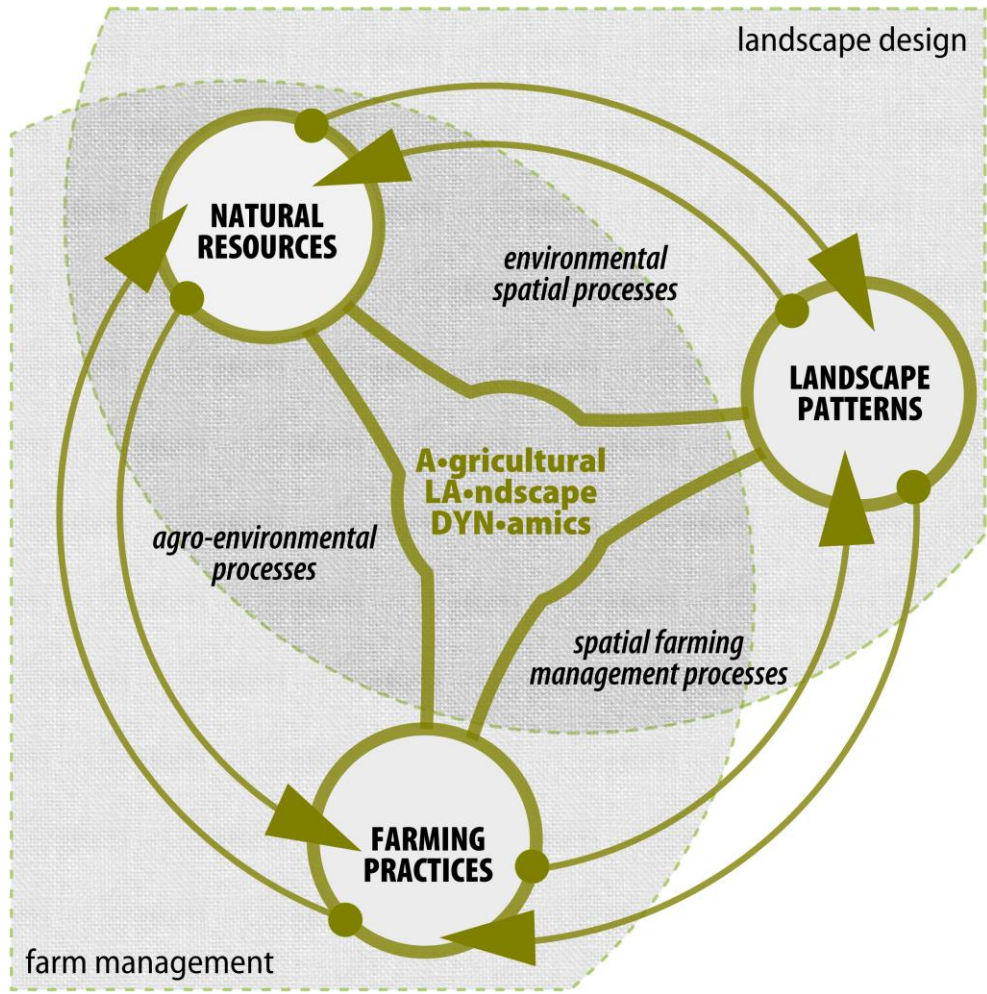
Landscape are shaped by more or less diversified farms.

- Several studies have shown the **benefits** provided at the landscape level by crop diversification, e.g. in terms of pest control (Redlich et al., 2018)
- Though, little is known on how the research community has addressed the crop diversification within a **landscape perspective**.

Hufnagel, J., Reckling, M., & Ewert, F. (2020). Diverse approaches to crop diversification in agricultural research. A review. *Agronomy for Sustainable Development*, 40(2), 14. <https://doi.org/10.1007/s13593-020-00617-4>
Beillouin, D., Ben-Ari, T., & Makowski, D. (2019). A dataset of meta-analyses on crop diversification at the global scale. *Data in Brief*, 24, 103898. <https://doi.org/10.1016/j.dib.2019.103898>
Cohen, A. A. B., Judge, J., Muneeppeerakul, R., Rangarajan, A., & Guan, Z. (2020). A model of crop diversification under labor shocks. *PLOS ONE*, 15(3), e0229774. <https://doi.org/10.1371/journal.pone.0229774>
Redlich, S., Martin, E. A., & Steffan-Dewenter, I. (2018). Landscape-level crop diversity benefits biological pest control. *Journal of Applied Ecology*, 55(5), 2419–2428. <https://doi.org/10.1111/1365-2664.13126>

Context: Landscape agronomy

Addressing agricultural landscape dynamics



Recent reviews on crop diversification highlighted that the topic is not addressed as such in the literature.
 → crop diversification is rather addressed in terms of **specific practices** (e.g., intercropping).

A **landscape (agronomy) perspective** requires to address the interactions of farming practices with natural resources and spatial and temporal patterns.

Rizzo D et al. (2013). Farming systems designing landscapes: Land management units at the interface between agronomy and geography. *Geografisk Tidsskrift-Danish Journal of Geography*, 113(2), 71–86.
<https://doi.org/10.1080/00167223.2013.849391>



2. Aim and method

AIM. Identifying the terms used in the literature to address crop diversification & landscape.

DATA. A bibliographic corpus retrieved from the Scopus database.

Homogeneous fields near Beauvais, July 2019

Method – a bibliometric review



Identifying the terms used in the literature via a scientometric platform

The corpus was analysed using the CorTexT platform (e.g., Ruiz-Martinez et al., 2015).

1. natural language processing was used to **extract multi-terms** from title, abstract and keywords to explore and summarise the essential parts of the literature
2. we observed the **co-occurrence** of the most frequent terms to identify temporal and thematic dynamics.

Ruiz-Martinez, I., Marraccini, E., Debolini, M., & Bonari, E. (2015). Indicators of agricultural intensity and intensification: A review of the literature. *Italian Journal of Agronomy*, 10(2), 74–84. <https://doi.org/10.4081/ija.2015.656>

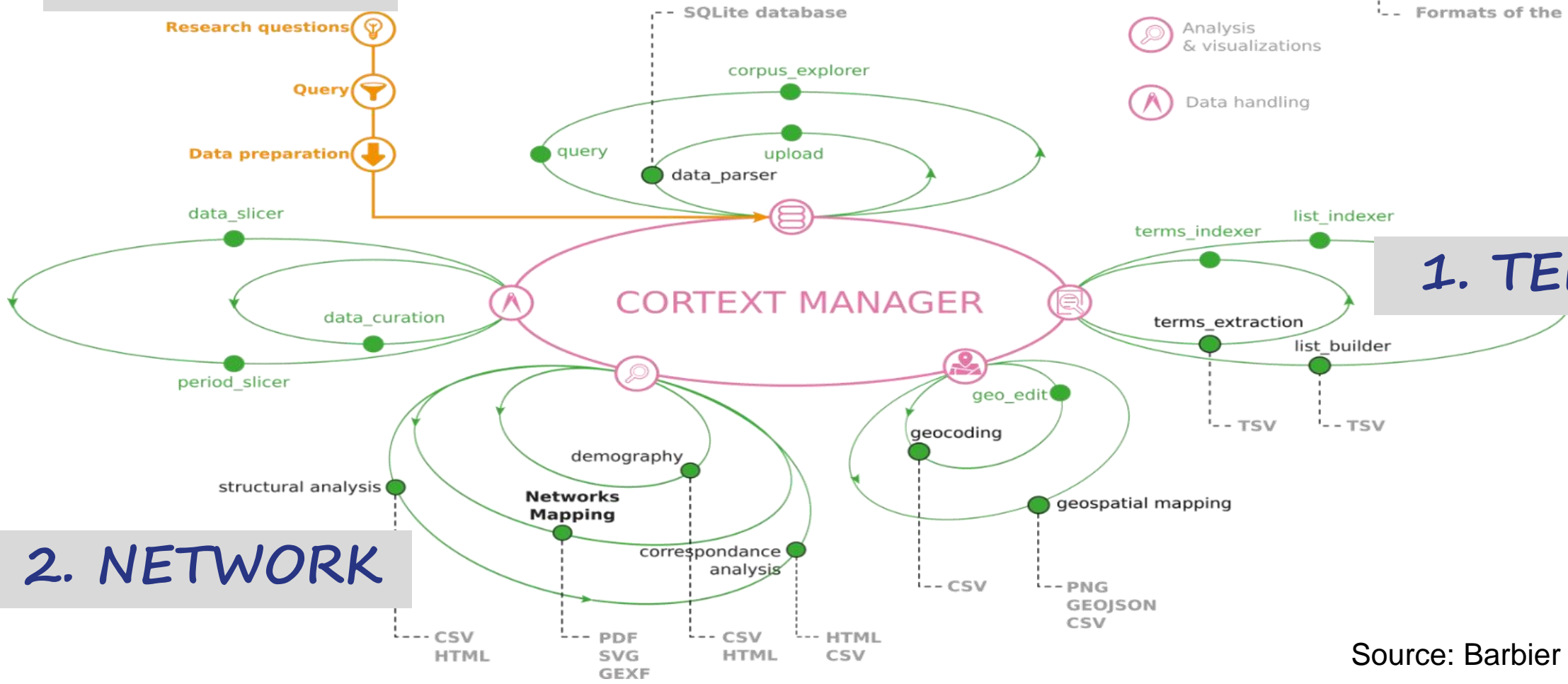
CorTextT – Overview of the scripts

0. QUERY



- Parsing & exploration
- Language processing
- Geospatial processing
- Analysis & visualizations
- Data handling

- Scripts (with an action only on the SQLite database)
- Scripts (with, in addition, downloadable results)
- Formats of the results



1. TERMS

2. NETWORK

Source: Barbier at SIAGR2021

3. Results

Query for the corpus constitution

Performed on SCOPUS, 17.09.2021

TITLE-ABS

((**crop*** W/2 **divers***)

AND (**landscape**))

OR

AUTHKEY

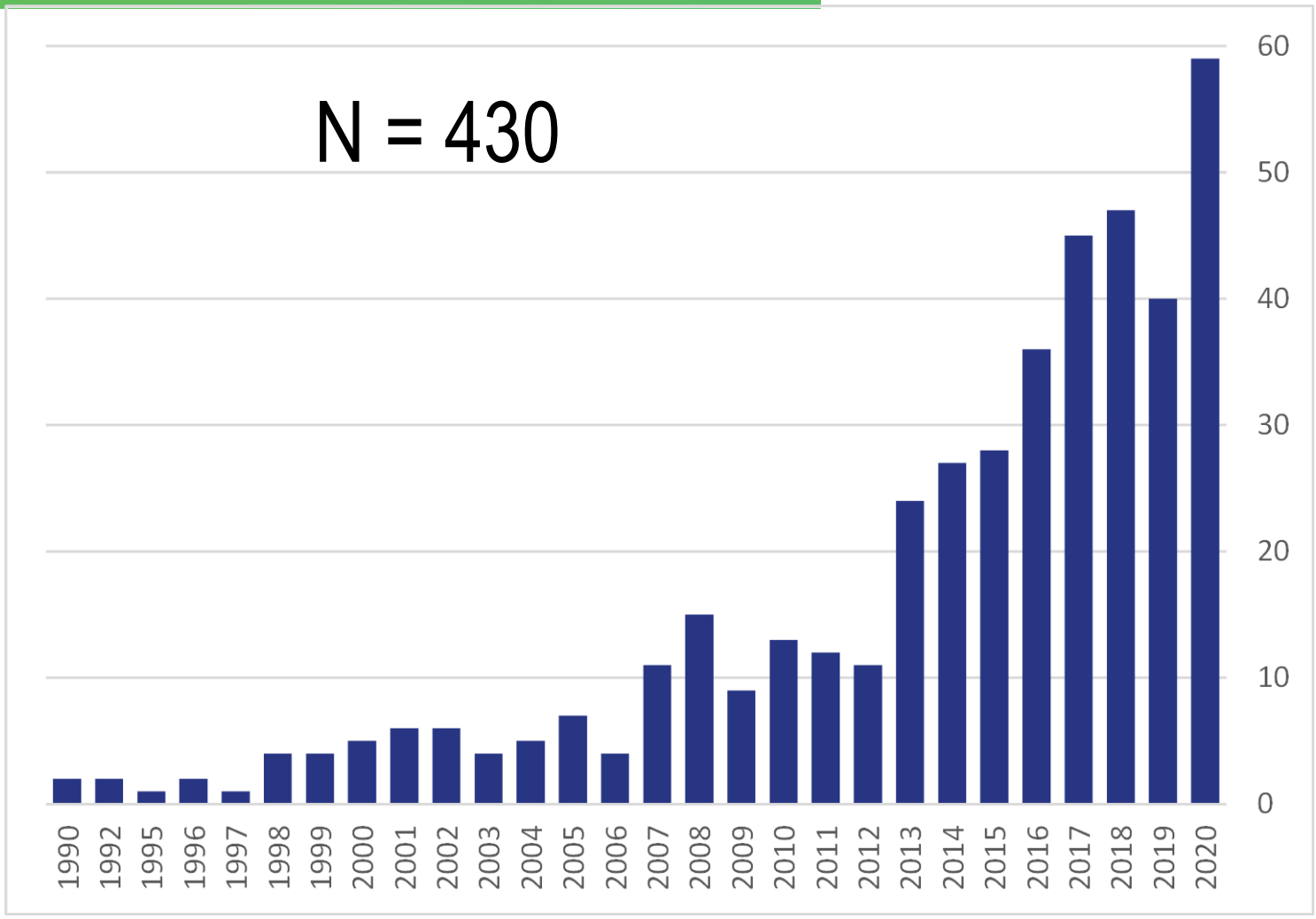
((crop* W/2 divers*)

AND (landscape))

AND

PUBYEAR > 1989 AND

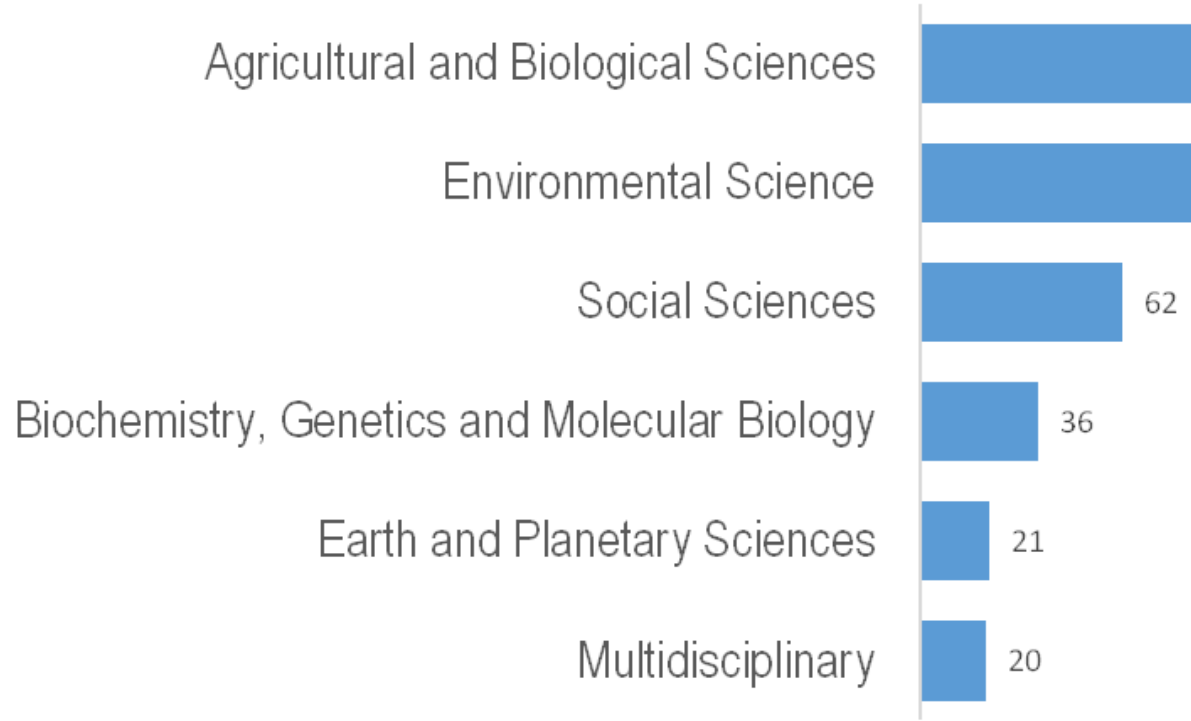
PUBYEAR < 2021



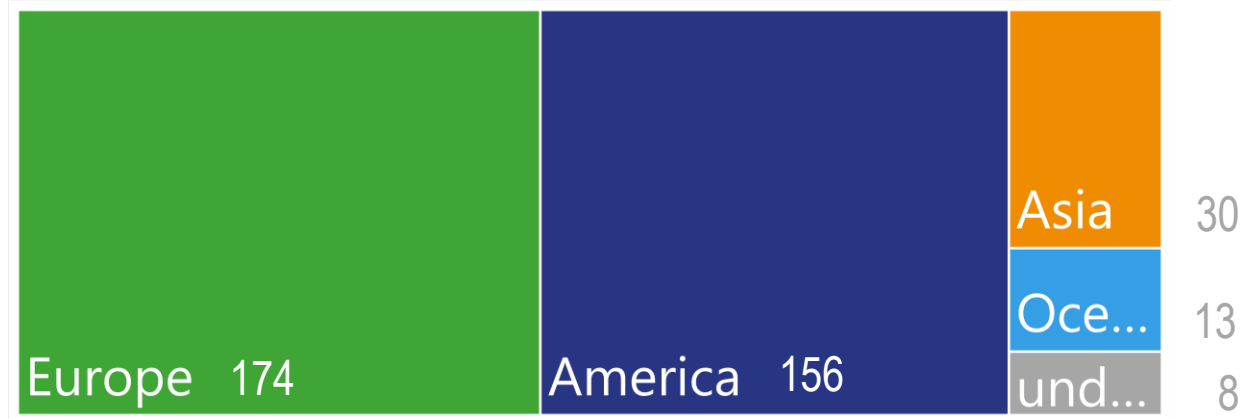
Corpus demography

A topic of main interest for agricultural sciences and European countries

Subject areas (first 6)



Funding bodies



Only 381 papers had the information – Data regrouped per world region

Source : analysis of Scopus metadata

Extracted terms – examples (first 10)

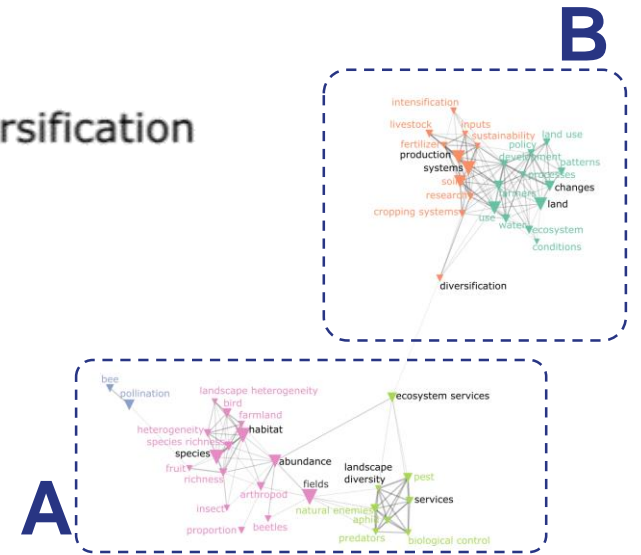
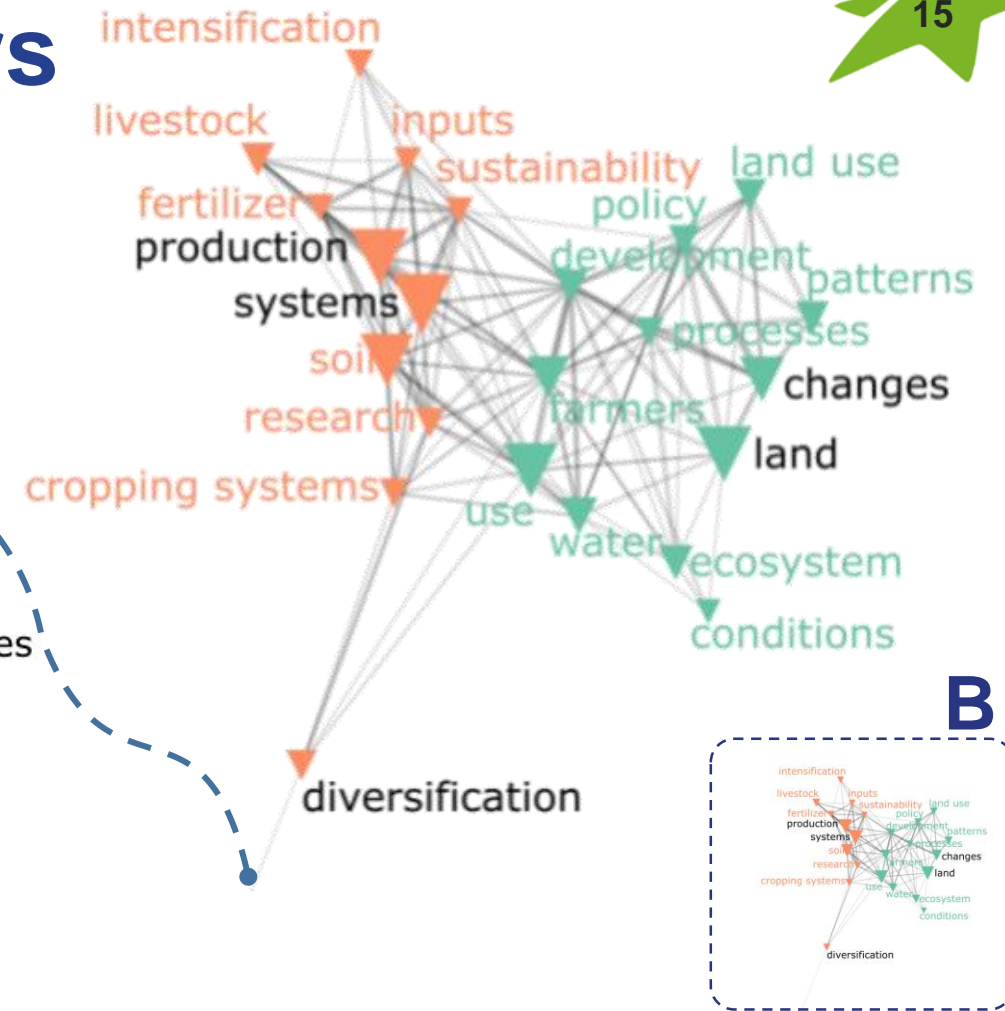
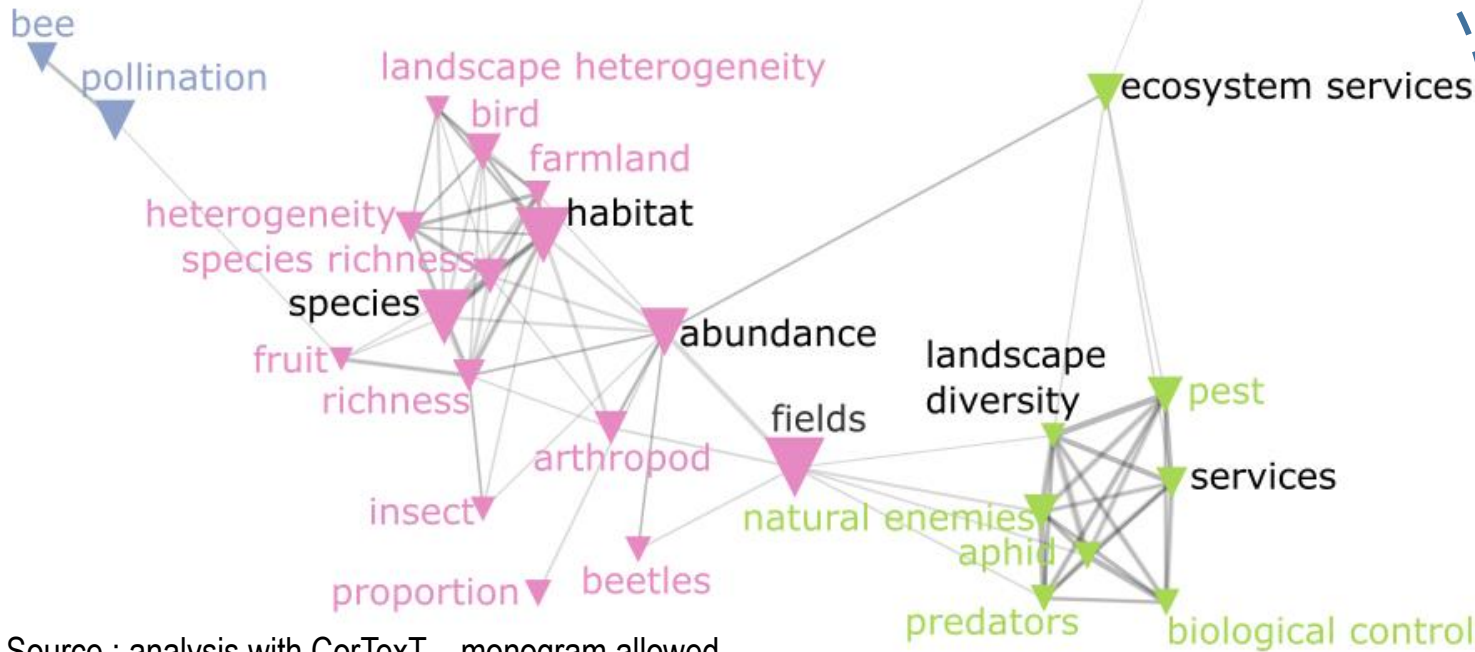
title abstract keywords, monograms forbidden, max 3-grams

Stem	Main form	Forms	Occurrences	Cooccurrences
rich speci	species richness	species richness & Species richness	82	804
land use	land use	land use & Land use & use of land & use land	89	621
enemi natur	natural enemies	natural enemies & natural enemy	43	394
crop type	crop types	crop types & crop type & types of crop	37	363
crop system	cropping systems	cropping systems & cropping system & crop systems	42	296
field size	field size	field size & field sizes	26	286
divers plant	plant diversity	plant diversity & Plant diversity	31	274
habitat non-crop	non-crop habitats	non-crop habitats & non-crop habitat & non-cropped habitats	24	264
biodivers farmland	farmland biodiversity	farmland biodiversity & biodiversity in farmland	26	253
food product	food production	food production	25	223

Two different clusters of papers

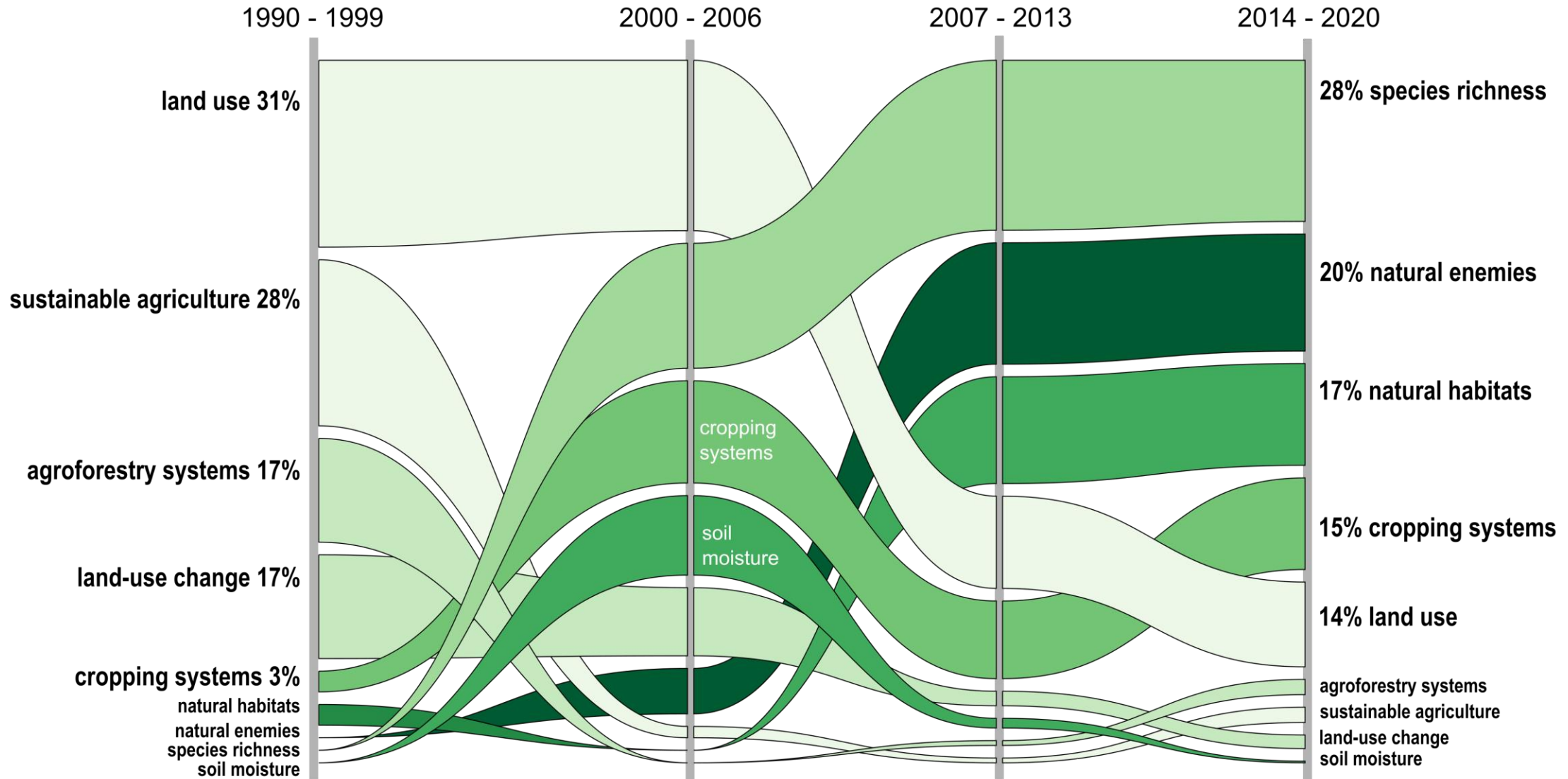
A. Ecosystem services – associated to landscape diversity and species abundance (and pollination)

B. Diversification – associated to production, systems and land, changes



Source : analysis with CorText – monogram allowed

Temporal dynamics (2- & 3-grams)





Species richness emerges as the main topic in this corpus; natural enemies and habitats, cropping systems and land use also increased in importance.

On the contrary, **land use and sustainable agriculture** decreased. Also spatially explicit terms were marginal or lost in importance.

From a landscape approach perspective, we might point out the apparent lack of terms directly related to **farmers** and other stakeholders.

Rapeseed blooming near Beauvais, May 2019

Perspectives

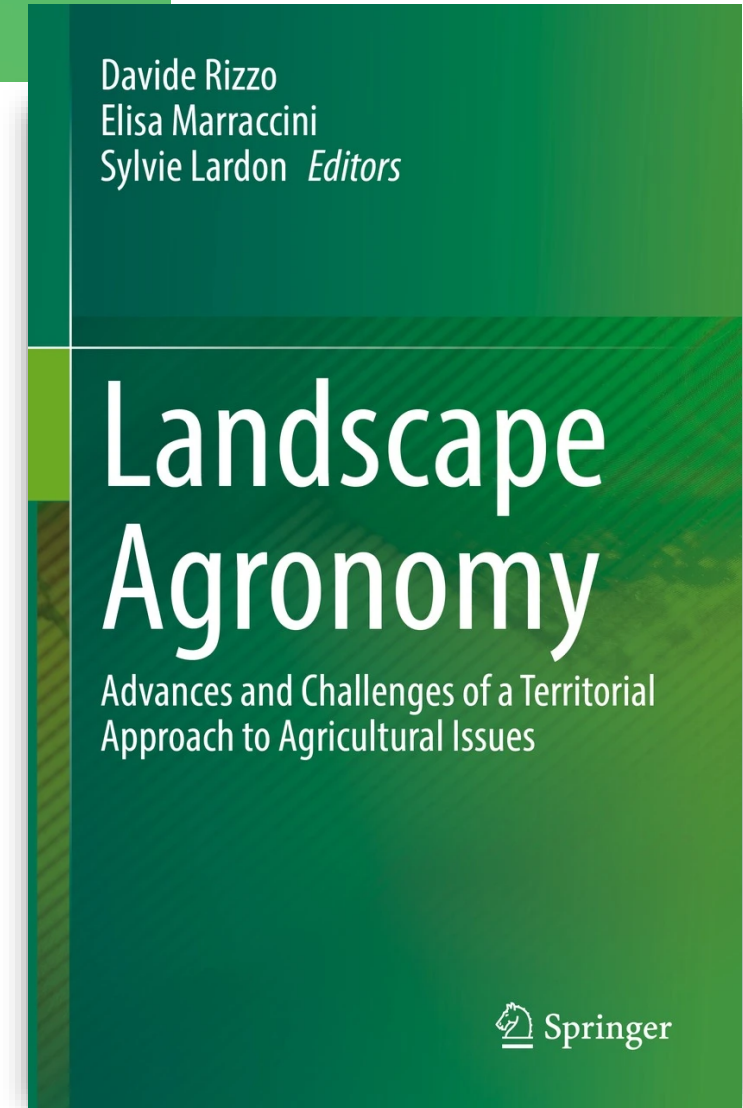
An exploratory approach to be fine-tuned

The simple and rapid text mining approach allowed to analyse the **main terms used in literature** to address crop diversification and landscape issues, as well as the co-occurrence.

A bibliometric approach is helpful to **identify knowledge gaps**, consensus and temporal dynamics of the terms that are used.

From a landscape agronomy perspective we point out the need to enhance the use of spatially explicit terms (thus of concepts and tools) related to crop diversification, consistently with (natural and cultivated) species diversity and farming practices.

<https://link.springer.com/book/10.1007/978-3-031-05263-7>



Thank you for your attention!

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Gradient of field size from Italy to France - September 2021



Details of the corpus export from Scopus



Export document settings [?](#)

You have chosen to export 430 documents

Select your method of export

- MENDELEY ExLibris RefWorks SciVal [i](#) RIS Format *EndNote, Reference Manager* CSV *Excel* BibTeX Plain Text *ASCII in HTML*

What information do you want to export?

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| <input checked="" type="checkbox"/> Citation information | <input type="checkbox"/> Bibliographical information | <input type="checkbox"/> Abstract & keywords | <input type="checkbox"/> Funding details | <input type="checkbox"/> Other information |
| <input checked="" type="checkbox"/> Author(s) | <input checked="" type="checkbox"/> Affiliations | <input checked="" type="checkbox"/> Abstract | <input type="checkbox"/> Number | <input type="checkbox"/> Tradenames & manufacturers |
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| <input checked="" type="checkbox"/> Document title | <input type="checkbox"/> PubMed ID | <input type="checkbox"/> Index keywords | <input checked="" type="checkbox"/> Sponsor | <input type="checkbox"/> Conference information |
| <input checked="" type="checkbox"/> Year | <input type="checkbox"/> Publisher | | <input checked="" type="checkbox"/> Funding text | <input checked="" type="checkbox"/> Include references |
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| <input checked="" type="checkbox"/> Open Access | | | | |



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