Networks of Interactions in Intercropping

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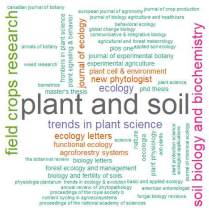
Intercropping (IC) consists in **growing various crops on one single plot at the same time**. Despite the **wide range of advantages** it is associated to, its **adoption in Belgium remains low**. In fact, **many interactions** can take place between two associated crops, which lead either to **facilitation** or **competition**. Despite several decades of research, the exact relationships leading to facilitation or competition and the conditions in which they occur are **still unclear**. Consequently, it is **hard to predict the outcome** of a given IC design in a given environment **and to advise farmers**.

In order to (i) **better understand the mechanisms at work in intercropping** and to (ii) **identify the gaps in current knowledge,** we made an extensive literature review and compiled the information in the form of networks of interactions.

1. Network creation

1. Extensive literature review

142 papers read



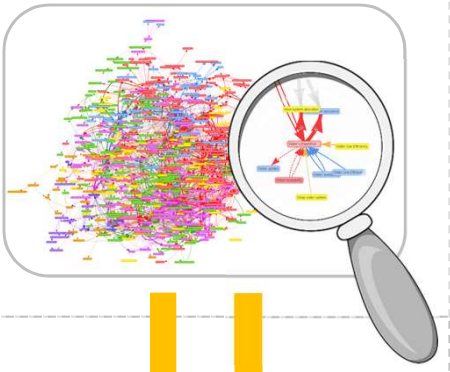
2. Identification of interactions

More than **900** nodes

More than **1200** interactions

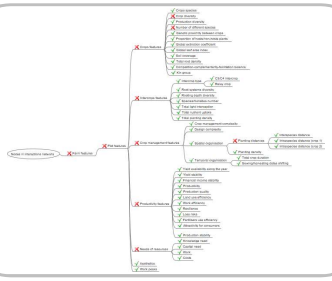
Nodes classification
→ Colours in the network

3. Creation of the global network



2. Networks simplification

4a. Classification of the Nodes



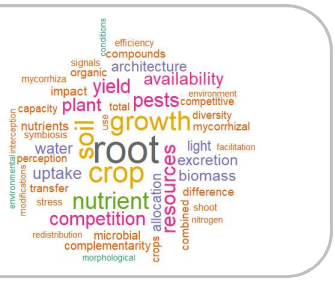
5a. Assignment of an accuracy level to each node

Level **1** → Least precise **(e.g. : « Plant »)**

Most precise **(e.g. : « Crypto-chromes »)** ← Level **5**

→ Creation of networks of **different accuracy levels**

4b. Identification of the 10% most frequently used words



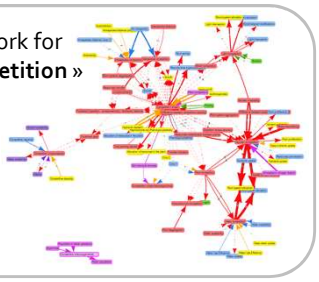
5b. Selection of the words of interest

Focus on the relationships and on the interactions in intercropping

Word	Nb of occurrences
root	391
pests	178
yield	176
competition	168
excretion	122
architecture	113
complementarity	83
transfer	78
competitive	72
perception	71
shoot	62
redistribution	51
facilitation	51

6b. Creation of an individual network for each word

Network for « **Competition** »



3. First conclusions & perspectives

The network is based on sound scientific literature from major journals, which have different focus (e.g. : plant physiology, ecology, soil biology)

→ **Intercropping is a focus of interest in many research fields**

Half of the links were added by ourselves, based on implicit knowledge (e.g. : Light interception → Photosynthesis) & common sense (e.g. : Crop 1 → Height (crop 1))

→ **These implicit links do not emerge from literature review but provide consistency to the network**

Next steps : finish simplifying the network and making it accessible to other researchers via an RShiny application

Possible applications :

- → Identify the gaps in current knowledge about intercropping
- → Advise researchers and research funds on what to study in intercropping
- → Make a simpler network to serve as a basis for discussion with farmers

R package used for networks : visNetwork