



A conceptual framework to better understand the role of phytobiome on field crop establishment

Jay Ram Lamichhane, Jean-Noel Aubertot

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A conceptual framework to better understand the role of phytobiome in field crop establishment

Jay Ram Lamichhane & Jean-Noël Aubertot
UMR 1248 AGIR, Centre INRA, Occitanie-Toulouse

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What is crop establishment?

The very initial phase of a crop cycle that involves the seed germination and seedling emergence (SGE) process

Sowing



Seed imbibition



Seed germination



Seedling emergence



Crop establishment

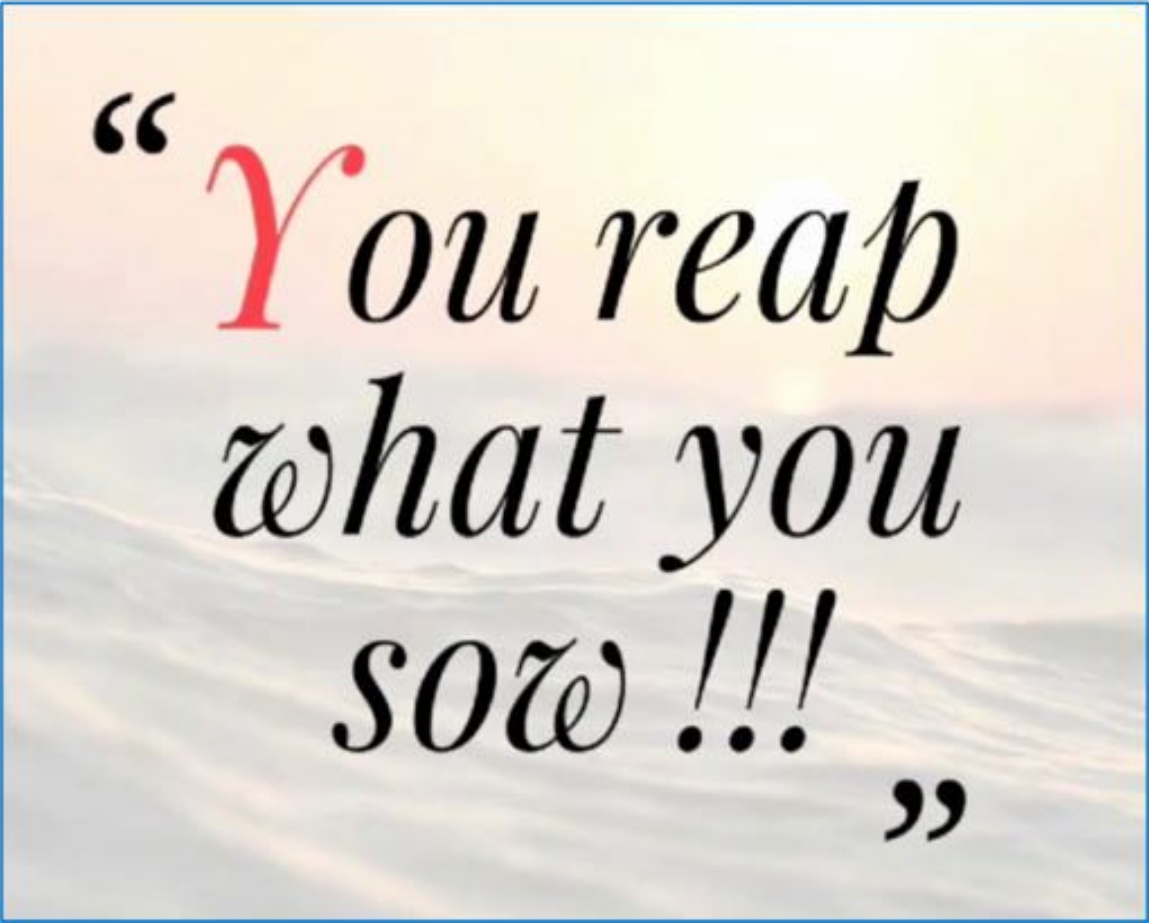


Why a special focus on crop establishment?

The most important and vulnerable phase of a crop cycle (Villalobos et al 2016).

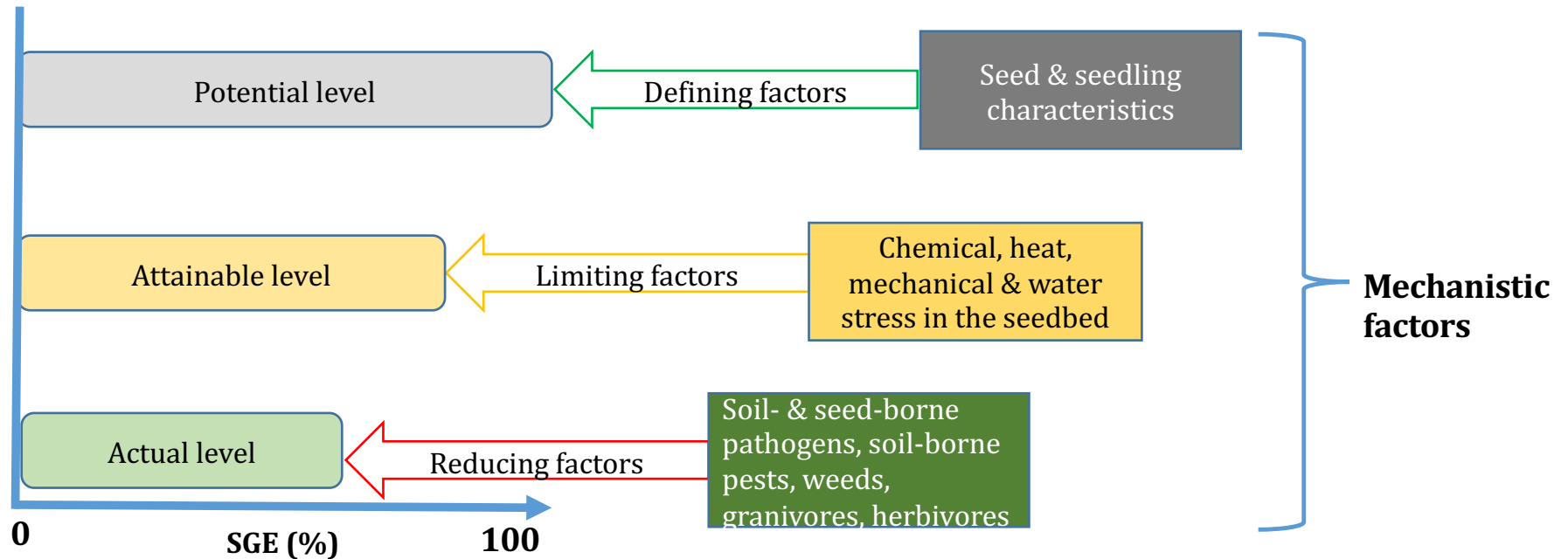
A poor crop establishment has several direct and indirect consequences.

Lower competitiveness towards weeds (quantitative and qualitative yield losses), increased weed seed bank



“*You reap
what you
sow !!!*”

Key factors affecting crop establishment



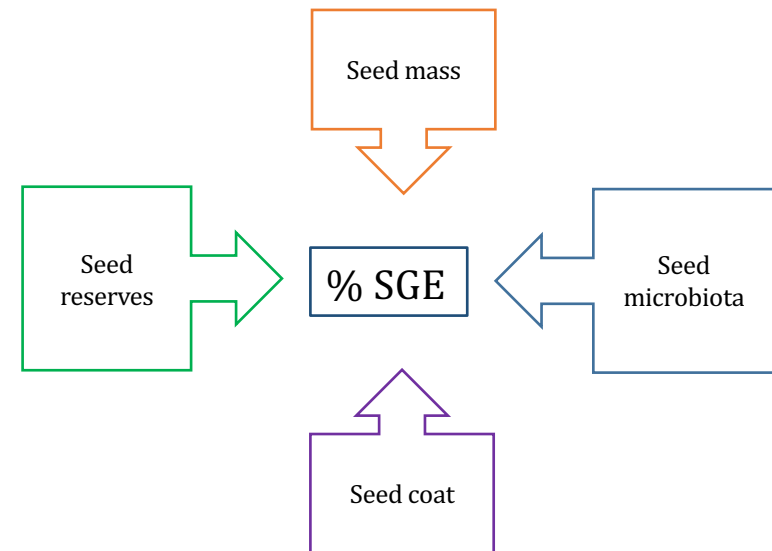
And cropping practices!

Affect crop establishment through alterations of the mechanistic factors

Defining factors affecting crop establishment



Seed intrinsic characteristics



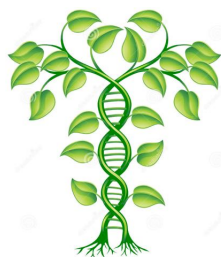
Managing defining factors affecting crop establishment

Cropping practices

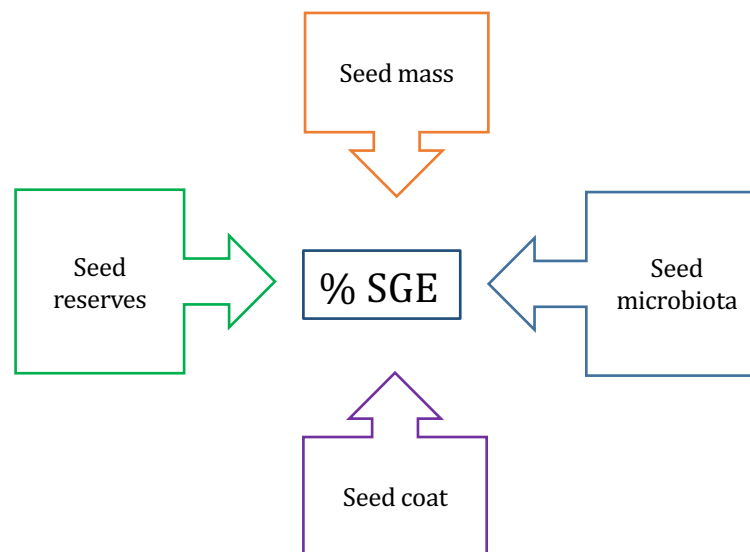
Crop varieties/species

The seed position within a plant

The mother plant environment
(soil & climate)



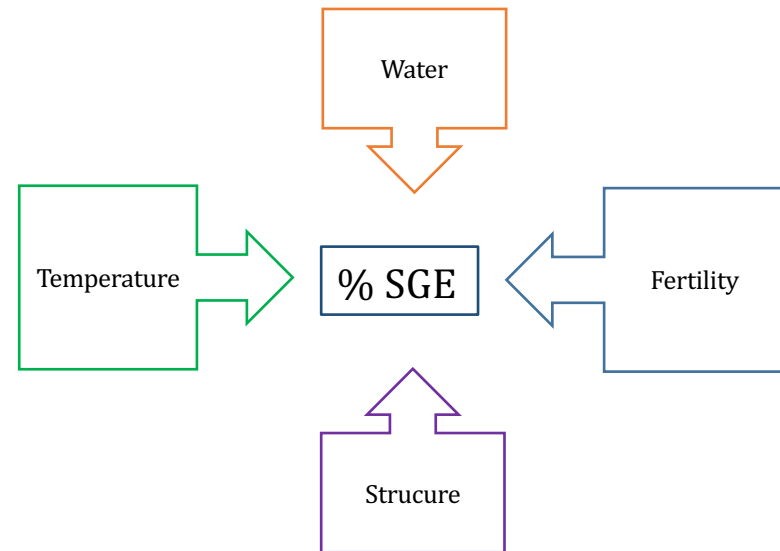
Seed intrinsic characteristics



Limiting factors affecting crop establishment



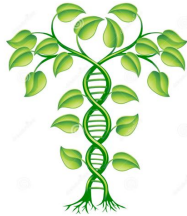
Seedbed physical and chemical components



Managing limiting factors affecting crop establishment

Cropping practices

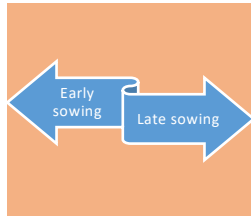
Crop varieties



Tillage (or not)



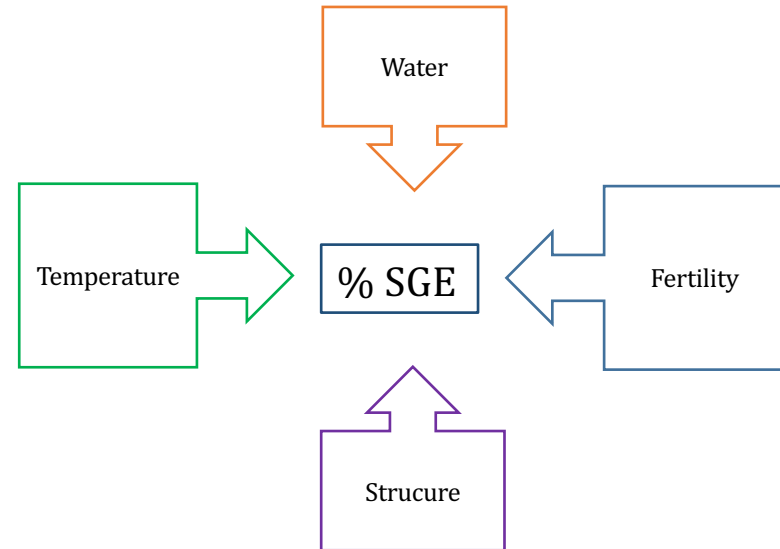
Shift in sowing date



Crop diversification
(in space/time)



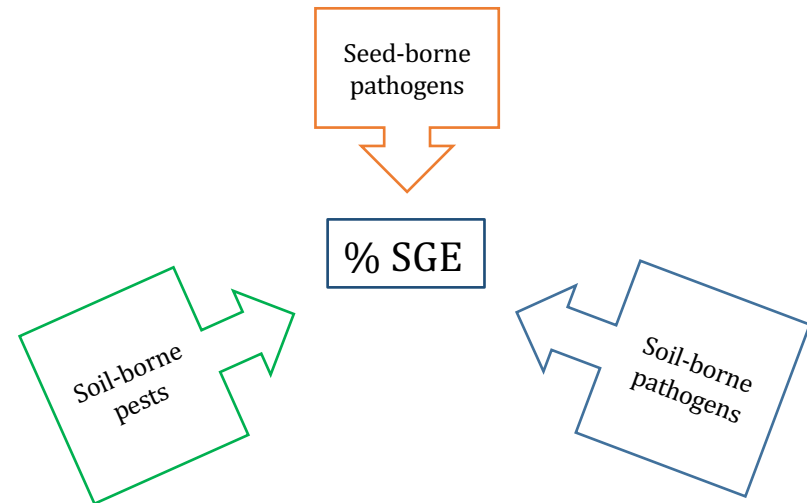
Seedbed physical and chemical components



Reducing factors affecting crop establishment



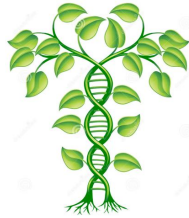
Seedbed biological components



Managing reducing factors affecting crop establishment

Cropping practices

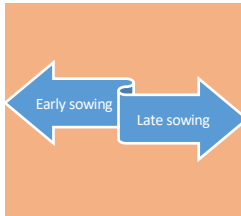
Crop varieties



Seed treatment/coatings



Shift in sowing date



Crop diversification
(in space/time)



Seedbed biological components

Seed-borne
pathogens

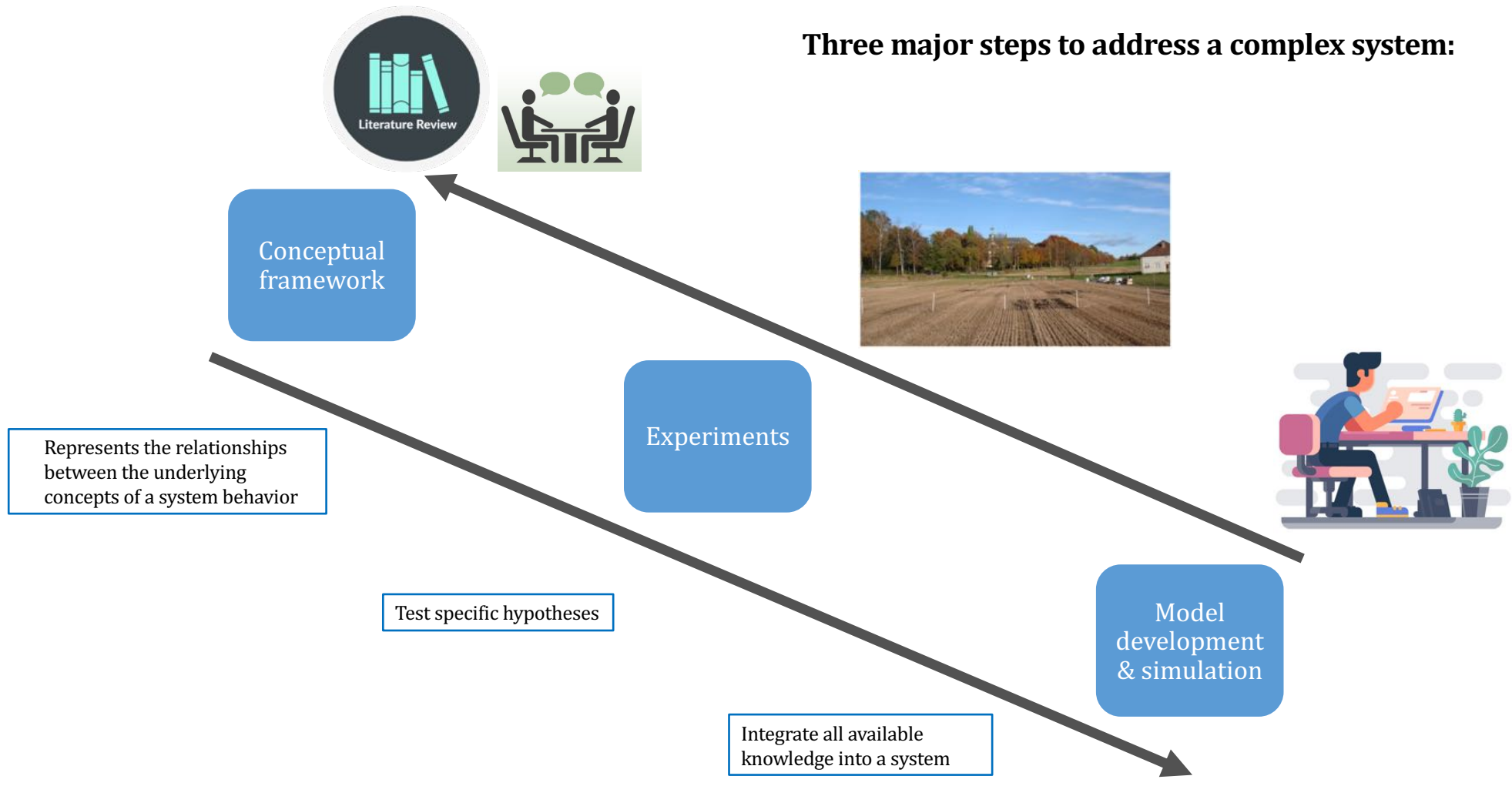
% SGE

Soil-borne
pests

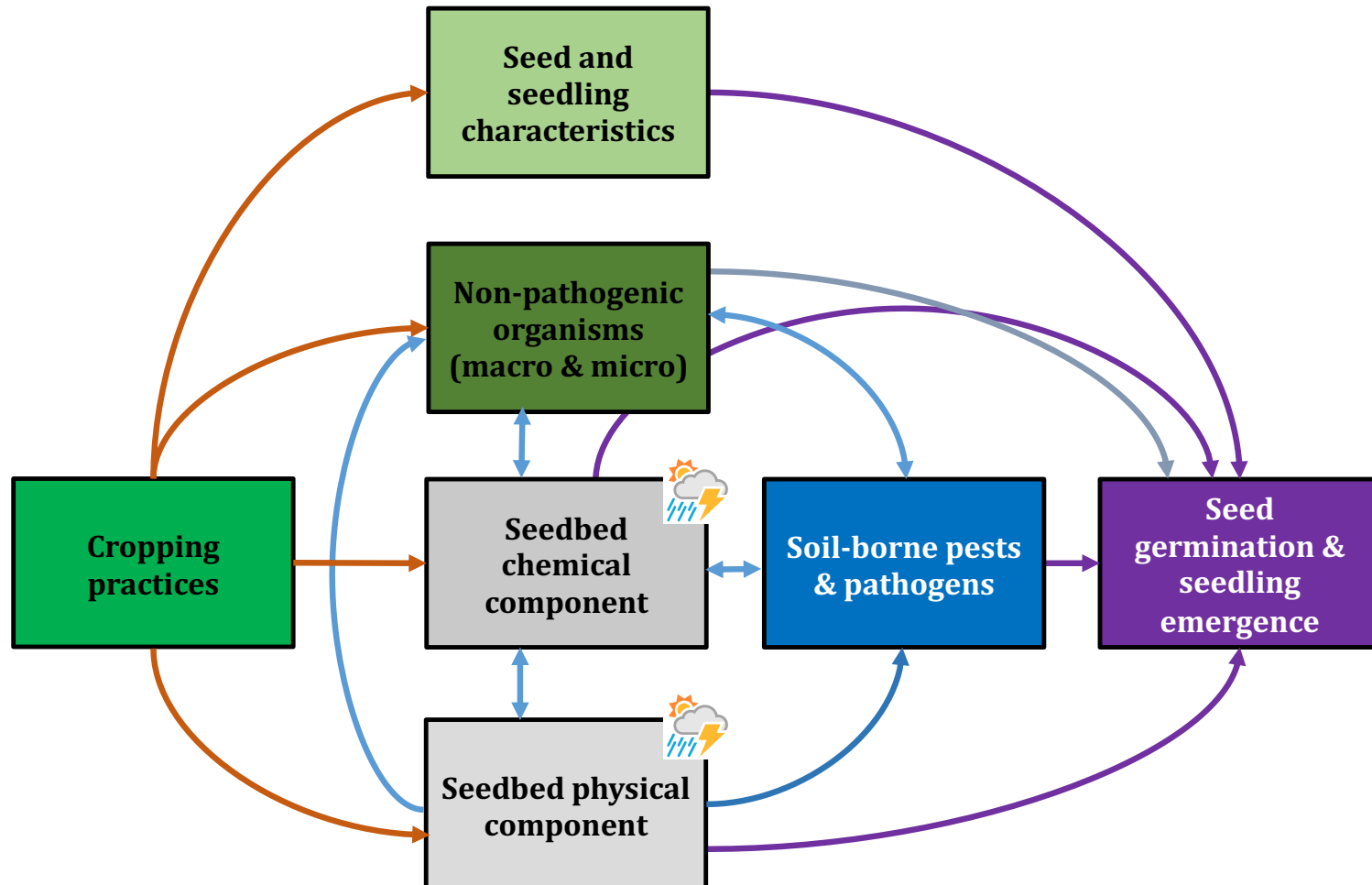
Soil-borne
pathogens

How to address such a complex system?

Three major steps to address a complex system:



A conceptual framework: putting the pieces of the puzzle together



Conclusions

- The crop establishment phase is affected by a number of factors and their interactions,
- Studies on individual components affecting this phase are useful but not sufficient to understand the entire system,
- A holistic research approach is needed to address this complex system,
- The phytobiome research represents a good initiative to this objective which is also an occasion for interdisciplinary research and transnational collaboration.



Acknowledgements

- The IPC organizing committee
- Thanks for your attention!