



Sustainable plant production in a changing world – a cross Faculty research network at KU

Lisa Bjørnlund*, Jan K. Schjoerring*, Søren Christensen, Ole Nybroe, Jan Pedersen, Jørgen Eilenberg, Lisa Munk, Regin Rønn, Oana Ciofu, Sander Bruun and Jens Erik Ørum

WHAT IS THE PROBLEM? Future plant production is faced with two major challenges. The world population is increasing and more food, fibre and fuel must be produced on a limited agricultural area. Meanwhile, climate change means altered growth conditions for plants worldwide. Researchers must deliver insight that can help future farmers adapt to new conditions and increase plant production in a sustainable way.

WHO ARE WE? Support is a cross-Faculty research network consisting of 11 researchers from four Faculties (HUM, SUND, NAT, LIFE) at the University of Copenhagen. We have realised that we need to approach this complex problem in a multidisciplinary way.

Plant growth depends on the environment- and on direct and indirect interactions between the plant and the surrounding organisms

Root symbionts, herbivores, plant pathogens and insects

Plant growth promoting rhizosphere organisms (PGPR), predators and parasitoids

Climate, soil properties and soil organisms

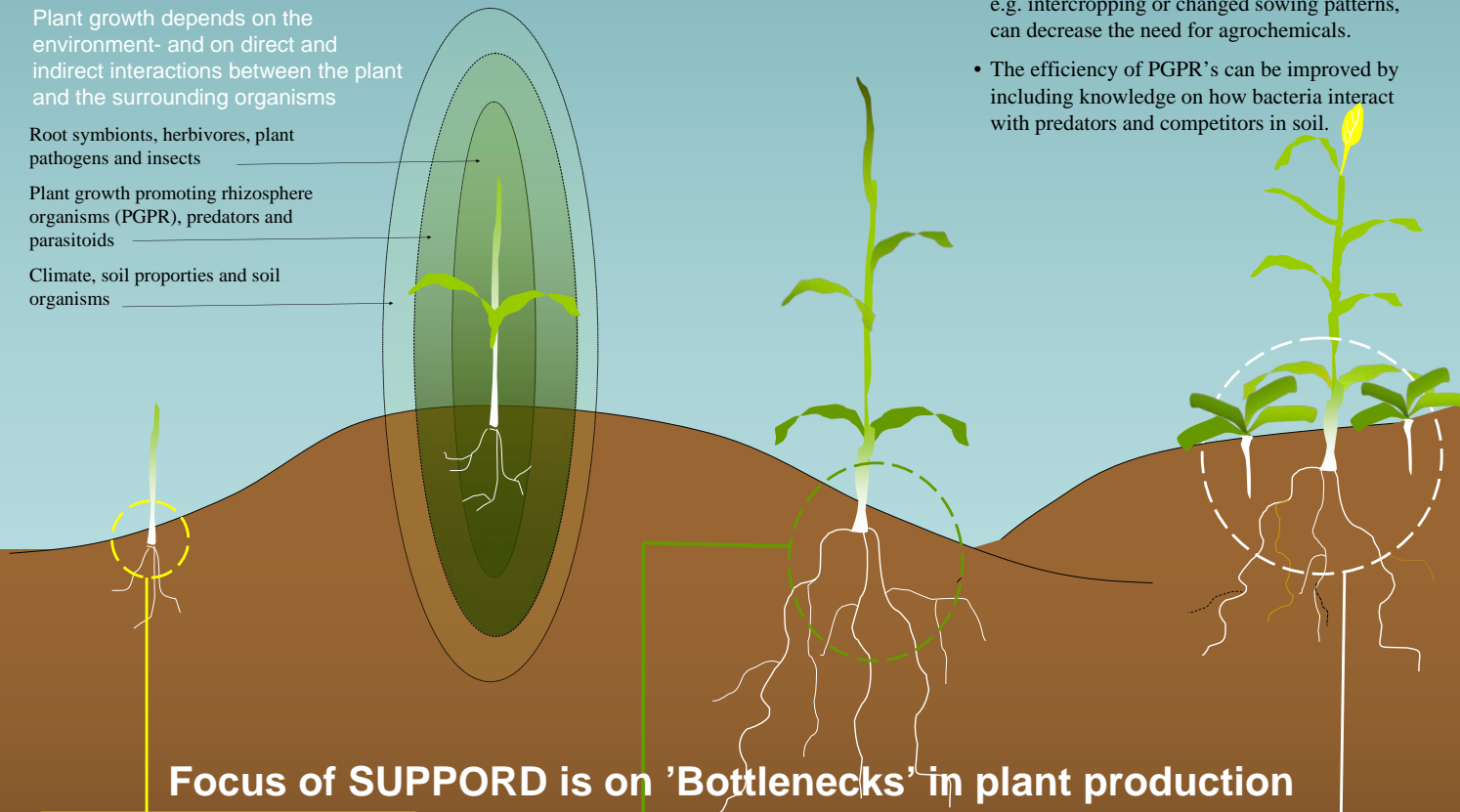
PLANT GROWTH depends on the physical environment and on the **positive** and **negative** interactions that the plant develops with other organisms in the field. With respect to the latter, three types of interactions are important: Competition among the plants, loss of resources to plant associated organisms and communication via chemical clues.

FOCUS of this poster is on the field related experimental part of our initiative. Bottlenecks or **critical stages** in plant development limit plant productivity. A small improvement of the growing conditions during such a critical plant stage, offers a potentially large improvement in plant productivity (See boxes below).

ACTION POINTS The farmer can facilitate positive biotic interactions in the field by four means. 1. Physical/chemical manipulation of the soil system 2. Choice of genotype. 3. Choice of cropping system 4. Addition of bioinoculants (often bacteria)

HYPOTHESES

- Soil fertility, carbon storage and nutrient retention can be improved - and greenhouse gas emission mitigated through proper soil manipulation. E.g. by adding 'black carbon'.
- Proper breeding and choice of new crop genotypes can improve the use-efficiency of light energy, fertilizers and water via optimized interactions with soil organisms.
- Proper choice of alternative cropping system, e.g. intercropping or changed sowing patterns, can decrease the need for agrochemicals.
- The efficiency of PGPR's can be improved by including knowledge on how bacteria interact with predators and competitors in soil.



Focus of SUPPORT is on 'Bottlenecks' in plant production

In early spring, plenty of light and nutrients are available for the **young seedlings** but the low temperatures of soil and air are limiting for growth. Can early growth be accelerated by supporting the positive interactions between soil environment, soil organisms and plants?

- Yes, in theory! SUPPORT aims to uncover and explore the relevant mechanisms.

In mid-summer the **maturing plants** are exposed to periods of drought or flooding. Can we increase water stress tolerance of plants by introducing plant growth promoting microbes to their rhizosphere?

-Yes, but often introduced PGPR's do not colonize the soil efficiently. We aim to enhance the colonisation potential of PGPR's based on our developed understanding of what makes bacteria in soil succeed or not.

With climate change we expect that the potential for growing two crops per growing season in parts of Scandinavia will increase.

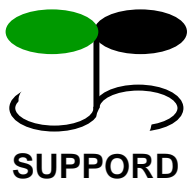
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