

# PlantLink Researcher in the spotlight

## Georg Carlsson

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*Dr Georg Carlsson, researcher in cropping systems ecology at the Department of Biosystems and Technology, SLU. Georg investigates the roles of legumes and crop diversification for the multifunctionality of arable cropping systems. The overall aim of his research is to assess if and how diversified crops and cropping systems can contribute to sustainable agricultural development.*



### **-What is currently on top of your research agenda?**

*We are analysing yield, N<sub>2</sub> fixation and abundance of weeds in field experiments where grain legumes (lentil, lupin, faba bean, and pea) are grown as sole crops, variety mixtures and intercropped with cereals in different combinations. The experiments are performed within two ongoing projects (one Swedish and one European), aiming to learn how resource-efficiency and yield stability can be improved in legume-based cropping systems. I am also co-applicant in a new project that will start in 2017, where we will work together with the food industry to investigate possibilities for increased Swedish cultivation and use of grain legumes as ingredients in novel food products.*

### **-Tell us about your latest publication?**

*It is a study performed by a postdoc in our group, using rhizoboxes in greenhouse to grow the legume faba bean intercropped or not with wheat under contrasting levels of water availability. We discovered that the root growth and nodule distribution of faba bean in intercropping responds differently to water limitation compared to faba bean grown alone – an interesting results with potential implications for the design of cropping systems that are able to adapt to environmental constraints e.g. in a climate change perspective (Bargaz et al. 2016, Journal of Plant Nutrition and Soil Science 179: 537-546).*

### **-What led you into your particular field of research?**

*I have been interested in agriculture since my childhood, and became fascinated by legumes and their symbiotic interactions with N<sub>2</sub>-fixing bacteria when I studied biology at the university in Umeå. I was able to combine these interests during my PhD studies at SLU in Umeå, where I investigated factors that influence the N<sub>2</sub> fixation in perennial forage legumes. After a postdoc at the French National Institute for Agricultural Research (INRA) in Montpellier, France, where I studied phosphorous use efficiency for symbiotic N<sub>2</sub> fixation in the model legume Medicago truncatula, I*

came to SLU Alnarp and started to explore the functional ecology of legumes at the cropping system level.

**-What are the implications of your research for the society?**

*If more legumes and more diverse crops were grown on agricultural land, there would be less need for inputs of N fertilizers and pesticides, i.e. important benefits for the society's use of limited resources and risks of spreading toxic compounds in nature. The challenge is to enhance the competitiveness of legume crops, in both agronomic and economic terms, and this requires improvements of yield stability, pest and weed management but also market development and the translation of environmental benefits into improved economic profitability. In this context, our new project about novel legume-based foods provides valuable opportunities to develop legume cropping systems that fit with emerging market demands and implement innovative uses of legumes in direct collaboration with food industry partners.*

**-Finally, let's say you got unlimited research funds; where would your research be five years from now?**

*Then I would perform research that integrates mechanistic understanding of plant-soil-microbial interactions in the rhizosphere, analyses of cropping system performance at the field level and holistic assessments of food system sustainability. My vision is that such multiple-scale and interdisciplinary research will show how to improve soil fertility and crop performance, and at the same time facilitate the implementation of knowledge for sustainable agricultural development.*