1) Introduction
Pea (Pisum sativum L.) is a valuable protein source for food and feed. Like other legume plants, peas form an intimate mutualistic symbiosis with nitrogen fixing rhizobacteria, and, thereby, are able to significantly improve soil fertility. Pea is highly prone to soil-borne pathogens and rotation breaks of up to ten years are recommended to avoid the build-up of high pathogen loads in the field. This stands in conflict with efforts to increase acreage of pea to strengthen low input farming systems and meet the increasing protein demand of a growing world population.

2) Objectives
- Identify pea lines resistant to soil-borne pathogen complexes.
- Elucidate the genetic basis of polygenic resistance of pea against fungal pathogens.
- Improve our understanding of plant-microbe interactions conferring resistance to pathogens.
- Provide the knowledge base to breed for superior cultivars for organic and other forms of sustainable agricultural systems.

3) Screening of 312 pea lines for resistance
Field soil infested with pea pathogens (=‘sick soil’)

- Sampled field soil is sterilised (pathogens are killed) or left untreated.
- Each of the 312 pea lines is grown on infested field soil and in a sterilised control. Pea lines will be genotyped by Small Nuclear Polymorphism (SNP) for subsequent GWAS.

4) Preliminary results: Biomass of different pea lines

- Pea line ➌ grows good on infested soil.
- Pea line ➍ is diseased and grows poorly on infested soil.

Biomass ratios between non-sterile and sterile treatment are calculated.

5) Next: GWAS* & plant-microbe interactions

- Hypothesis: Susceptible pea lines (eg. line ➍) release molecular compounds that favor pathogenic fungi. Roots get infected and destroyed. Resistant pea lines (eg. line ➌) release molecular compounds that repel pathogenic fungi directly or that attract non-pathogenic/beneficial fungi.

Conclusion:
About 25% of the evaluated pea lines grow as good on the infested field soil as on the sterilised soil - these lines are potentially resistant/tolerant to the pathogen complex present in the soil.