Sandra Wenger – MSc Agricultural Science 2018 – ETH Zurich – Group Plant Nutrition – Prof. Dr. E. Frossard and Dr. H. Gamper

SHEEP DUNG FOR ORGANIC ROOIBOS

sustainable intensification
→ create fertilisation options

unique South African vegetation
→ prevent farmland expansion

smallholder development
→ strengthen poor farmers

background
- cash crop in small-scale farming
- declining yields, high market demand
- few fertilisation options, no substitute crops

vulnerable environment
- sandy and extremely nutrient-poor soils
- semi-arid climate
- protected, diverse vegetation
- exposed to unfavourably changing climate

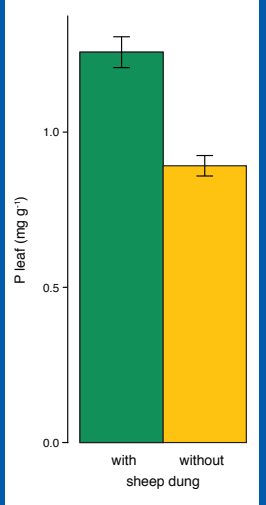
results
sheep dung significantly increased yield and reduced cluster formation

despite significantly reduced N2 fixation, leaf N and nodulation remained stable; long-term effects require further examination

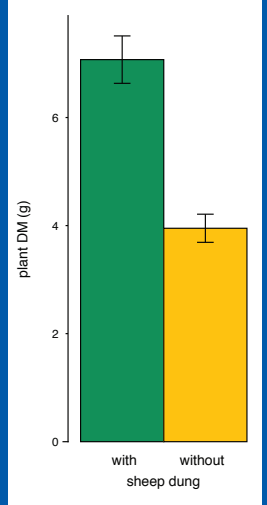
sheep dung is a good P source and an appropriate rooibos fertiliser

rooibos
- «red bush» or *Aspalathus linearis*
- used for herbal tea
- perennial, woody legume
- adapted to a scarce environment
- sensitive to nutritional oversupply
- only grows in Western South Africa

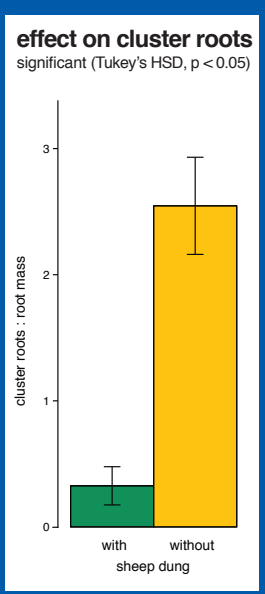
effect on phosporus
significant (Tukey's HSD, $p < 0.05$)



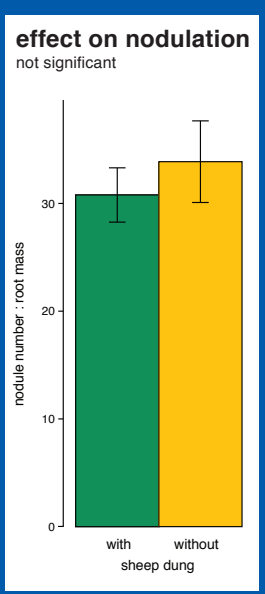
effect on yield
significant (Tukey's HSD, $p < 0.05$)



effect on cluster roots
significant (Tukey's HSD, $p < 0.05$)



effect on nodulation
not significant



cultivated rooibos

local sheep

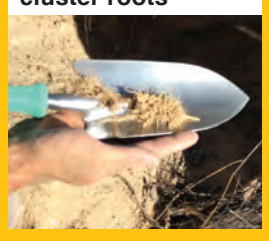
sheep dung
- unused local resource from husbandry
- sheep browse on wild vegetation
- accumulates and dries in night enclosures
- reflects the composition of soil & vegetation

hypothesised to be a suitable rooibos fertiliser

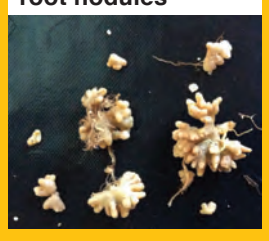
cluster roots provide phosphorus
- P deficiency induces cluster root formation
- exudation boosts solubilise soil P

∂15N isotope ratio
- states the efficiency of N_2 fixation
- rhizobia discriminate against ∂15N
- low values indicate high N_2 fixation

cluster roots



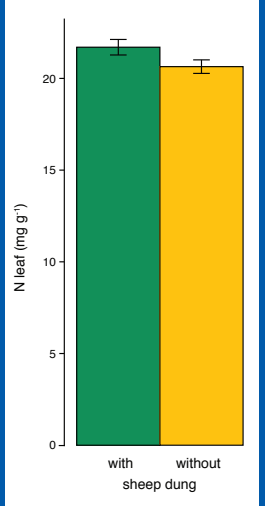
root nodules



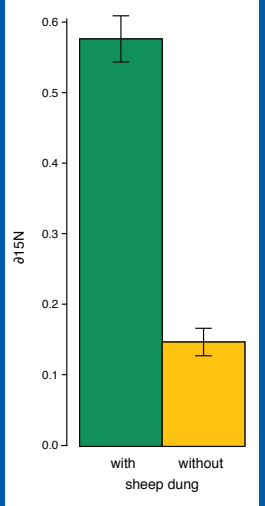
pot experiment
- 200 pots, either plain soil or soil with dung
- 7.5 g sheep dung added per 3L-pot
- seedlings grown for 8 months

rhizobia provide nitrogen
- rhizobia fix atmospheric N_2
- N deficiency intensifies nodulation
- infection rate increases with quantity of inoculum and root size

effect on nitrogen
not significant



effect on N_2 fixation
significant (Tukey's HSD, $p < 0.05$)



200 pots

collab with farmers

ETH zürich in collaboration with University of Stellenbosch, ARC Infruitec and Heiveld Farming Cooperative (South Africa)