A study was conducted investigated the effects of inoculation and phosphorus fertilizer on the yield and fodder quality of three improved cultivars of cowpea. Split-plot design was used with a replicate in four different communities in Savelugu-Nanton district of Ghana. The treatments were: songotra, padituya and apagbaala varieties as main plot factor and combinations of inoculation and phosphorus fertilizer as sub-plot factors (inoculant only, phosphorus only, phosphorus and inoculant and control) The inoculant used is called BR3262 from EMBRAPA. Results indicated that rhizobia inoculation and phosphorus fertilizer increased yield significantly ($p < 0.05$) of both grain and fodder as compared with control treatments between and among varieties. Padituya produced the most biomass yield (6.04 t/ha) while songotra produced the least (3,09.t/ha). Grain yields were not significantly different. There were no significant differences in number of nodules per plant. Fodder quality factors such as crude protein (CP), neutral detergent fibre (NDF), Acid detergent fibre (ADF) and in-vitro digestibility are being conducted to determine the treatment effects on the quality of cowpea haulms as fodder for livestock.

1*Corresponding author (daniel.akakpo@wur.nl)

Paper Number: 1355 (Poster Number: 227)

The Abundance of Indigenous Rhizobia Nodulating Common Bean in Uganda and the Soil Factors That Influence Them.

Allan Ochieng, N2Africa / Wageningen University*

Common bean is an important grain legumes in Uganda. It forms an important part of the traditional diet and provides income for the rural communities. Common bean is able to fix nitrogen through bacterial symbiosis and yields could potentially be increased through the use of rhizobial inoculants. Inoculant response depends on the abundance, competitiveness and effectiveness in N fixation of the indigenous compatible rhizobia in relation to the attributes of the inoculant strains. We therefore aim to determine the most-probable numbers (MPN) of indigenous rhizobia and the soil characteristics that influence them. Soils were sampled from the Montane and Mt Elgon Agro-ecological zones (AEZ) in Uganda. Indigenous rhizobia populations were determined using the plant infection technique and soils were subjected to physicochemical analysis. Among 29 soil samples assessed, the highest MPN was found in the bean-banana/ coffee intercrop and the lowest in grasslands under sterile conditions using growth pouches supplied with sterile water and N-free nutrient solution. This data showed that the land use management system and cropping history determine the abundance of indigenous rhizobia but this is influenced by soil characteristics such as pH, organic matter and phosphorus content. Notably the organic matter ranged from 1.3-5.0%, pH 3.7-6.6, phosphorus content 2-69 ppm mg/kg and N content from 0.1-0.3%. Our next steps will be to isolate, characterise and test potential strains as inoculants that can be used to enhance common bean yields.

Key words: nitrogen fixation, MPN, physicochemical analysis

Paper Number: 1356 (Poster Number: 228)

Policing the Gate: Can Pea Plants Stop Rhizobial Cheats from Entering?.

*Annet Westhoek*1, Finn Rehling2, Philip Poole1 and Lindsay Turnbull1, (1)University of Oxford, (2)Philipps-University Marburg*

Legumes form symbioses with nitrogen-fixing soil bacteria called rhizobia. An intricate signalling process allows rhizobia to infect plant roots and form nodules. Inside nodules, rhizobia fix atmospheric nitrogen into ammonia and provide it to the plant. Rhizobial strains vary widely in how much nitrogen they provide and this influences crop yields. Despite some evidence to the contrary, there have been recent claims that legumes exert 'partner choice' and selectively form symbioses with rhizobia that provide more nitrogen. We tested whether peas exert such partner choice. As many traits influence the ability of rhizobia to form nodules, the only unbiased test of partner choice requires the use of strains that differ in their ability to fix nitrogen, but nothing else. We developed sets of wild-type nitrogen-fixing strains and their respective nifH mutant non-fixing strains. Strains were distinguished using chromosomal gusA and celB marker genes and were otherwise completely isogenic. Peas were inoculated with different ratios of wild type to mutant strains. We found that the percentage of nodules containing the wild type strain exactly reflected the percentage of the wild type strain in the inoculum. We therefore found no evidence for partner choice. Our results demonstrate that pea plants cannot exercise partner choice. This emphasizes the essential role of plant sanctions for plant and rhizobial fitness. In sanctioning, plants allocate fewer resources to established nodules providing little nitrogen. Ongoing work will focus on how such sanctions affect crop yields and populations of effective and less effective rhizobia in the soil.