Activity : Upgrade of LeasyScan platform (load cells equipment)

Objective of activity and intended output – In 2014 the first phase of the LeasyScan platform was put in place, consisting of the scanning technology to assess leaf canopy development features, together with a prototype of 50 load cells to measure plant transpiration seamlessly. The load cells have turned out to be able to detect our phenotype of interest (the capacity to restrict transpiration under high VPD) (see Vadez et al 2015 – JXB doi:10.1093/jxb/erv251). We have then now expanded the LeasyScan capacity to 1488 load cells to give us the capacity to assess that critical phenotype at a scale and throughput that can match breeding programs and genetic studies.

Materials and Methods: No methodology as such. Of course we have had to design the layout, decide on the capacity of the load cells depending on size of plant container, etc…

Results and interpretation:

Overall view of the upgrade with load cells (left) and trays on the load cells (top) with the first dummy crop on top.

As of December 2017, the load cells are almost fully operational and few only need to be replaced. A first experiment has been initiated (Dec 2017) and consists in 952 BCNAM progenies + 14 parental check in a P-rep design (1.4 n rep). These BCNAM are in Lata3 background, a Guinea type cultivar that is popular in the Sahelian sorghum growing environment in Mali, and have been developed between CIRAD and ICRISAT-Mali. Parents of these BCNAM progenies contrast in their transpiration response to increasing VPD and the purpose of the experiment is primarily to map genetic regions involved in that trait.

With this experimental setup, density commonly used in the field are practiced, by planting 2 rows of 4 plants/row in crops like chickpea, groundnut (for a density of approximately 30 plant m^{-2}), and one central row with 4 plants in crops like sorghum, pearl millet, maize, pigeonpea (for a density of approximately 16 plant m^{-2}).

Next steps: We believe we have here a platform that is quite unique and has the potential to target the genetics of key traits for crop adaptation to water limited environment. The platform has also the potential for new investigations in a number of domains, the following being a non-exhaustive list of potential uses: (i) testing the effects of a range of soil cover treatments on soil evaporation (for application in crop simulations); (ii) re-exploring the value/validity of crop coefficients using the continuous lysimetric assessments of the platform and have a precise assessment of crop water use; (iii) compare and distinguish over time the two aspects of plant growth that are leaf expansion (something we would capture by looking at leaf area increase) and mass increase (which would be proxied by plant transpiration); (iv) measure RUE.