## Abstract

Catherine Kiwuka (2020). Genetic diversity and phenotypic variation of wild, feral and cultivated *Coffea canephora* in relation to drought stress. PhD thesis, Wageningen University, The Netherlands, with summary in English, 177 pp.

*Coffea canephora* Pierre ex A. Froehner (Robusta coffee) is an important crop sustaining millions of livelihoods in its production zone which is predominated by poor countries. Like the other commercially important coffee species, *Coffea arabica*, the production of *Coffea canephora* is threatened by the prevailing intense and frequent drought spells reported to be increasing in relation to climate change. There is thus an urgent need to develop drought resilient *C. canephora* cultivars especially for poor farmers who often lack irrigation options. Availability of *C. canephora* intraspecific diversity and occurrence of wild populations across an environmental gradient may indicate presence of valuable genetic material, which could be used directly as a new variety or as a parent in breeding climate resilient varieties. This thesis explored: (i) the genetic diversity of Ugandan Robusta coffee; (ii) linkages between allelic variation and environmental variables; (iii) phenotypic variation in drought tolerance and (iv) phenotypic plasticity to shifts in water availability and its relationship with drought tolerance. Results showed that: Uganda's *C. canephora* differentiates into five geographically delimited groups, and there is substantial phenotypic variation in relation to their response to water availability across locations and genetic groups but no significant phenotypic variation along the level of cultivation status. We observed a trade-off between drought tolerance and growth in ample water conditions. Drought tolerance of the genotypes was negatively associated to an index that indicated wetness of the climate at their locations suggesting some degree of local adaptation. Finally, our results also showed a negative correlation between plasticity in response to changes in water availability and drought tolerance. Generally, our study revealed the comprehensive genetic structure of Uganda's *C. canephora,* its differential response in to drought stress, growth-tolerance trade-off, plasticity-tolerance trade-off, the link between $\delta^{13}C$ discrimination and water-use efficiency, and the probable implications of the findings to developing drought tolerant cultivars. Our findings can be used in further studies like association studies to identify putatively adapted genotypes and in breeding programs to develop climate resilient cultivars.