**Breeding for rapid cooking biofortified bean cultivars for East Africa through novel breeding strategies**

Saradadevi R1, Amongi W2, Mukankusi C2, Ssekamate, AM2, Nkalubo S3, Tumsa K4, Misango S5, Ndabashinze B6, Uwera A7, Mbiu J8, Rubyogo JC9, Huttner E10, Siddique KHM1, Cowling WA1

*E-mail of corresponding author: renu.saradadevi@uwa.edu.au*

1 The UWA Institute of Agriculture, The University of Western Australia, Perth, Australia

2 Alliance of Bioversity International & CIAT, Kawanda, Uganda

3 National Crop Resources Research Institute (NaCRRI), Kawanda, Uganda

4 Ethiopian Institute of Agricultural Research (EIAR), Addis Ababa, Ethiopia

5 Kenya Agricultural and Livestock Research Organization, Kakamega, Kenya

6 Institut des Sciences Agronomiques du Burundi, Bujumbura, Burundi

7 Rwanda Agriculture and Animal Resources Development Board, Kigali, Rwanda

8 Tanzanian Agricultural Research Institute, Maruku, Bukoba, Tanzania

9 Pan Africa Bean Research Alliance, Nairobi, Kenya

10 Australian Centre for International Agricultural Research, Canberra, Australia

Common bean (*Phaseolus vulgaris* L.) is a key food to combat anemia, stunting and wasting in diets of East African women and children. Long cooking time discourages consumption due to the significant amounts of water and fuel required, and health hazards to women and children from smoke inhalation and firewood collection. The study aims to breed biofortified bean cultivars with 30% less cooking time (CKT), 15% higher seed iron and 10% higher seed zinc compared to current commercial cultivars, while safeguarding grain yield, and seed size and colour. Innovative breeding strategies guided by BRIO principles were implemented (Cowling et al. 2023; Saradadevi et al 2021) in an East African breeding program based at the Alliance of Bioversity International and CIAT, Uganda, with regional testing at national agricultural research systems in six countries. BRIO in common bean involves two-year cycles of recurrent selection, accurate breeding values from genomic and pedigree information, selection indices composed of weighted breeding values of key traits, and optimised crossing designs through optimal contribution selection. Up to 30% reduction in CKT was achieved while increasing grain yield from cycle 1 to cycle 2. However, detrimental genetic correlations prevented improvements in iron and zinc in large-seeded beans, and the first rapid-cooking biofortified bean cultivars will have small seeds. Adjustments to BRIO will permit selection of large-seeded biofortified beans in future. The progress marks a significant stride towards rapid cooking biofortified bean cultivars which will enhance future health outcomes for women and children and improve nutritional security in Africa.

***References:***

[1] *Cowling, W. A., et al. (2023). "Optimal Contribution Selection Improves the Rate of Genetic Gain in Grain Yield and Yield Stability in Spring Canola in Australia and Canada." Plants 12(2): 383.*

[2] *Saradadevi, R., et al. (2021). "Multivariate genomic analysis and optimal contributions selection predicts high genetic gains in cooking time, iron, zinc, and grain yield in common beans in East Africa." Plant Genome 14(3): e20156.*