

# Enhancing the Nutritional Value and Agronomic Performance of Tuber Crops: Making Genetic Gains in Biofortified Cassava Over a Decade at CIAT



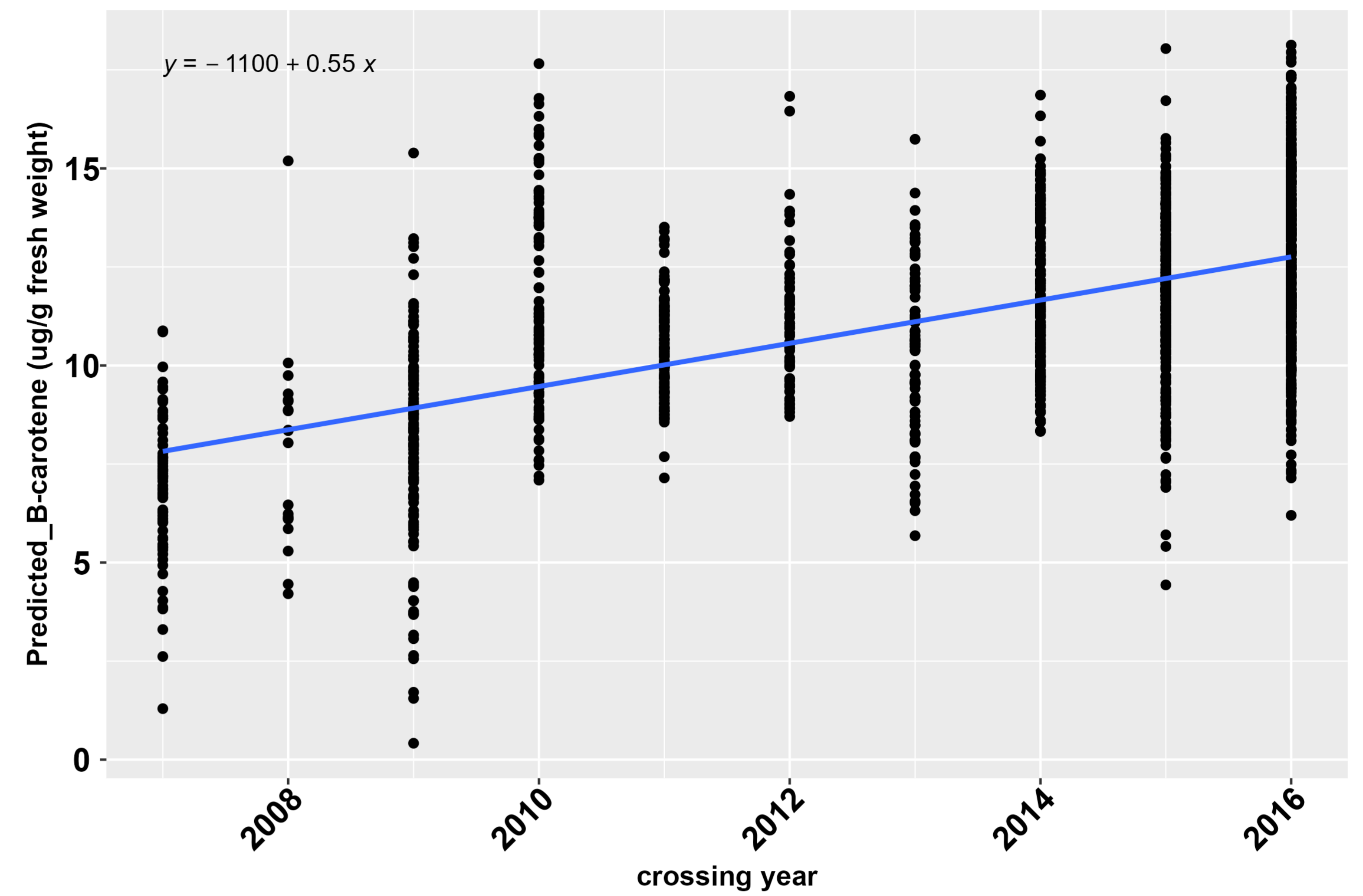
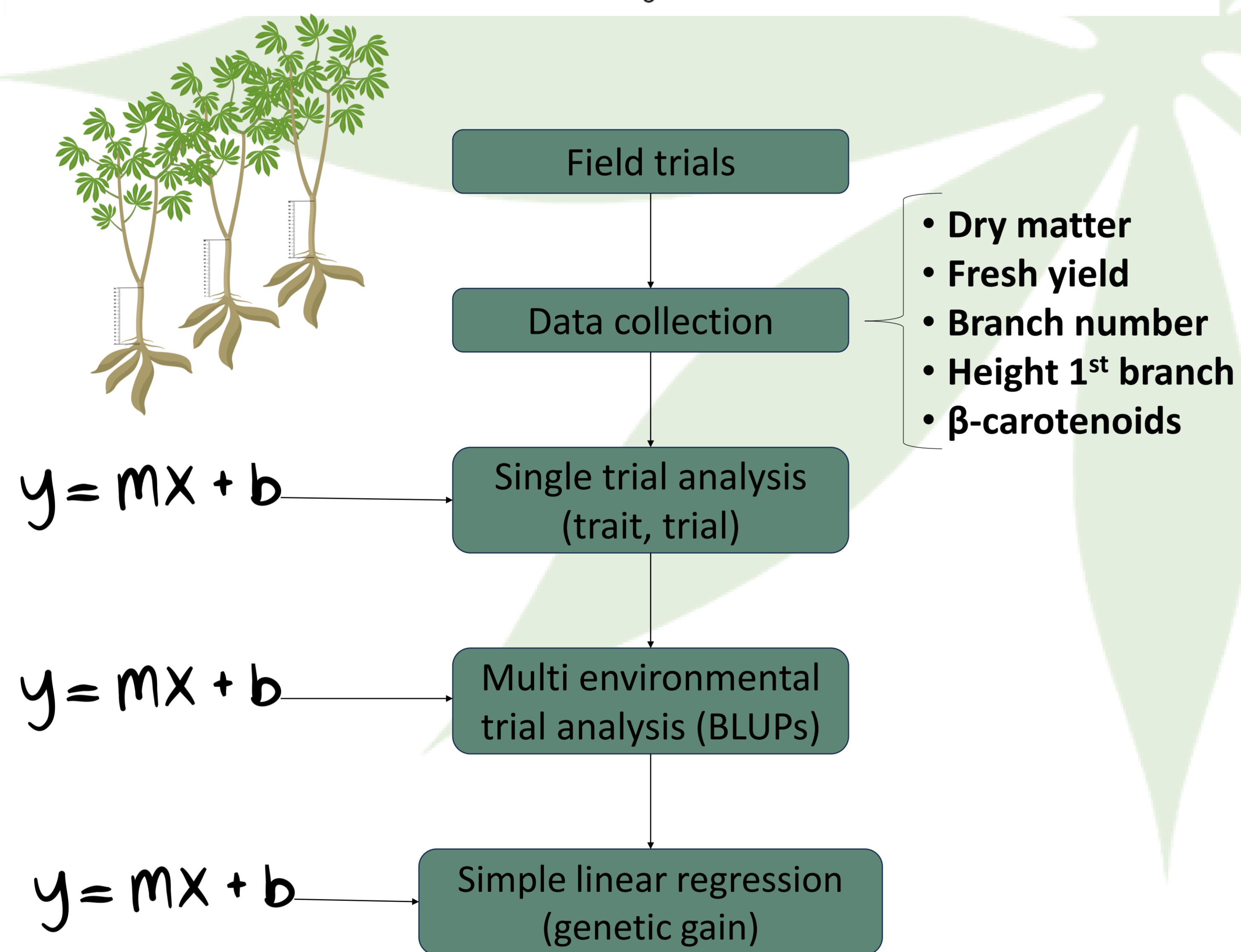
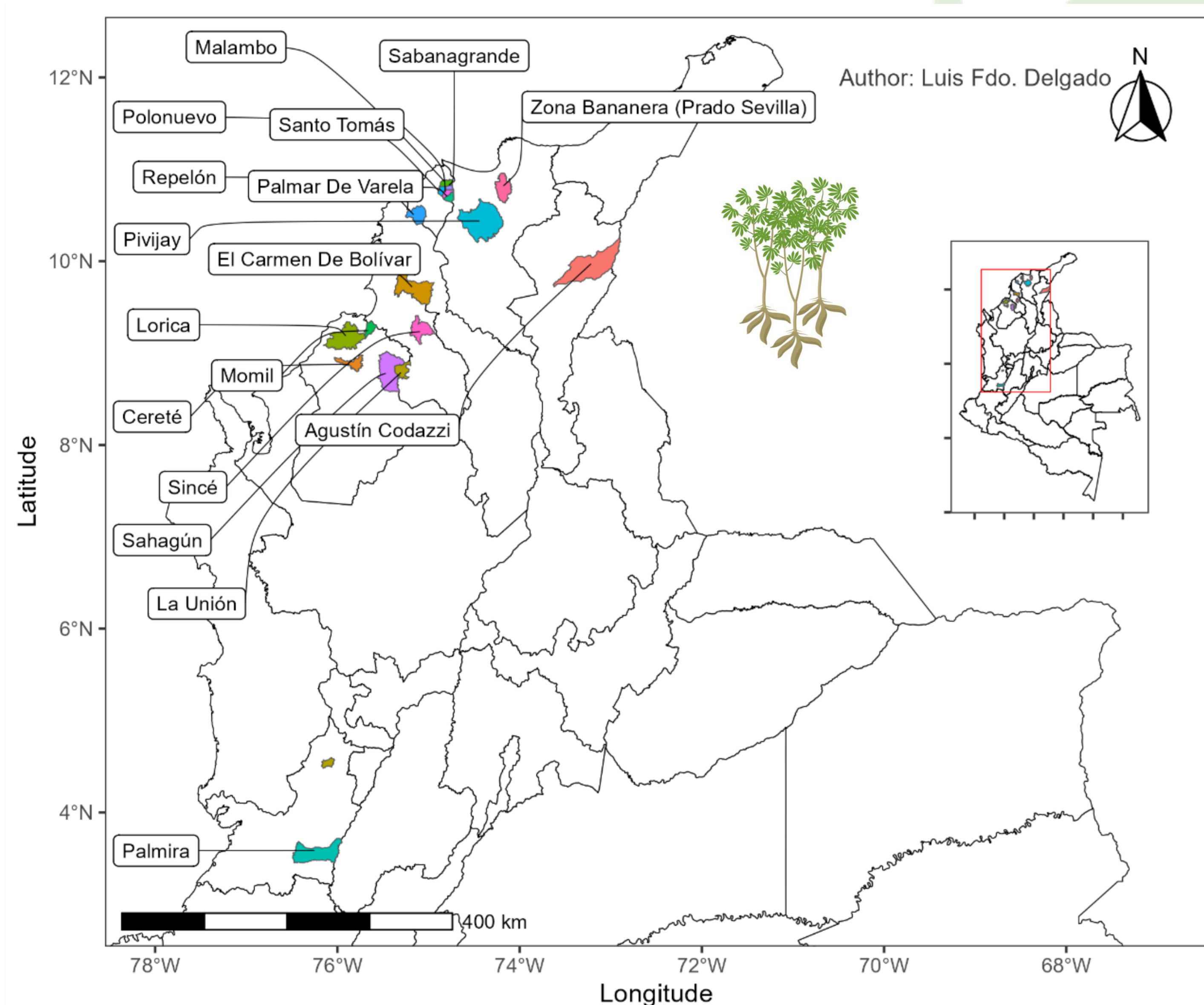
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## Background

Cassava is a crucial staple crop in tropical regions, particularly Africa, Asia, and Latin America. Biofortified cassava, enriched with pro-vitamin A carotenoids, addresses nutritional deficiencies. A 13-year study at CIAT, Colombia, shows genetic gains in  $\beta$ -carotenoids (7%), yield (4.1%), dry matter (0.55%), and plant height (1.30%), while branch number remained mostly unchanged (0.81%). This highlights the need to focus on branch number in future breeding efforts.

## Materials and methods



## Genetic gain

Trait	Units	Years data	Number of environments	gg% (1st year)	gg% (Average year)
yield	t/ha	7	52	4.16	3.44
dry matter	%	8	77	0.55	0.54
$\beta$ -carotene	ug/g fresh weight	8		7.04	5.21
height of the first branch	cm	8	38	1.30	1.22
Branches number	Units of trait	8	38	0.83	0.80

## Correlation across traits

DM_gravity	-0.07 ns			
yield_ha	-0.26 ***	0.16 ***		
branch_number	0.28 ***	-0.02 ns	-0.17 *	
height_1st_branch	-0.07 ns	0.07 ns	0.17 *	-0.69 ***
	betacarotenoid_nirs	DM_gravity	yield_ha	branch_number

## Results

Traits	Number of Locations	Number crossing - years	Mean single Heritability
DM_gravity	77	11	0.83
yield_ha	52	11	0.72
$\beta$ -carotene	1	10	
branch_number	38	11	0.82
height_1st_branch	38	11	0.76

## Conclusion

The results demonstrated the effectiveness of the breeding program in addressing vitamin A deficiency, which is particularly important in low-income regions with limited dietary diversity. However, there was a lack of significant genetic progress in the number of branches, indicating a possible area of focus for future breeding efforts. The study confirms the potential of biofortification to improve the nutritional profile of cassava, while identifying traits where targeted interventions are needed for comprehensive crop improvement.