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# Editorial: Gender-intentional breeding case studies

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## Editorial on the Research Topic

### Gender-intentional breeding case studies

Women play a critical role in smallholder agriculture, yet their limited access to technology contributes to a significant gender gap in agricultural productivity. A major factor in this gap is the slow adoption of modern crop varieties. One key contributor to this lag is insufficient attention to user preferences, particularly quality traits valued by women. Gender-intentional breeding seeks to integrate gender considerations into crop development from the outset, to promote equitable adoption and to ensure new varieties meet the needs of both men and women.

Two Collections on Gender Intentional Breeding, of which this is one, provide insight into ongoing experience with gender intentional breeding and the contextual issues that determine the effectiveness of the approach. Research Topic One, *Gender-intentional breeding case studies*, consists of 12 case studies documenting experiences with gender-intentional breeding. Research Topic Two, *Gender Intentional Breeding :From Integration to Institutional Innovation*, consists of two additional cases, potato breeding in Kenya and sweetpotato breeding in Uganda, and 10 papers that address broad institutional and methodological challenges of the type confronted in the cases.

The importance of gender equity for agricultural development has been recognized for decades but attention to gender differences in demand for new varieties has fluctuated. As a result, relatively little of the growing body of experience with gender-intentional breeding has been systematically documented until now. Building on work that began in the 1990s, the Consultative Group on International Agricultural Research (CGIAR) launched a Gender and Breeding Initiative (GBI) in 2015, which accelerated gender integration into international and national breeding programs, particularly in Africa, where the GREAT training program supported capacity development.

Recognizing that a wealth of undocumented experience with gender-intentional breeding was accumulating across regions over several decades, in 2022 the CGIAR Genetic Innovation Action Area (GI) issued an open call for case studies, receiving 43 submissions from CGIAR centers, national agricultural research and extension systems (NARES), and NGOs. The Editors participated in the selection of the cases and mentored their development. The published cases were selected based on their focus on gender research, evidence of changes in breeding objectives, and diversity of geographic and institutional contexts.

The cases examine breeding outcomes, the process of integrating gender research into plant breeding and how breeding programs changed objectives, methods and management practices as a result. Many illustrate how gender-intentional breeding requires the

formation of multidisciplinary teams that include breeders and social scientists, and in some instances, food scientists. Several case studies show that embedding gender researchers in breeding teams led to changes in variety design and prioritization. Programs that initially used participatory varietal selection (PVS) without specific gender considerations revised their approach to include women's trait preferences and production constraints. A key innovation was the use of gender-responsive participatory research methods, such as TRICOT crowdsourcing trials, which allowed both men and women to evaluate varieties based on agronomic, processing, and consumption characteristics.

Gender-intentional breeding programs consistently reveal the widespread occurrence of both distinct and overlapping plant trait preferences among men and women. For example, in Mali and Burkina Faso, women preferred sorghum and millet varieties with soft grain for easier processing, while men prioritized yield and marketability. In Nigeria, women cassava processors valued high carotenoid retention and low water content in roots. Similar findings were reported in other crops, such as cowpea, sweet potato, and yam, where gender-informed trait preferences influenced breeders' selection. These insights led to modifications in breeding objectives, ensuring that new varieties incorporated user-preferred traits.

As a result of integrating gender research, breeding programs released several gender-intentional varieties. In Nigeria, new cassava varieties included processing-friendly traits preferred by women. In Uganda, sweetpotato varieties included quality traits like mealiness and aroma, important to women. In Mali, gender-intentional sorghum and millet hybrids were released, increasing adoption by women farmers. Several Cases emphasize the value of incorporating gender considerations early in the breeding cycle.

Changes in breeding programs extended beyond variety selection. Many programs revised their target beneficiary definitions, moving away from a generic "farmer" model to more inclusive frameworks that account for intersecting gender and social differences. Breeding objectives expanded beyond yield and disease resistance to include processing and nutritional traits, reflecting diverse user needs. Evaluation criteria evolved to prioritize gender-relevant traits, and participatory methods were refined to ensure equal representation of men and women in varietal selection. Seed dissemination strategies also shifted, incorporating community-based distribution models that empowered women as seed producers and entrepreneurs.

The cases also highlight challenges and areas for further improvement. Gender research requires dedicated funding, yet many programs rely on donations rather than institutional budgets. Ensuring that gender research informs early-stage breeding decisions remains a challenge, as does developing high-throughput screening methods for quality traits. To advance gender-intentional breeding, breeding programs must allocate funds for gender research, incorporate gender experts into breeding teams, and refine participatory methodologies to better capture diverse trait preferences.

An important lesson from the Cases is that gender-responsive breeding is more effective when integrated into a fully client-oriented and demand-led breeding strategy. The cases show how strengthening partnerships with community

organizations and fostering transdisciplinary collaboration help to embed gender considerations into breeding efforts, ultimately contributing to greater adoption and agricultural sustainability.

In conclusion, the transition from conventional to gender-intentional breeding within a fully client-oriented approach, represents a significant shift in agricultural research. The experiences documented in these case studies provide valuable lessons for future breeding programs, demonstrating that gender-responsive approaches not only promote equity but also lead to more widely adopted and impactful crop varieties.

## Author contributions

JA: Methodology, Writing – review & editing, Validation, Conceptualization, Data curation, Investigation, Writing – original draft, Formal analysis. VP: Writing – review & editing, Investigation, Resources, Formal analysis, Funding acquisition, Methodology, Project administration, Supervision, Conceptualization, Writing – original draft. HT: Formal analysis, Writing – original draft, Conceptualization, Funding acquisition, Supervision, Project administration, Resources, Methodology, Writing – review & editing, Investigation.

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