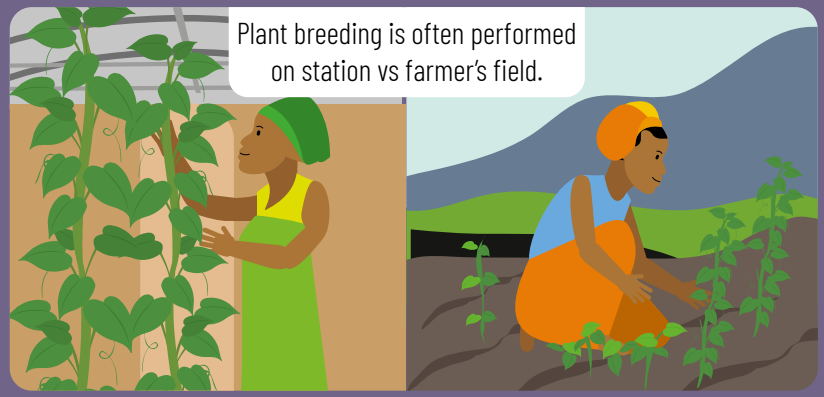
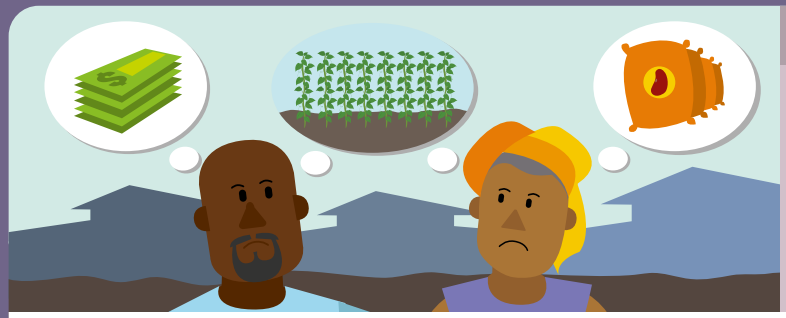
Genomic Selection Project
meeting the variety needs of future farmers



Conventional breeding takes 8 to 12 years but on-farm genomics-assisted breeding takes a much shorter time.

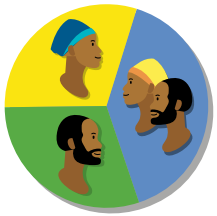


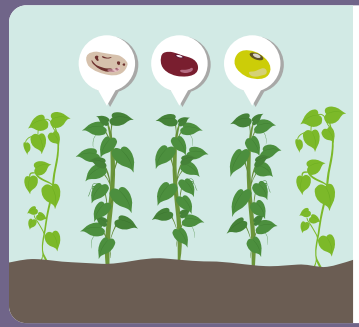
Men and women have different and sometimes same trait preferences, so we need to understand what these preferences are:

Sometimes women are excluded from stating what their preferences are, so we are including them.

Thus, farmers were selected with: At least 4 years in bean farming; Land ownership or access; Willingness to participate; Inclusivity lens (wealth, age, sex); Can provide some space in the middle of the farm.

We worked towards meeting the 30%, 30% and 40% quotas for men, women and joint-managed plots, respectively.





We started with 93 on-farm sites and each farmer received three breeding lines, and these were medium and large Red mottled, Yellow and Red grain types.

Farmers are expected to carry out the normal management on these plots that they allocate on their farms. They are also advised by extension officers.

Due to increasing climatic changes, farmers preferred breeding lines that were climate smart and resilient to heavy rains or drought and heat.

MORE INFORMATION
Gender-responsive genomic selection on farmers' fields for accelerating genetic gains

Introduction

Crop varietal and breeding lines selection is predominantly performed in controlled research stations, which may not properly represent African farmers' crop growing environmental conditions. To address this, the project seeks to test the bean breeding lines in real farmers' bean farming environments by implementing genomics-assisted on-farm testing using the tricot approach across a wide range of bean-growing environments. This approach addresses the performance of breeding lines/varieties between on-farm and on-station testing, particularly the challenges faced by women farmers, who typically experience low-input management conditions. By incorporating gender-intentional participatory methods and considering diverse perspectives, the project aims to accelerate genetic gains and develop varieties tailored to local environmental conditions, and empower farmers in the decision-making processes of varietal development that can address the need of farmers and consumers.

By utilizing genomics-assisted techniques, the project aims to accelerate the breeding cycle and improve the accuracy of selection for desired traits. On-farm testing of unfinished and untested breedling lines will enable the assessment of on-farm performance much earlier in the breeding process than is currently possible, significantly reducing the time required to develop new varieties. This rapid and efficient approach has the potential to deliver substantial genetic gains to African bean farmers, enhancing their resilience and productivity in the face of climate change and market fluctuations.

Women often face disparities and have limited access to the resources necessary for enhancing productivity, creating a gender gap in agriculture. Furthermore, the field conditions in farmers' plots vary in terms of size, gradient, and fertility, posing additional challenges. These differences between research stations and on-farm conditions may lead to a lack of genetic correlation between performance on-station and on-farm, further exacerbating the disparity faced by small-scale farmers, particularly women.

Methodology

To overcome these challenges and ensure inclusivity, the project adopts gender-intentional participatory methods. It strives to incorporate women's objectives and preferences throughout the research process, aiming to overcome potential obstacles to women's participation and avoid the "silencing effect" that excludes their unique perspectives. By directly involving women and considering their preferences and production environments from the outset, the project aims to address structural limitations to women's empowerment and foster their active involvement in decision-making processes related to crop improvement.

Additionally, the project recognizes that men and women farmers often have different trait preferences or prioritize traits in different orders. These differences arise due to gendered roles, knowledge, and division of labor on and off the farm. Gender norms and socioeconomic factors further shape these preferences and influence the adaptation of varieties to specific landscapes. Therefore, the project seeks to capture and consider gender and socioeconomic differences among farmers to increase genetic gains on their fields. By understanding and targeting the preferences of distinct user groups, the adoption of new varieties can be enhanced.

To achieve these objectives, the project will utilize purposive sampling to select women, men, and joint plot managers to measure agronomic performance and trait preferences in different production environments. It will conduct rapid gender analyses to ensure accurate plot allocation based on gendered differences in management, ownership, and responsibilities. Gender-responsive tools such as Participatory Variety Selection (PVS) and Gender+ product profile will be employed to collect trait preferences, considering factors such as drudgery, employment creation, and costs for male and female plot managers.

Furthermore, the project aims to contextualize on-farm variety testing results by characterizing broader farming systems and households. Socio-demographic and economic factors, including gender, education, ethnicity, land size, labor availability, credit, assets, networks, household size, and market orientation, can significantly influence trait preferences and on-farm variety performance. By incorporating diverse perspectives and input from farmers, the project seeks to enhance the local adaptation of varieties and ensure that broad user preferences are considered.

Process

The project targeted 93 experimental plots in Tanzania managed by men, women and jointly. This selection was built on existing TRICOT work in Tanzania. These plot owners received three untested and unfinished bean breeding lines (red, yellow and red mottled), which they planted on their plots, preferably in the middle of the farm. The criteria for selection were:

1. Land ownership or access
2. Willingness to participate
3. At least 4 years in bean farming
4. Inclusivity lens – wealth, age, sex
5. On-farm space availability

Partners were identified with TARI and private sector partners through a stakeholder workshop and additional meetings with the project PI. To meet up with the season, men-managed, women-managed and jointly managed plots, owners were identified, and they got the seed. We worked towards meeting the 30%, 30% and 40% quotas for men, women and joint-managed plots, respectively. In the coming season, we intend to work directly with women's groups to get more women and joint plot owners. Extension officers were also identified to provide minimum advisory on farm management to participants and collected data on crop growth and any interesting parameters.

Feedback from farmers

Due to increasing climatic changes, farmers prefer the breeding lines they received compared to their existing varieties because it has good yields that can adapt to the erratic climate, such as heavy rains or droughts. More information can be accessed on the Alliance webpage.

While we saw more than 80% germination, crops suffered from heavy rains and animal destruction; these can be read in field trip reports across the regions developed during socio-economic and gender data collection.

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