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Opinion
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From Cold Storage to Living Fields: Unlocking Genebank Diversity for Climate Resilient Food Systems in Africa

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Opinion

Standfirst: Conserving seeds is not enough. To combat climate change and malnutrition, genebanks must become dynamic partners with local researchers and farmers especially in Africa. A plant scientist who helped broker one such partnership offers a roadmap.

The year 2026 is a critical juncture for global biodiversity and food security. The KunmingMontreal Global Biodiversity Framework's target of safeguarding 30% of plant genetic diversity by 2030 has catalyzed unprecedented investment in seed vaults and cryopreservation. Yet, in the highlands and lowlands of western Ethiopia where I work, farmers are living the contradiction: they face erratic rainfall, emerging pests and degrading soils, while the very germplasm that could help them adapt sits dormant in freezers often thousands of kilometers away. I am not referring to the globally traded staples maize, wheat, rice but to the orphan crops that sustain millions of smallholders: grass pea, teff, finger millet, enset and dozens of under-utilized legumes. These species harbor traits for drought tolerance, cold hardiness and nutritional density that modern breeding have largely ignored. The problem is not a lack of genetic treasure; it is a lack of living bridges between the vaults and the villages.

Earlier this year, I initiated collaboration between Wollega University, Ethiopia, and the CGIAR Genebanks including AfricaRice, CIMMYT, ILRI and the Alliance of Biodiversity International and CIAT. Our goal was to move decisively beyond the traditional "requestandreceive" model of germplasm exchange. Instead, we designed a genuine partnership built on three pillars: joint research on crop improvement tailored to local stresses (such as coldtolerance screening for rice in midaltitude environments), reciprocal exchange of materials and data, and capacity building that puts earlycareer scientists from the Global South at the center. The resulting action plan includes a collecting mission for endangered landraces in Ethiopia and the coevaluation of orphan crops directly in farmers' fields. This collaboration, forged with minimal external funding, demonstrates that a new model is not only possible but practical.

My experience has convinced me that the prevailing global strategy for plant genetic resource conservation is fundamentally incomplete not because genebanks fail at preservation, but because they are structurally disconnected from the people and places where diversity must be tested, adapted and used. The very word "genebank" evokes a vault: secure, static, inert. But genetic resources are living libraries; their value is realized only when they are read, interpreted and rewritten through selection in the environments for which they are destined. I argue for a paradigm shift: from genebankasmuseum to genebankaslivinglaboratory, with developingcountry researchers and farmers as coequal partners, not passive recipients.

This is not a distant ideal. 2026 also marks the midpoint of the United Nations Decade of Family Farming, which emphasises the centrality of smallholders to food security. In Africa, smallholder farmers manage the majority of agricultural land but have

extremely limited access to improved varieties of orphan crops. Climate projections warn that, without adaptation, maize yields in parts of East Africa could fall by up to 30% by 2030. The seeds that can fill this gap already exist in Genebanks droughttolerant accessions of sorghum, lowODAP lines of grass pea developed through mutation breeding, earlymaturing legumes identified in my own work, and coldtolerant rice genotypes that we are currently testing. Yet without a systematic pipeline to multiply, evaluate and deliver these seeds through farmerparticipatory networks, they remain invisible to the communities that need them most.

What should change? I propose a threepronged "Living Genebank" model. First, funding bodies from the Global Crop Diversity Trust to national governments should ringfence at least 20% of genebank operational budgets for downstream partnerships that include onfarm trials, farmer field schools and participatory variety selection, with an explicit focus on orphan crops. The recent CGIAR 2030 Research and Innovation Strategy acknowledges the need for "genebanktofield" impact pathways, but ambition must be matched by hard budgetary commitments. Second, we must democratize expertise. That means investing in the training of earlycareer scientists and extension agents in the Global South to become "germplasm brokers" professionals who can translate between genebank holdings and local needs, design field evaluations, and facilitate the cocreation of knowledge. My own journey, from a student in Bako to a coordinator of an international genebank partnership, illustrates what is possible when talent is given access and responsibility. Third, we must institutionalize reciprocal datasharing. When a farmer grows a genebank accession, the performance data phenotypic, nutritional, and cultural should flow back to the genebank and be openly accessible. This creates a dynamic feedback loop that enriches the global commons and continuously refines the characterization of collections.

Sceptics may argue that such a model is logistically complex and expensive. But the cost of inaction is far higher. The 2021–2023 drought in the Horn of Africa left over 20 million people foodsinsecure; in Ethiopia, I saw farmers abandon their land because the only available maize seed was illadapted. Against that backdrop, funding a few thousand onfarm trials of alternative crops are a modest, highreturn proposition. My own collaboration with CGIAR Genebanks was launched with almost no dedicated budget it relied on the shared conviction that we cannot afford to wait. Imagine what could be achieved with just a fraction of the resources currently channeled into static conservation.

My message to the global research and policy community is direct: the seeds are ready; are we? As a young scientist from a climatevulnerable region, I have witnessed the hunger for innovation among farmers and the eagerness of students to engage in meaningful research. What is missing is not the genetic diversity; over 1.2 million accessions are held in the CGIAR collections alone nor the local knowledge, but the institutional bridges that connect them. Let us build those bridges before the next drought, before the next food crisis, and before the genetic resources we have so carefully stored become historical artefacts rather than tools for survival.

Usman Mohammed Ali is a lecturer and researcher in the Department of Plant Science, Wollega University, Ethiopia, and the initiator and Coordinator of the Wollega University–CGIAR Genebanks collaboration. He is a recipient of the 2026 Outstanding Scientist Award (Biotechnology Scientist Awards) and author of *Genetic Improvement of Underutilized Legumes for Climate Resilient Agriculture and Food Security*.

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