

Food legume genetic resources for a sustainable future

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Food legumes are crucial for all agriculture-related societal challenges, including climate change mitigation, agrobiodiversity conservation, sustainable agriculture, food security and human health. The transition to plant-based diets, largely based on food legumes, could present major opportunities for adaptation and mitigation, generating significant co-benefits for human health. The characterization, maintenance and exploitation of food-legume genetic resources, to date largely unexploited, form the core development of both sustainable agriculture and a healthy food system. An innovative approach to conserve, manage and characterize genetic resources is needed. We propose to combine the development and active conservation of Food Legume Intelligent Collections, consisting of nested core collections composed of single-seed descent-purified accessions (i.e., inbred lines), from gene banks and on-farm and subjected to different levels of genotypic and phenotypic characterization including massive metabolomics and transcriptomics analysis combined with artificial intelligence and smart tools towards gene discovery and gene prediction activities will meet, via a participatory science towards a decentralized strategy to promote research and innovation for food legumes genetic resources and breeding. Participatory science is needed to meet the needs of various actors, including breeders, scientists, farmers and agri-food and non-food industries. Moreover, INCREASE will test, with a citizen science experiment, an innovative system of conservation and use of genetic resources based on a decentralized approach for data management and dynamic conservation. By promoting the use of food legumes, improving their quality, adaptation and yield and boosting the competitiveness of the agriculture and food sector, the INCREASE strategy will have a major impact on economy and society and represents a case study of integrative and participatory approaches towards conservation and exploitation of crop genetic resources.