

1.1 Smart water-use sorghum and pearl millet lines for dryland systems

The 1960s Green Revolution saw accelerated breeding programmes develop high-yielding (elite) cereal crop varieties which provided food for a rapidly growing global population. The introduction and dependence on water-thirsty varieties harvested twice annually across arid regions of India has reached tipping point with agricultural productivity of sorghum and pearl millet reportedly declining by 60% caused by drought stress and land-use change.

Drought: the climatic challenge for high-yielding varieties

Research at ICRISAT measured and compared crop traits (phenotypes) to identify climate-smart lines from global diversity collections of sorghum and pearl millet.

This method yields precise data on water-consumption related to crop yields and provides information on traits (here transpiration efficiency) that contribute to yield increase. Climate smart-lines were identified for inclusion in breeding programs to develop cultivars adapted to drought conditions.

Automated phenotyping monitors water use

The researchers developed an automated crop monitoring facility including lysimeters, which weigh weekly water use by individual elite varieties of Sorghum and pearl millet. This allows rapid identification of drought tolerant phenotypes, enabling climate-smart lines to be selected from global diversity collections. This method yields precise data on water-consumption in relation to crop yields and provides information on the genetic links combining water use efficiency with yield increase.

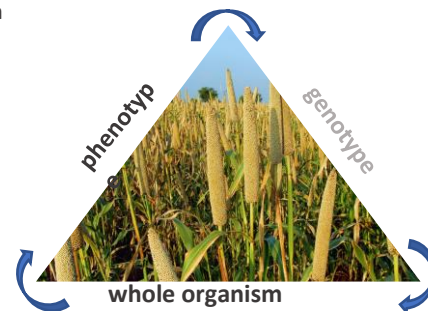
Climate smart lines were identified for inclusion in breeding programs to develop more resilient varietal lines adapted to drought conditions.

A citizen science approach with tribal small holder farmers

In collaboration with the Centre for Collective Development, Utnoor, the ICRISAT team introduced small-holder farmers from tribal regions in Telangana, to the water-efficient varieties of Sorghum for comparison with traditionally preferred varieties.

Participatory engagement processes explored farmers' needs and varietal preferences and suitability for local growing conditions. Interestingly. Researchers discovered that the tribal farming communities valued grain quality, taste and resilience to drought and disease over high yielding varieties.

Working with farmers in the early stages of the research planning process enabled researchers to demonstrate the benefits of the drought-adapted varieties to farming communities in water-limited regions.



FUNDING CALL	Growing Research Capacity: UKRI GCRF
COUNTRY:	India
TITLE:	Transforming India's Green Revolution by Research and Empowerment for Sustainable food Supplies (TIGR ² ESS)
GRANT NO:	BB/P027970/1
LEAD INVESTIGATOR & CO-INVESTIGATOR	Sivasakthi K, Srikanth Bollam, Tharanya, Santosh P Deshpande, Rakesh K Srivastava, Damaris A Odeny, Jana Kholova and Rajeev Gupta
	ICRISAT, Essex, NIPGR
https://tigr2ess.globalfood.cam.ac.uk/	