



We have
1001 reasons
to invest in sorghum

BREEDING FOR HYBRIDS & PERENNIAL SORGHUM AT ICRISAT

ICRISAT- EUROPE PARTNERSHIP



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4th European Sorghum Congress Budapest

October 8th - 9th 2025

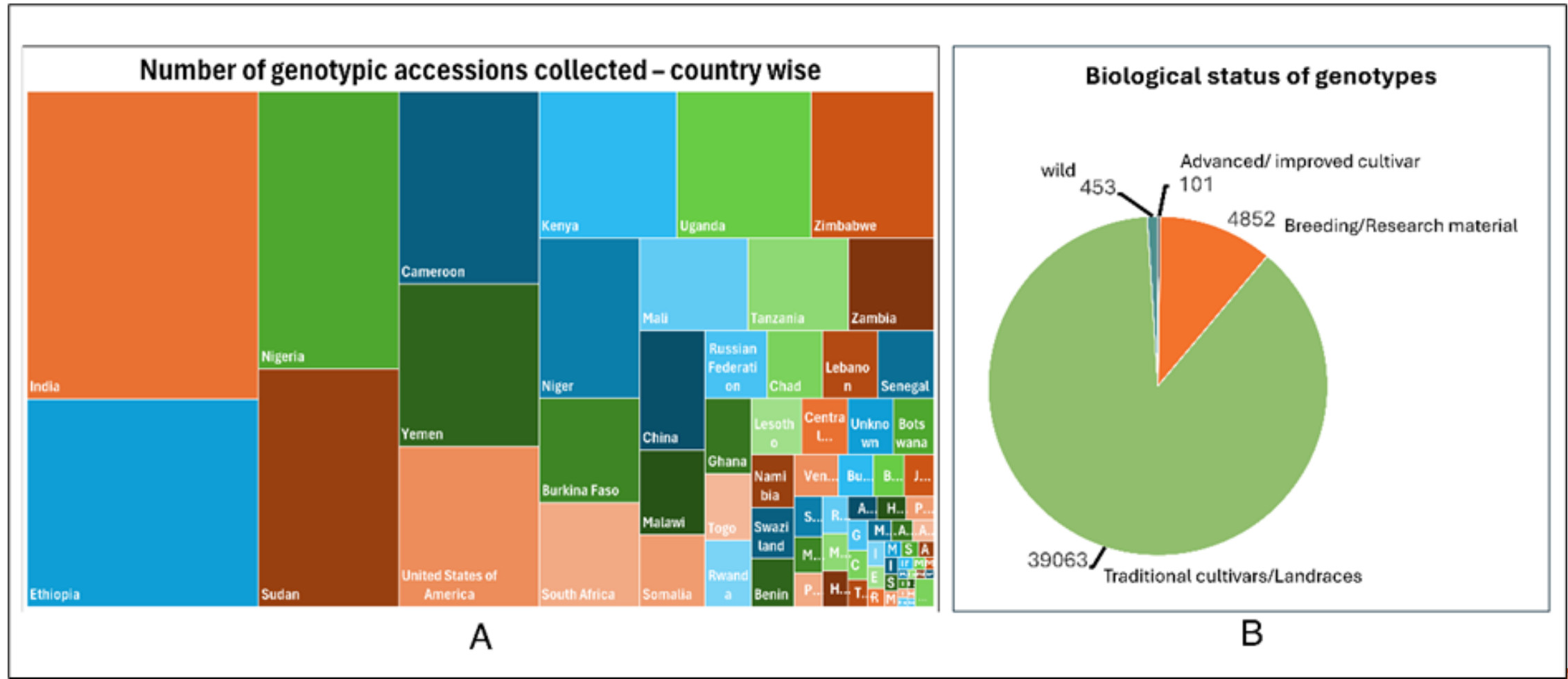


Dr. Ephrem Habyarimana

Principal Scientist – ICRISAT

International Crops Research
Institute for the Semi-Arid Tropics

A vast geographic diversity of sorghum at ICRISAT



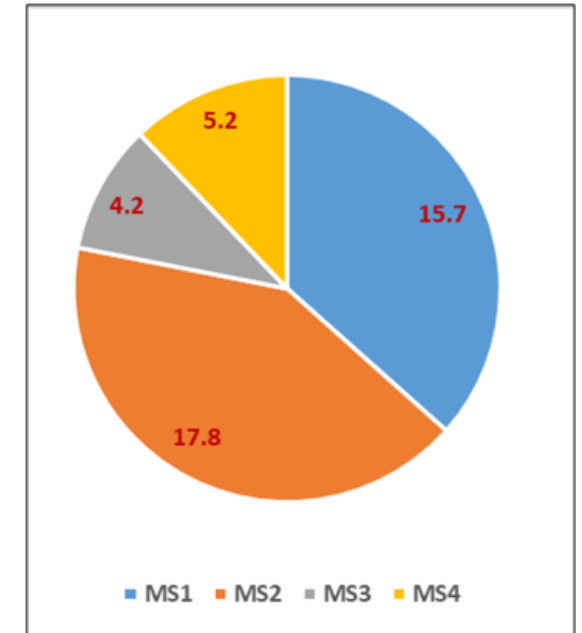
Market segment & target product profiles

ICRISAT's sorghum breeding program targets **four distinct market segments (MS)**

- 1) MS1 (Post-rainy season grain sorghum)
- 2) MS2 (Rainy season grain sorghum)
- 3) MS3 (Forage sorghum)
- 4) MS4 (Sweet sorghum and high-biomass sorghum)

❖ Major traits for improvement

- **MS1** - grain yield, dry biomass, and stay-green phenotype
- **MS2** - grain yield, grain mold resistance, and dry biomass
- **MS3** - fresh biomass, tillering capacity, and resistance to anthracnose and leaf blight
- **MS4** - fresh stalk yield, dry stalk yield, and Degree Brix (proxy soluble sugar concentration), relevant for bioenergy production.



*Importance of the market segments in Mha.
MS: market segment.*

Sorghum Scientists Field Day at ICRISAT

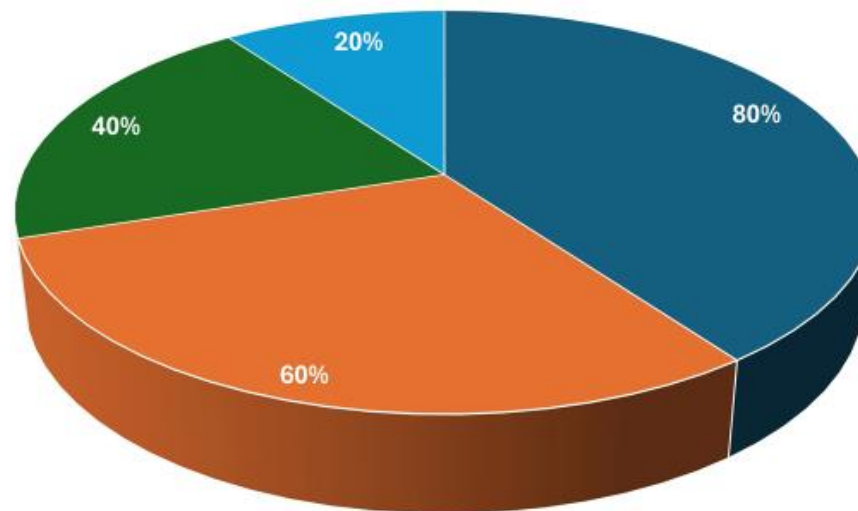


ICRISAT's scientist's field day is an interactive platform that allows ICRISAT to share advanced breeding materials with public and private partners and enables partners to identify promising resources for further research and commercialization.



ICRISAT-Bred Sorghum Flourishes in the Drylands of Saudi Arabia

ICRISAT SORGHUM MATERIALS VS SEED COMPANIES. 20-21 March 2025



■ ICRISAT A-/B- lines ■ ICRISAT R lines ■ Others R lines ■ Others A-/B- lines

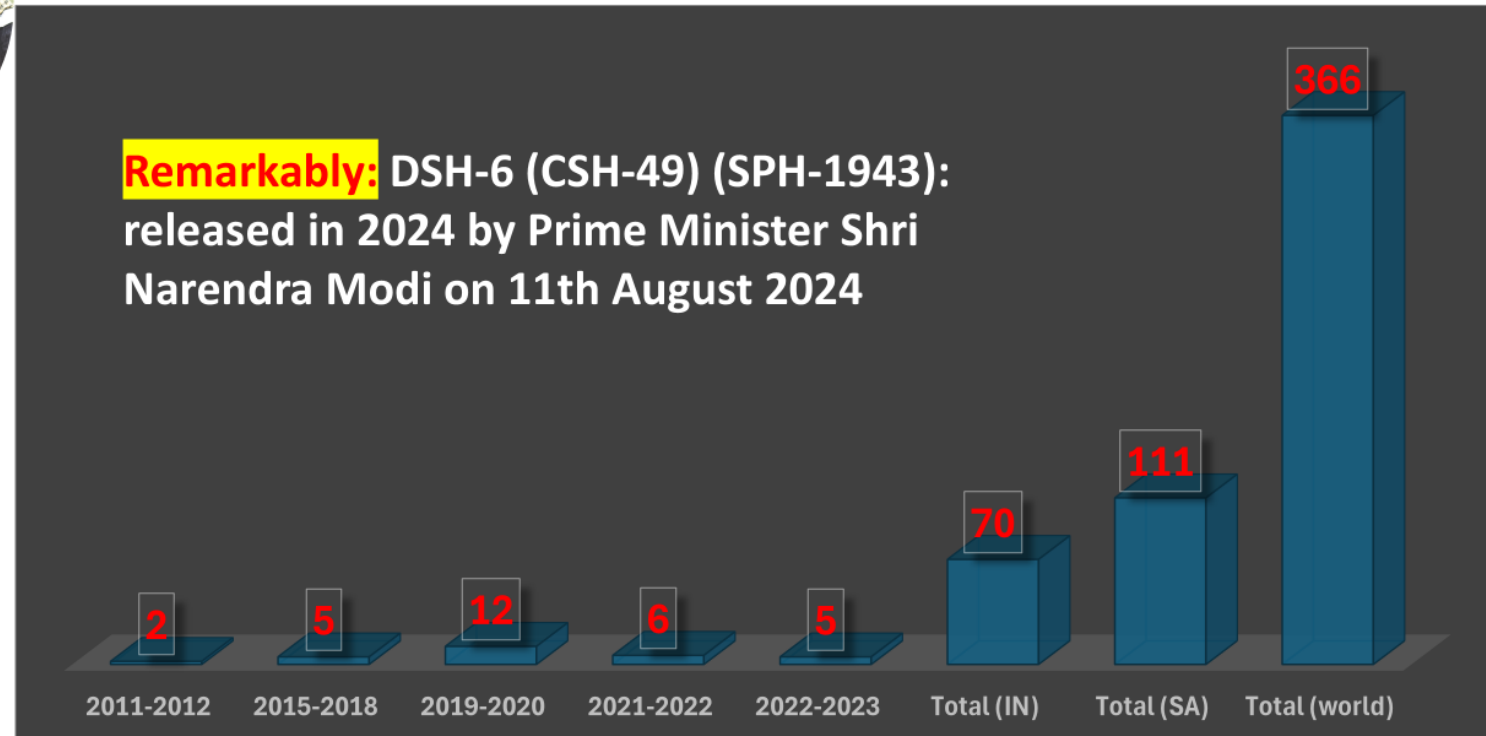
With over 40 delegates from 8 countries across Asia, Africa, Latin America, and Europe, including both public researchers and private-sector leaders, the event showcased next-generation sorghum varieties and technologies designed to boost nutrition, resilience, and incomes in dryland regions worldwide.

ICRISAT'S IMPACT: GLOBAL VARIETY RELEASE



New Sorghum varieties released in India, SA,
in the last 13 years (India) and beyond (SA & the world)

Remarkably: DSH-6 (CSH-49) (SPH-1943):
released in 2024 by Prime Minister Shri
Narendra Modi on 11th August 2024

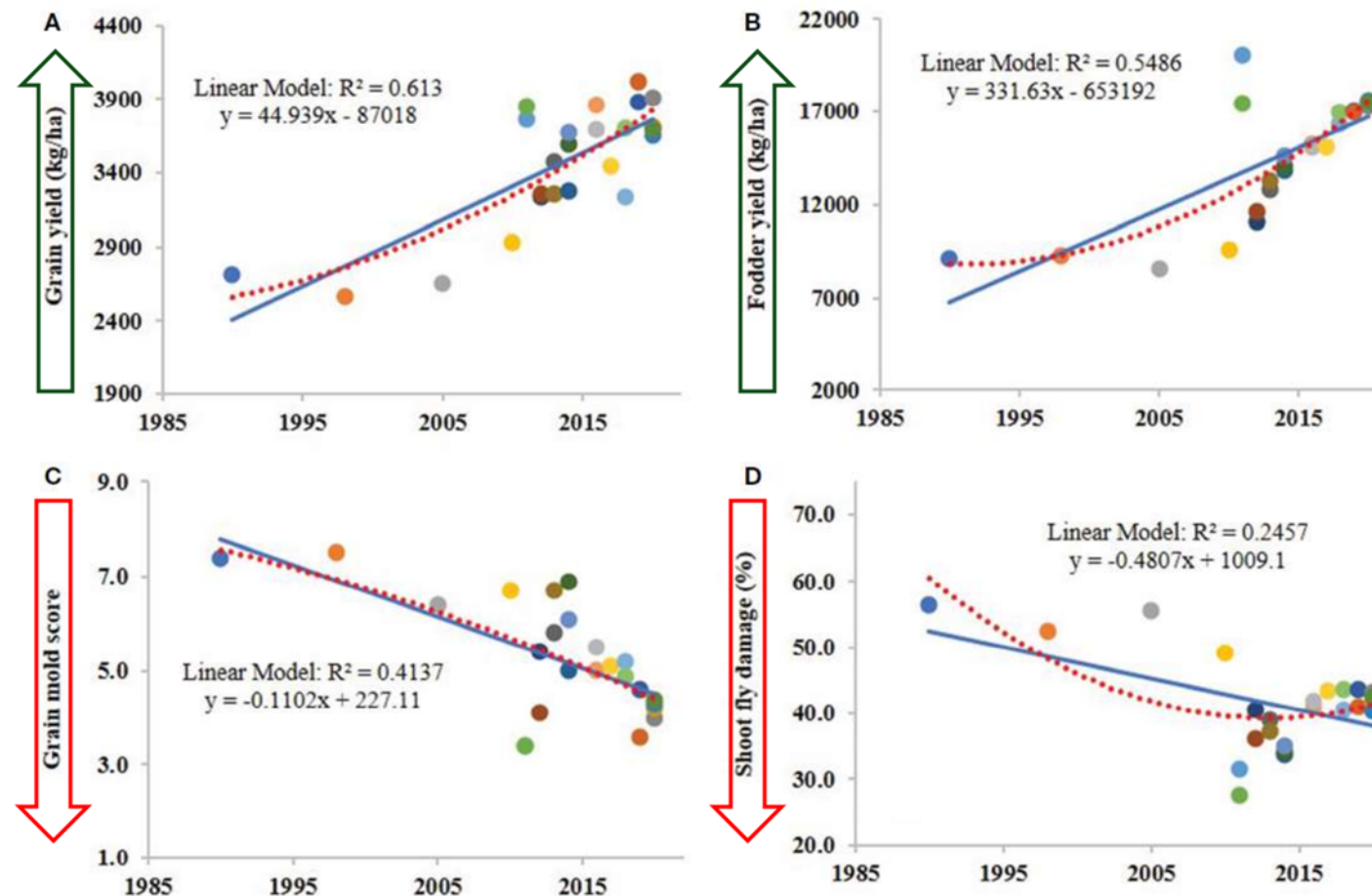


In addition, we regularly share new genetic materials with NARS. E.g., >1000 seed samples shared in 2023 including breeding lines (early generations, METs), resistance lines (grain mold, shoot fly), traits lines (bmr), and pre-breeding populations (shoot fly, sugarcane aphid).

REALIZED GENETIC GAIN IN INDIA

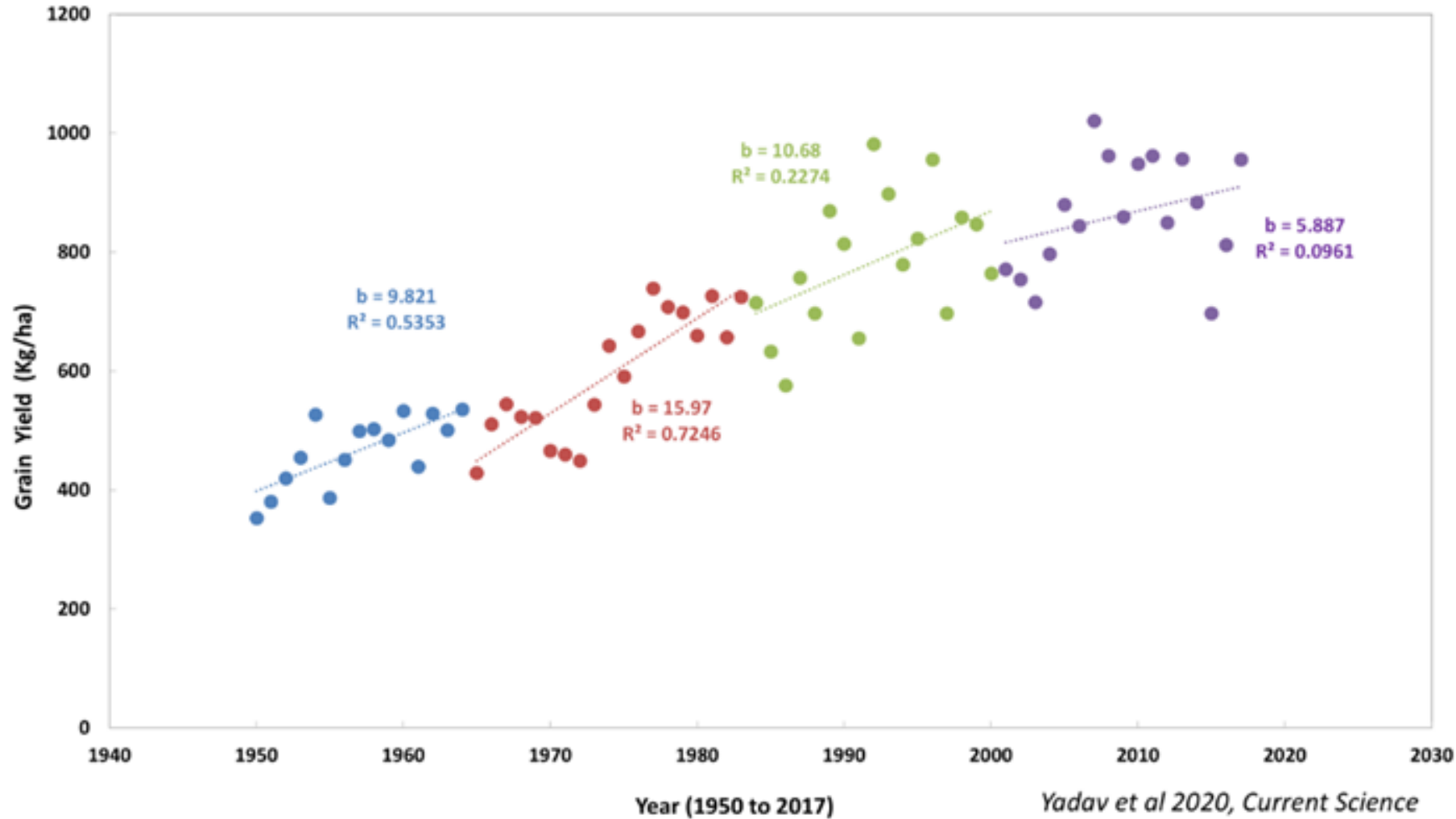
- First sorghum hybrid CSH 1 in 1964
- Steady increase in yield: 969 kg/ha in 1990-91 to 1210 kg/ha in 2020-21
- Improvement in traits over decades

- ✓ Gradual decrease in sorghum acreage
- ✓ Increase in yield = Genetics and Agronomy
- ✓ Similar pattern in India and world



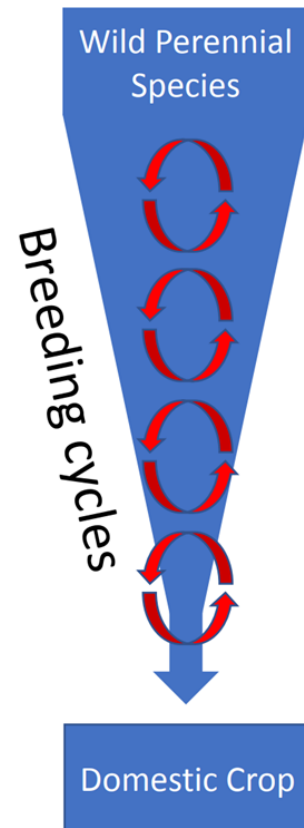
Nagesh Kumar et al. 10.3389/fpls.2022.1056040

Sorghum productivity gain in India

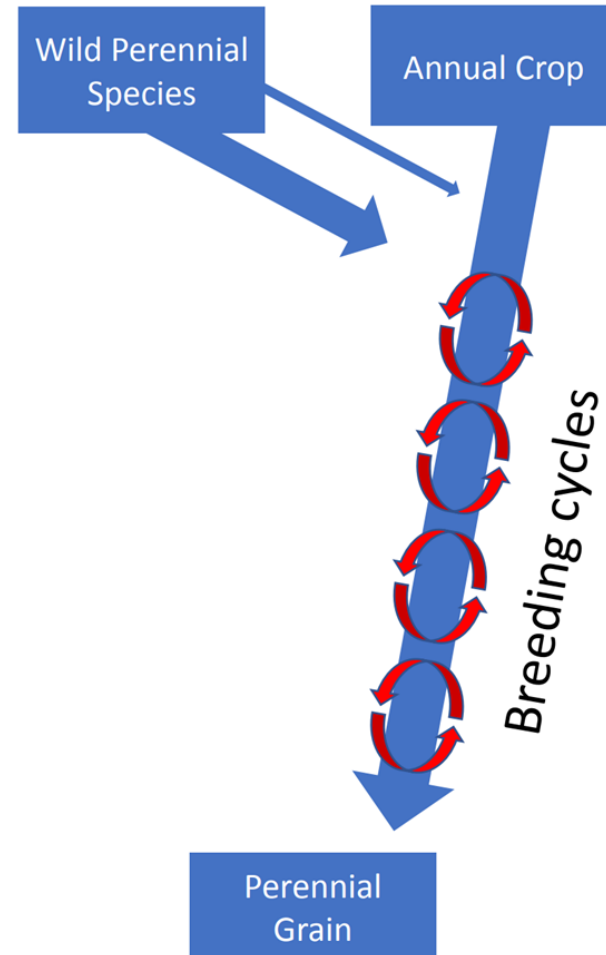


DOMESTICATION VS WIDE HYBRIDIZATION

Domestication



Wide Hybridization





THE EUROPEAN UNION SUPPORTS
CAMPAIGNS THAT PROMOTE HIGH
QUALITY AGRICULTURAL PRODUCTS.

Why does annual agriculture needs much work?



Arresting Succession

Vegetation clearing
Weeding

Compensating for
Poor Ecosystem
Function

clearing



planting



Heat stress!

weeding



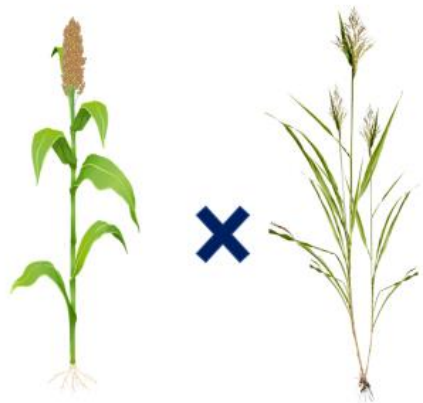
harvesting



Timeline: Our work on perenniality since 2014!



ICRISAT's Elite perennial lines tested across India (> 6 states) for multicut forage

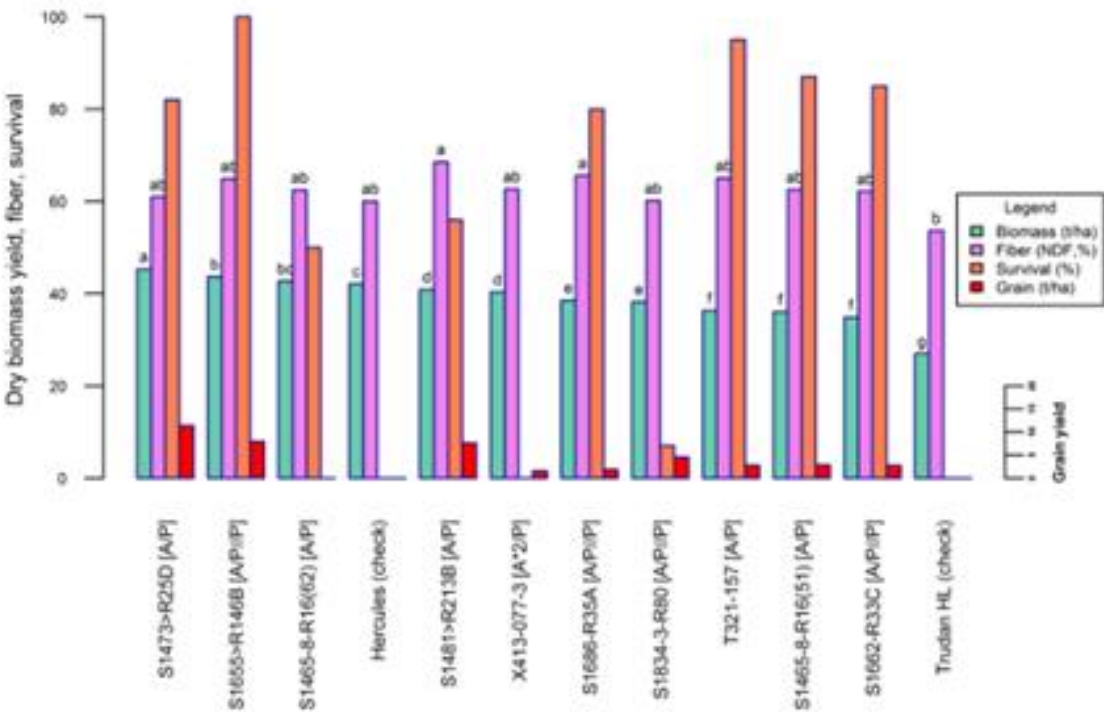


S. Bicolor vs S. halepense



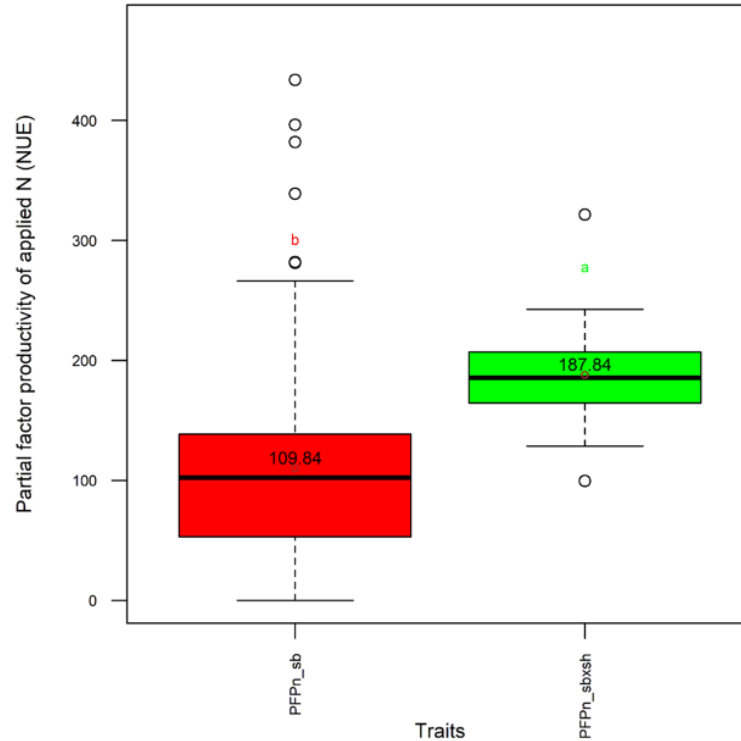
Figure: Seed increase for elite perennial sorghum lines grown in BP 11 at ICRISAT campus. Rabi 2024/2025. Photo taken Jan-21, 2025

Perennial sorghum breakthrough products

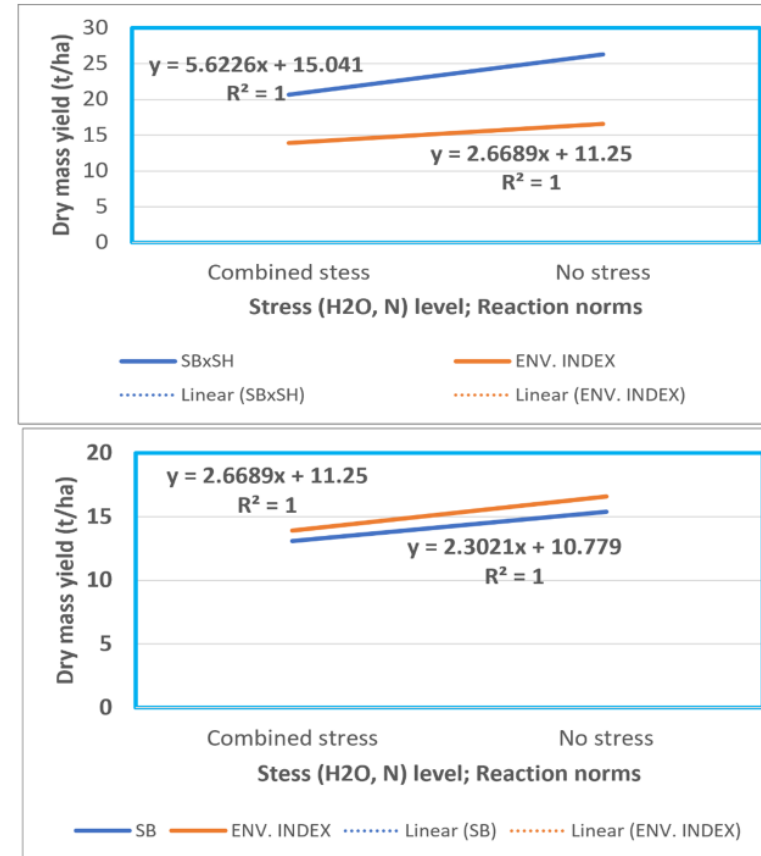


Perennial sorghum: best for agroecology

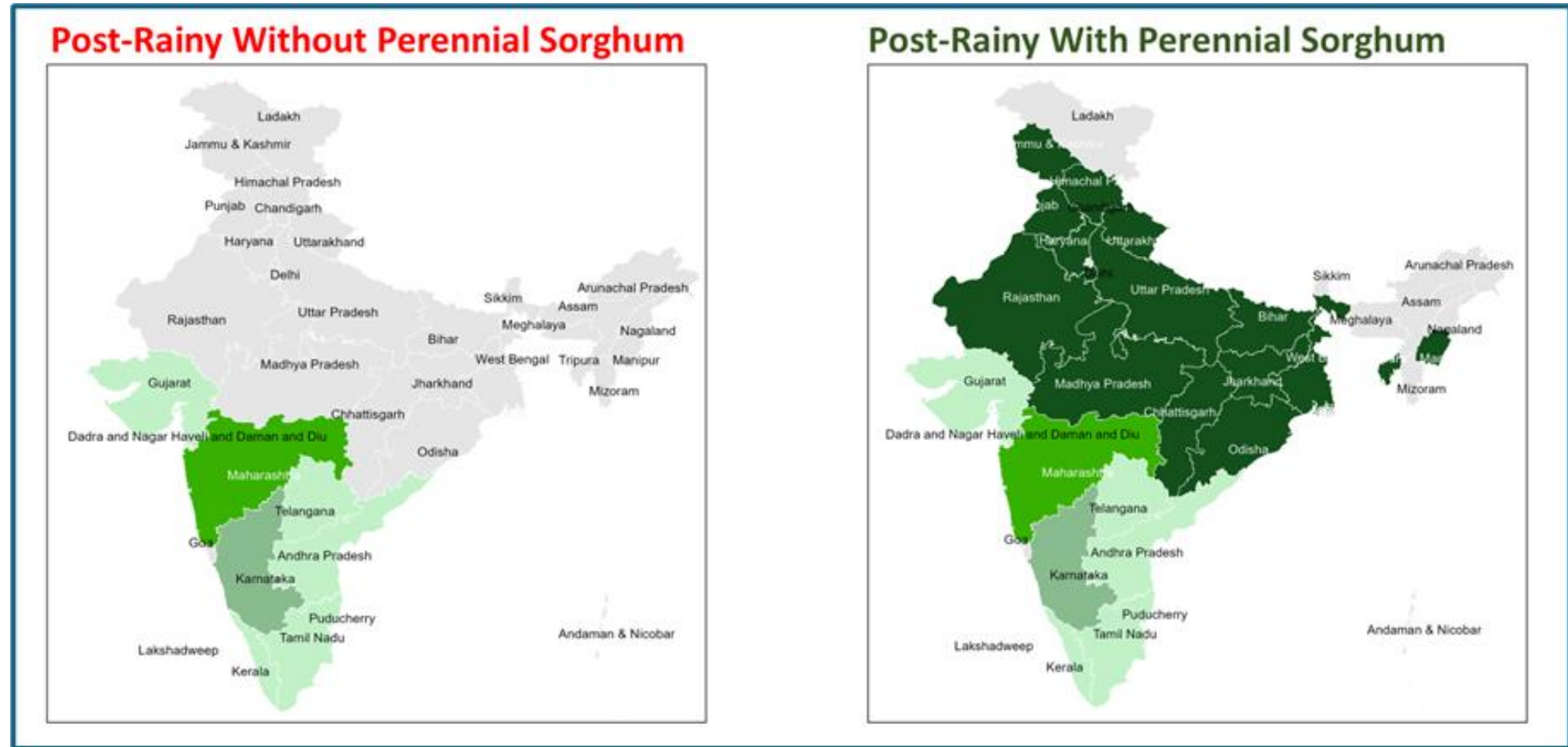
Annual vs. Perennial Sorghums:
Partial factor productivity of applied N (NUE)



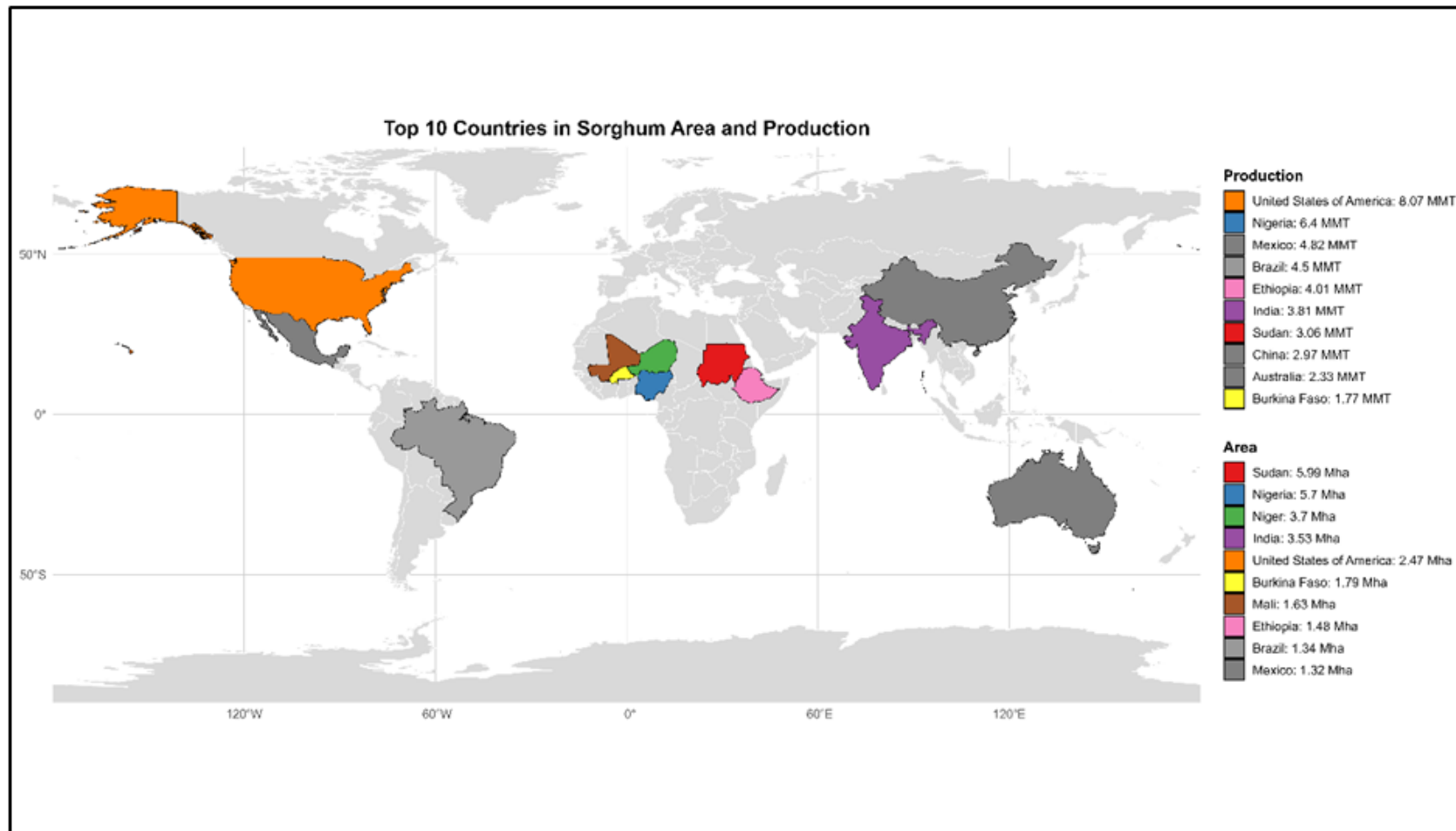
Annual vs. Perennial Sorghums:
Reaction norms for primary productivity



ICRISAT's Elite perennial lines tested across India (> 6 states) for multicut forage: **A 4 MHA increment.**



Top 10 in area and production: Now it's time for EU SorghumID





Climate change: Europe needs ICRISAT's sorghum genetic diversity



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