International Conference on Innovations to Transform Drylands

21–23 February 2023

ICRISAT, Hyderabad, India

Abstract Book

Organised by

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

ICRISAT 50

INTERNATIONAL YEAR OF MILLETS 2023

Co-organisers

कृषि एवं किसान कल्याण मंत्रालय
MINISTRY OF AGRICULTURE AND FARMERS WELFARE
सत्यमेव जयते

भाकृअनुप ICAR

AGRA
Sustainably Growing Africa's Food Systems

Nutrient dense millets germplasm to develop biofortified cultivars for addressing nutritional security of poor and small holder farmers in the drylands

Vetriventhan M[1], Srinivas R[1], Naresh D[1], Jagadeesh K[1,2] and Singh K[1]

[1]Genebank, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India.
[2]Professor Jayashankar Telangana State Agricultural University (PJTSAU), Rajendranagar, India
Email: vetriventhan.mani@icrisat.org

To address the food and nutritional challenges of the rapidly increasing population, by 2050, the world will need to produce twice as much food as was produced in 2000. Both in developed and developing countries, malnutrition, unhealthy diets and lifestyle disorders are the major risk factors for chronic diseases in humans. Millets are future smart-food crops, which are gluten-free with a high nutritional index, the high levels of tolerance to abiotic stresses, and adaptation to inherent low soil fertility make the millets progressively more relevant for food, fodder and nutritional security in the drylands. The potential of millets is far greater than what is currently being realized in dryland agriculture. Promoting large-scale production and consumption of millets can lead to the diversification of sustainable diets and have a positive impact to improve the health of people and the planet. Due to selective domestication, cultivation of most of the millets have been confined to marginal lands, mostly in the dry areas of Asia and Sub-Saharan Africa, but there is ample scope for expanding millets cultivation globally. Globally, the genebank at ICRISAT holds the largest collections of sorghum, pearl millet, and six other minor millets, assembled mostly from Asia and African continents. The nutritional characterization of these germplasm resources revealed the diversity of various nutrients showing the untapped yield and nutritional potential for breeding biofortified cultivars. In sorghum, Fe ranges from 26-61 mg/kg, Zn 17-57 mg/kg; pearl millet, Fe 51-121 mg/kg, Zn 46-87 mg/kg, Ca 85-249 mg/kg; finger millet, Fe 22-65 mg/kg, Ca 1840-4890 mg/kg; foxtail millet, Fe 24-68 mg/kg, Zn 33-74 mg/kg, protein 10-18.5%; proso millet Fe 41-73 mg/kg, protein 11-19%; little millet, protein 6-15.6%; barnyard millet, Zn 31.8-62 mg/kg and protein 11.7-19%. The use of these germplasm in breeding benefited in the development of the world's first biofortified varieties in pearl millet (Dhanasakthi) and Sorghum (Parbhani Sakthi) contributing exponentially to alleviating the hidden hunger in the rural masses, where mostly these crops are their staple foods. Continued use of the diverse genetic variability is important in developing agronomically desirable climate-resilient and nutrient-dense cultivars in a broader genetic base.

Sustainable intensification of agrifood systems to ensure food and nutritional security

Jat HS, Gora MK, Choudhary M, Sharma PC and Jat ML

[1]ICAR-Central Soil Salinity Research Institute (CSSRI), Karnal, India
[2]International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India
Email: hsjat_agron@yahoo.com

Indo-Gangetic plains (IGP) of South Asia supports bulk of human and bovine population through major agrifood (rice/wheat) systems since ages. Increasing population and resources (soil, water, energy) degradation in the region alarms the challenges of malnourishment, factor productivity, soil degradation and air quality. Furthermore, monotonous cereal (rice-wheat; RW) system reduced the dietary diversity towards carbohydrate rich foods which resulted in nutritionally imbalanced food and causing malnourishment and health issues. To address these challenges, a study was conducted on conservation agriculture (CA)-based crop diversification options to ensure food and nutritional security. On 3 years mean basis, CA-based diversified production scenarios increased the system yield by 15.0%, net return by 29.6%, protein yield by 32.0% and irrigation water saving by 52.6% compared to CT-based rice-wheat system (Sc1). CA based maize-mustard-mungbean (Sc4) recorded the highest productivity (+44.4%), profitability (+66.1%) and saved 80.4% of irrigation water compared to Sc1 (12.02 Mg ha-1; 2223 USD ha-1; 2592 mm ha-1) and closely followed by maize-wheat-mungbean (Sc5). With respect to nutritional values, Sc5 was more balanced and produced 64.4, 16.4 and 213.3% higher protein, carbohydrate and fat yields, respectively compared to Sc1 (1.01, 9.09 and 0.15 Mg ha-1) and able to meet out the nutritional demand of 23, 26 and 35 extra persons ha-1 year-1. Integration of pulses and oilseeds in to cereal systems improved the soil health and its productivity. The soybean-wheat-mungbean (Sc6) system was more economic in protein and fat yield. In South Asia, pulse/oilseed based diversification is an idle option to ensure quality and nutritious food for the dwelling communities in the region for healthy life.