

Task Force 01

FIGHTING INEQUALITIES, POVERTY, AND HUNGER

Super Food Millets Portraying Smart Food Pathways for Climate Resilience: Fructification of G20 Commitments for Food Security and Adequate Nutrition

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Abstract

Global food systems face increasing demand amidst stressed supply due to climate change as well as conflicts. Moreover, the pandemic exposed the limitations of global supply chains and stressed global food security relegating nutrition to even lower pedestal.

Some crops are inherently climate-smart in nature like millets and other ancient grains; while for many others the climate-smart practices can be deepened. These include millets, sorghum, barley, legumes, and diverse vegetables that present a promising solution toward achieving sustainable development goals (SDGs). Such crops are nutritious, environmentally sustainable, have therapeutic benefits, use less resources and protect livelihoods of small farm holders. Equipped with these benefits the millets are already called as super foods and other crops can be smartly raised to harness such benefits.

For the G20, these crops align with sustainable development and climate resilience. The G20 Brazilian presidency is also seamlessly aligning with the G20 Deccan High-Level Principles on Food Security and Nutrition accepted at New Delhi in 2023, emphasizing access to nutritious foods, and call for strengthening policies and collaborative actions for climate-resilient and sustainable agriculture and food systems. Enhancing proportion of these foods into food basket can reduce hunger, enhance nutrition, and ensure environmental sustainability, contributing to SDGs and combating climate change. There exist strong opportunities for G20 toward capacity building, technology and investments to achieve productivity gains to increase production, strengthen global supply chains and enhance consumer awareness toward these foods.

Keywords: Climate Resilience, Food security and nutrition, G20 Millet Initiative, Smart Foods, Zero Hunger.

Introduction

It is evidenced that some crops are inherently climate-smart in nature for example millets and other ancient grains accordingly termed as Super-foods; while for many others the climate-smart practices can be deepened through in genomics, agronomic and other desirable initiatives. Such crops can better meet food security and adequate nutrition needs so critical for improving living standards and well-being of people. To address related challenges, transdisciplinary approaches that integrate innovations, better policies with swifter implementation are essential. Integrating climate resilience in agriculture would reduce carbon footprints through sustainable practices like soil and water conservation, and agroforestry through carbon sequestration, leading to conservation of biodiversity and sustainability.

Further, by recovering food loss and waste, the production demand can be reduced by 1.6 billion tons of food (Hayati et al. 2023). This is akin to production of such large quantity at zero resource cost. The FAO estimates that achieving zero hunger by 2030 will need additional resources of US\$ 265 billion annually for agricultural development, social protection, and rural infrastructure.

The Challenge of Global Food Security and Nutrition

1. Current state

Global food security faces severe threats with burden of 738.9 million undernourished people in 2021 and disparities in nutritional health (FAO and others, 2023)¹. Food insecurity is more prevalent among poor and vulnerable including women and rural populations. Women engaged in agriculture face varying impacts of climate change based on social factors². Non-climate stressors like population and income growth, alongside climate change, also undermine food security³.

It is projected that almost 600 million people would be chronically undernourished by 2030⁴. The 2023 Global Hunger Index underscores 43 countries having alarming or serious levels of hunger, disproportionately affecting people in low- and middle-income nations⁵.

Despite past productivity gains, the FAO stresses the need to increase agricultural production further by 70 per cent by 2050 to bridge the vast gap in achieving food security⁶.

¹ FAO, IFAD, UNICEF, WFP and WHO. 2023. The State of Food Security and Nutrition in the World 2023. Urbanization, agrifood systems transformation and healthy diets across the rural–urban continuum. Rome, FAO. <https://doi.org/10.4060/cc3017en>

² <https://www.ipcc.ch/srccl/chapter/chapter-5/>

³ <https://www.ipcc.ch/srccl/chapter/chapter-5/>

⁴ <https://www.fao.org/3/cc3017en/cc3017en.pdf>

⁵ <https://www.globalhungerindex.org/>

⁶ FAO (2009). How to Feed the World in 2050. Rome, Italy, Food and Agriculture Organization

2. Climate Change

Climate change disrupts food security via increasing temperatures, changing precipitation patterns and more frequent extreme events⁷. Crop yields thus tend to suffer especially in lower latitudes, even though adaptation measures like irrigation help but that too requires substantial investments.

3. Water scarcity

By 2050, the global population will increase by 22 to 34 per cent, intensifying water scarcity (WWDR 2023). Africa and Asia, already facing clean water shortages, will be significantly impacted (Boretti and Rosa 2019; WWDR 2023). Countries located in Central Africa, East Asia, South America, will face seasonal water scarcity due to climate change, whereas regions such as the Middle East, and the Sahel in Africa are already water scarce (WWDR 2023).

4. Changing lifestyles and non-communicable diseases

Rapid urbanisation, rising incomes and changing lifestyles are leading to rising incidence of non-communicable diseases (NCDs), necessitating the need to shift toward healthy diets. By now, dietary risks are among top five risks associated with deaths for both the genders (Murry *et al.*, 2020). These challenges pose existential threats to humanity, and require a multi-pronged approach, including transition toward sustainable agri-food systems.

⁷ <https://www.ipcc.ch/srccl/chapter/chapter-5/>



4.1 Super Foods including millets and other ancient grains

Millets and several other ancient grains, are stress-tolerant, attributable to their short life-cycle, physiology and resource-use efficiency. These crops have additional advantages such as therapeutic benefits, better nutrition and can ensure livelihoods for resource constrained farmers, especially small farm holders. Notably, between 1965 and 2021, there was a decline in area under sorghum and millets (**Table 1**), a trend which needs to be reversed.

TABLE 1. Global Area, Production and Yield for Sorghum and Millets for the Years 1965 and 2021 and CAGR, triennium ending (TE)

Particulars	1965	2021	CAGR 1965 to 2021(%)
Area			(Million Hectares)
Sorghum	47.3	40.9	-0.26
Millets	43.4	30.6	-0.62
Production			(Million Tonnes)
Sorghum	48.1	59.6	0.38
Millets	25.9	30.9	0.32
Yield			(Kg/hectare)
Sorghum	1,017	1,458	0.65
Millets	597	1,011	0.95

Source: Authors' compilation from FAOSTAT

The G20 Leaders at New Delhi, India, in September 2023 also encouraged efforts to strengthen research cooperation on climate-resilient and nutritious grains (G20 Leaders' Summit, 2023).

5. Spectrum of Elasticity of Supply of Agricultural Land

Urbanization and geopolitical conflicts driven migration into cities also create social and economic inequalities, exacerbated by diminishing availability of agricultural land in urban areas. The fact that in many African countries, which grow many super foods such as millets and other ancient grains, supply of agricultural land is still elastic, gives a global opportunity to scale production of these crops to reduce food insecurity and undernutrition as well as obesity.

Recommendations

1. Leveraging technology for precision agriculture

The Fourth Industrial Revolution empowers farmers in developing countries with digitized operations using ICT, blockchain, big data, robotics and IoT, (Malabo Montpellier Panel, 2019). These technologies utilize data and climate patterns to predict crop growth, forecast yields, predict pests/diseases, and optimize harvests thus allowing farmers to manage potential problems in real time.

In livestock farming, utilizing RFID sensors, precision livestock farming systems monitor individual cattle's feeding and drinking behaviors, enabling adjustments to nutrient profiles and feeding schedules. This enhances performance, reduces feeding cost, and meets consumer demands.

Amidst growing global interest in sustainable food production, urban farming is gaining prominence. These methods make use of underutilized spaces like rooftops and urban lots (Mabon *et al.*, 2023). Vertical aquaponic systems, for instance, grow plants vertically, saving space (Goddek *et al.*, 2019).

2. Using smart foods including super foods like millets to fight hunger

2.1 Encouraging crop diversification toward super-foods

Investing in research for developing drought-tolerant and nutrient-rich crops is crucial. FAO (2023) underscored need of larger investments in basic research, genetic improvements, and in farm and processing machinery suited to millets. Thus, millets and other similar ancient grains require concentrated efforts to increase area, production and productivity. Global efforts in countries like Bangladesh, Brazil, Canada, India and USA highlight the importance of crop diversification, which is equally essential for better

nutrition. Moreover, techniques like intercropping, mixed cropping, and companion cropping can also bring climate resilience (Hufnagel *et al.*, 2020). Financial incentives are essential to encourage farmers to diversify their crop portfolios, mitigating climate risks and ensuring food security and nutrition.

G20 needs to foster partnerships and collaborations including PPP models. It should establish a cooperation mechanism to leverage expertise of different institutions in this endeavour, to advance R&D and technology, promote ancient grains, and facilitate knowledge sharing and capacity building.

2.2 Strengthening food supply chains

Blockchain enhances the traceability of food supply chains and efficiency, reducing food loss. Such practices ensure transparent transactions and reduce waste. Advanced logistics technologies, like innovative cold storage, optimize distribution, lessening environmental impact. Integrating blockchain and logistics technologies is vital for sustainable practices in agriculture, ensuring food security and nutrition, and promoting agricultural sustainability.

A study conducted on millets value chain highlights need of primary processing, market linkages, access to e-commerce platforms, and policy support in terms of establishing food parks for developing millets products and their promotion (Sangappa *et al.* 2023). The G20 Millet Initiative secretariat based at IIMR, Hyderabad, India along with ICRISAT could promote R&D in aggregation models.

2.3 Investing in food processing technologies

Investing in food processing, particularly cold storage and nutrient retention, is vital for food security and sustainability. Innovative technologies like supercooling extend

shelf life, reduce waste, and maintain food quality by preventing ice crystal formation. Efficient cold storage is crucial in developing countries, where up to 50 per cent of perishable food is lost due to inadequate facilities.

2.4 Strengthening Agricultural Market Information System (AMIS)

The G20 AMIS should be reformed to enhance its scope to add some of these resource-efficient ancient grains, which will help countries, private buyers and other stakeholders seeking imports, access to information on area under cultivation and production prospects, to timely plan their purchases. A Centre of AMIS in this regard may be established in a developing country that is a producer as well as consumer of millets and other ancient grains.

3. Learning from global success stories

Research indicates that it is economically viable to transition to smart foods and climate-resilient agriculture. Many countries have developed climate resilient varieties for instance, India's Central Soil Salinity Research Institute has developed salt-tolerant rice, wheat, and mustard, while the International Maize and Wheat Improvement Center (CIMMYT) focuses on drought-resistant maize and wheat. Further, in many countries some crops act as a food reserve to overcome crop failures like Cassava in Africa which also stabilizes food production in deteriorating conditions⁸. Resilience initiatives include mapping vulnerabilities, using earth observation data for building resilience. In many

⁸ <https://www.sciencedirect.com/science/article/abs/pii/S0306919294900086>

countries like Lebanon, solar-assisted heating in poultry houses reduces energy costs and boosts efficiency⁹.

G20 may leverage its platforms to bring traction to adoption of millets and other ancient grains and also give a big push to smart foods. The Global Alliance Against Hunger and Poverty, which aims to implement public policies and social technologies proven effective against hunger and poverty, needs to include promotion of ancient grains in its outcomes and promote for earmarking of resources for traction on all critical aspects including research, conserving genetic resources, infrastructure development, market development, and value addition.

⁹ <https://energysustainsoc.biomedcentral.com/articles/10.1186/s13705-023-00437-w>

Scenario of Outcomes

Scenario 1: Area and production under smart foods decreases

Globally, any decline in area as well as production of millets and smartly-raised foods would affect incomes and livelihoods of farmers. It would also exacerbate the effect of extreme weather events especially on small farm holders under this scenario.

Scenario 2: Aggregate area and production under smart foods rises but not the aggregate share in food basket

Traction imparted to millets and smartly-raised foods gained through efforts made by various international agencies may prove useful in increasing area and production. It is expected that with promotion and awareness through constant efforts, including policy support to enhance demand, a rise in area under cultivation can be achieved. However, in this scenario it is not perceived that share in food basket would rise.

Scenario 3: The aggregate share of smart-foods in food basket rises

It is expected that support to millets and smartly-raised foods for their benefits may lead to increase in productivity and production to meet their rising demand. The governments can provide support in form of investment in climate resilient technologies including germplasm conservation and development. Moreover, consumer awareness on benefits of such foods requires more investment, to develop vibrant markets. Some of these crops such as millets and other ancient grains can grow on degraded soils not only for subsistence, but also as a regular portion of food basket of poor and rich alike. Gains to productivity could also accrue by mainstreaming these underutilised crops to more productive lands along with R&D for cultivars development and improving agronomic

practices. Accordingly, this sustainable scenario perceives rise of the share of such foods in the food basket.

Relevance for G20

G20 can lead R&D for promoting millets and smartly-raised foods for climate-resilient agriculture by prioritizing policies that support innovation in agriculture sector. G20 can further play a pivotal role by fostering partnerships for knowledge exchange, funding research, and supporting climate-resilient agriculture in developing nations. G20 therefore needs to develop and strengthen collaboration mechanisms in its work programme.

It is recommended to have a G20 initiative to promote awareness of the benefits associated with production and consumption of millets and smartly-raised foods. The G20 could appeal to all the stakeholders to run awareness campaigns to popularise these crops, and restore and increase their acceptance among consumers, in line with the efforts intensified including since International Year of Millets (IYOM), 2023. The G20 should also call for institutional promotion of these foods through development of dietary guidelines, and food safety nets, including mother and child support services, and school feeding programmes.

In conclusion, the G20 should spearhead the global shift to sustainable food systems by utilizing its economic strength, technological position and capacity for policymaking. It is expected that the production, productivity and the share of smart foods including millets and other ancient grains in the food basket would increase, along with increases in the production of wheat, rice and maize to meet the future food security requirements and to progress towards adequate nutrition

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