



ISSUE NOTE

G20 Meeting of Agricultural Chief Scientists (MACS)

17-19 April 2023

Varanasi, India

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ONE EARTH • ONE FAMILY • ONE FUTURE

ISSUE NOTE FOR
G20 Meeting of Agricultural Chief Scientists (MACS)
Sustainable Agrifood Systems for Healthy People and Planet
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1. BACKGROUND

The food and agriculture production systems worldwide are facing unprecedented challenges worldwide from an increasing demand for food for a growing population, rising hunger and malnutrition, adverse climate changes effects, overexploitation of natural resources, loss of biodiversity, and food loss and waste. These challenges can undermine the world's capacity to meet SDG2 targets by 2030.¹

Between 702 and 828 million people were affected by hunger in 2021. The number has grown by about 150 million, since, the outbreak of the COVID-19 pandemic. The increase in global hunger in 2021 reflects exacerbated inequalities across and within countries due to an unequal pattern of economic recovery among countries and unrecovered income losses among those most affected by the COVID-19 pandemic. If the trend continues, projections show that nearly 670 million people (8% of the world population) will still be facing hunger in 2030, which is the same as in 2015 when the 2030 Agenda was launched.²

Domestic food price inflation, disturbance to the food supply chains due to conflicts, rise in fertilizer prices due to supply side constraints will further limit agricultural production and increase food insecurity especially in vulnerable, fertilizer import-dependent countries.³ In addition, increased incidences of abiotic and biotic stresses will not only affect adversely the food production but also agricultural livelihoods, with developing countries bearing a disproportionate burden.⁴ Many countries and international organisations are consistently working to create resilient food systems but the magnitude of the problem necessitates a multipronged approach and continuous action. G20 nations have assigned considerable focus to address global food security challenges and achieving sustainable, inclusive and resilient agrifood systems.

The G20 Meeting of Agricultural Chief Scientists (MACS) is instrumental in promoting joint action to put science-based solutions into practice for achieving sustainable agricultural production systems along with food and nutritional security through strengthening cooperation among G20 States. Since 2012, G20-MACS launched

¹ SDG Goal 2: Zero Hunger – facts, targets (<https://www.un.org/sustainabledevelopment/hunger/>)

² FAO, IFAD, UNICEF, WFP and WHO. 2022. The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable. Rome, FAO. <https://doi.org/10.4060/cc0639en>

³ FAO and WTO. Global Fertilizer Markets and Policies. 2022.
https://www.wto.org/english/news_e/news22_e/igo_14nov22_e.pdf

⁴ IPCC. Climate Change 2022: Impacts, Adaptation and Vulnerability. 2022.
https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf

several concrete activities providing basis for desired progress in the future. Recently, in 2020 during the Kingdom of Saudi Arabia Presidency of the G20 MACS, the importance of developing sustainable agriculture including pastoralism, in drylands for livelihoods and ensuring global food and nutrition security was recognized⁵. In the 10th MACS in 2021 under the Presidency of Italy, the need for effective research collaboration between countries, and between the public and private sector, to find solutions to help farmers to mitigate and adapt to climate change, to improve sustainability, productivity, and profitability was stressed. In the 2022 G20 MACS Presidency of Indonesia, post COVID 19 food security policies, digital agriculture, food loss and waste were prioritized for joint actions.

In consonance with India's G20 Presidency theme "One Earth, One Family, One Future", the MACS will pursue dialogues on issues of relevance for food security (especially in the context of international year of millets), resilience to crisis (through climate resilient agriculture and One Health approaches), emerging issues (e.g. digital agriculture) and public – private partnerships for research, development, and extension and advisory services. The meeting will feature Millets And OtHer Ancient GRains International ReSearch Initiative (MAHARISHI)⁶ with emphasis on millets based local food system for agrobiodiversity, food and nutrition security in context of the International Year of Millets.⁷

2. PRIORITY THEMES OF THE G20 MACS 2023

2.1 ACHIEVING FOOD SECURITY AND NUTRITION: FRONTIERS IN SCIENCE AND TECHNOLOGY

The challenges to ending hunger, food insecurity and all forms of malnutrition keep growing. The COVID-19 pandemic has further highlighted the fragilities in our agrifood systems. Science, technology and innovation are powerful components of evidence-based decision-making at all levels and key to identify synergies and trade-offs, transforming agrifood systems and achieving the SDGs. Accordingly, the 2030 Agenda for sustainable development positioned Science, Technology, and Innovation (STI) as a key means of implementation of the SDGs. In 2021, the UN Food Systems Summit (UNFSS) affirmed the need to invest in science and innovation for the SDGs.⁸

The landscape of science and innovation is continuously evolving and providing new opportunities for achieving the 2030 Agenda. The G20 MACS will focus on how science, technology and innovation can contribute and provide innovative solutions to achieve the food security and nutrition with due consideration to social and ethical dimensions, leaving no one behind. The deliberations are expected to emphasize the

⁵ MACS Communiques - <https://www.macs-g20.org/about-macs/macs-communiques>

⁶ Detailed action plan and document will be shared separately.

⁷ UN (2021) A/Res/75/263 International Year of Millets, 2023 - UN Resolution adopted by the General Assembly on 3 March 2021

⁸ United Nations Food Systems Summit 2021: <https://www.un.org/en/food-systems-summit>

need for coordinated actions by G20 Members for sharing scientific knowledge and effective use of science, technology and innovation at all levels and reiterate the role of G20 Members as one of the main sources of consolidated and reliable scientific information for achieving the sustainable agriculture and food security. The session will feature Millets And OtHer Ancient GRains International ReSearch Initiative (MAHARISHI)⁹

Questions for discussion:

- How can the G20 countries help sharing science-based technological and innovative solutions for achieving sustainable agrifood systems and food security and nutrition;
- How the frontiers in science and technology could meaningfully play a role in transforming agrifood systems and help achieve food security and nutrition;
- In what ways can research and awareness on millets and other nutri-cereal crops be improved?

Key Deliverables:

- Promote knowledge sharing on frontiers in science, technology and innovation among the G20 members and highlighting the need for concrete actions;
- Initiate G20 Millets And OtHer Ancient GRains International ReSearch Initiative (MAHARISHI).
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2.2 RESILIENT AGRIFOOD SYSTEMS: “ONE HEALTH”

One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, plants, animals and ecosystems that are closely linked and inter-dependent.¹⁰ The global impact and response to the COVID-19 pandemic, a human health crisis caused by a virus passed from animals, highlights the need for coordinated action across sectors to protect health and prevent disruption to food systems. This involves a spectrum of actors and work on sustainable agriculture, animal, plant, forest, and aquaculture health, food safety, antimicrobial resistance (AMR), food security, nutrition and livelihoods. Ensuring a One Health approach is essential for progress to anticipate, prevent, detect, and control diseases that spread between animals and humans, tackle AMR, ensure food safety, prevent environment-related human and animal health threats, as well as combatting many other challenges. A One Health approach is also critical for achieving the Sustainable Development Goals (SDGs).¹¹ The 12th MACS shall discuss the topic during this meeting. A separate technical workshop is being planned in August 2023 to discuss the topic in detail.

⁹ Detailed action plan and document will be shared separately.

¹⁰ Joint Tripartite (FAO, OIE, WHO) and UNEP Statement Tripartite and UNEP support OHHLEP’s definition of “One Health”
<https://www.fao.org/3/cb7869en/cb7869en.pdf>

¹¹ One Health (FAO): <https://www.fao.org/one-health/en>

Questions for discussion:

- How to promote One Health approach systemically, in particular, through multi-actor partnerships involving international and national organizations;
- What role G20 Members could play for promoting food safety and healthy diets, preventing and controlling transboundary diseases, zoonoses and AMR, to protect the livelihoods of farmers from the impacts of plant and animal diseases, and to increase the sustainability and resilience of agrifood systems, with One Health benefits.

Key deliverables:

- Partnerships for coordinated action for promoting One Health approach;
- R&D Priorities on transboundary pests and diseases for resilient agrifood systems.

2.3 RESILIENT AGRIFOOD SYSTEMS: CLIMATE RESILIENCE

Enhancing food production while adapting to climate change and preserving natural resources has become critical to ensure stability in food security. Building resilience to climate change involves an integrated approach that aims to help farmers adapt to and mitigate the impacts of climate change while also increasing food production. Awareness and action on efficient use of water, soil and energy plays an important role in fostering resilience of food production systems to changing climate. In this context, it is crucial that the emerging technologies for precision irrigation, preservation of soil organic matter, use of renewable energy in agricultural operations, etc. are affordable and accessible to farmers, especially, the smallholders.

The development of climate resilient crop varieties for increased tolerance to pests, diseases, droughts, floods, salinity and other climate-related stresses, are vital to help farmers better adapt to climate change. There are several farming systems that are designed to be non-degrading and resource conserving in nature and are more resilient to the impacts of climate change. Integrated farming systems that incorporate crops, livestock, poultry and fisheries, make more efficient use of resources and are less reliant on the external inputs.

Regenerative Agriculture, a way of farming that focuses on conservation agriculture, agro-forestry, silvi-pasture, etc. and makes the farming system more sustainable and resilient to climate change impact. In this context, key areas of policy focus include, increasing investment in agricultural research, encouraging public-private partnership for developing innovative technologies, providing financial, technical and logistic support to farmer, creating an enabling environment for adoption of sustainable farming practices and climate resilient production systems. Adaptation and resilience to increasing extreme events can be accompanied through weather and climate related

information services, early warning systems, risk sharing and transfer mechanisms such as insurance markers and index based-weather insurance.¹²

The climate resilient technologies and innovations for sustainable agrifood systems including nature-positive agriculture can help in climate change adaptation and mitigation. The Biological Nitrification Inhibition (BNI)¹³ has been proved effective approach contributing to reducing GHG emissions and increasing crop yields. These will be introduced during this meeting and a detailed deliberation are expected to take place during the technical workshop in August 2023.

Questions for discussion:

- How can G20 countries foster collaboration for exchanging information and establishing partnership to make food production system more resilient to climate change?

Key Deliverables

- Enhanced research collaborations for developing climate resilient technologies and practices

2.4 FOSTERING THE DIGITAL TRANSFORMATION OF AGRIFOOD SYSTEMS

Unlike past technological revolutions in agriculture, which began on farms, the digital agriculture revolution is being sparked at multiple points along the agri-food value chain.¹⁴ Connectivity, mobile adoption, artificial intelligence, and other emerging technologies are opening doors to new opportunities. Digital Technology based precision agriculture can help farmers to increase farm productivity through improving efficiency of agricultural operations and enhance farm productivity through and following sustainable agricultural practices.

The application of digital technologies will be able to provide support to farmers to i) access to real-time and accurate advisory on weather, irrigation water, soil health, pests, diseases, market prices, and other relevant data can assist farmers to make informed decisions about farm operations; ii) managing and tracking farm activities, such as irrigation, fertigation, and harvesting can help farmers to improve efficiency and reduce waste; iii) connecting farmers with potential buyers, suppliers, and agro-industries in the agricultural value chain can help them to access new markets and fetch better prices for their produce.

Common barriers to adopt digital technologies by the farmers includes up-front investment and recurring maintenance expenses, relevance and limited use cases, user-friendliness, high operator skill requirements and technological risks. National

¹² IPCC (2019): Food Security. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems (<https://www.ipcc.ch/srccl/chapter/chapter-5/>)

¹³ JIRCAS: Biological Nitrification Inhibition – dual benefit for agriculture and the environment (https://www.jircas.go.jp/en/publication/research_results/2009_06)

¹⁴ World Bank (2021). What's cooking: Digital transformation of the agrifood system. (<https://openknowledge.worldbank.org/entities/publication/e9b250b5-f560-523a-9328-ec90e8b2a29a>)

governments have an important role in addressing bottlenecks related to adoption of these technologies by providing (i) information on costs and benefits of various technologies, (ii) investing in human capital, ensuring appropriate incentives for innovation, (iii) serving as facilitators of data-sharing to spur inclusive, secure and representative data ecosystems, and promoting competitive markets.¹⁵ G20 Members could aim at exchanging information and knowledge about successful digital agriculture projects/ initiatives and learn from each other's experiences to address the barriers.

Digital agriculture solutions need to be carefully designed to ensure inclusive participation of small and marginal farm holders, women, and youth. Likewise, the technological and digital-enabled agri-food system can become vibrant through the interventions of the public and private sector participation. Agri-tech start-ups can provide innovative ideas and affordable solutions to tackle challenges across the agricultural value chain, using open digital networks. A multi-dimensional, multi-stakeholder and collaborative approach is the best way forward. The 12th G20 MACS meeting takes forward the discussions carried out during the previous meetings and further analyse the potential of digital transformation in agrifood systems.

Questions for Discussion:

- How can G20 Members collaborate on the new and emerging technologies to empower farmers, particularly small and marginal farmers?
- In which ways G20 Members can work together to further advance digital technologies including traceability and apply innovative solutions for reducing food loss and waste?

Key Deliverables:

- Strengthening the application of new and emerging digital technologies to empower farmers, women and youths.
- Promoting collaborations among G20 Members, Guests and IOs to exchange experiences and lessons learned on digital technologies traceability and application of digital solutions for reduction of food loss and waste.

2.5 PUBLIC – PRIVATE PARTNERSHIP IN AGRICULTURE RESEARCH AND DEVELOPMENT (R&D)

Developing and leveraging transformative partnerships serve as a primary resource in co-development of technologies and practices. Innovative partnerships that bring together government agencies, universities, laboratories, the private sector and small businesses are increasingly being promoted as a mechanism for pooling much-needed financing for agribusiness development.¹⁶ Establishing strategic links between public

¹⁵ OECD (2022) The digitalization of agriculture – A literature review and emerging policy issues (<https://www.oecd.org/publications/the-digitalisation-of-agriculture-285cc27d-en.htm>)

¹⁶ FAO (2016). Public–private partnerships for agribusiness development – A review of international experiences, FAO, Rome, Italy (<https://www.fao.org/3/i5699e/i5699e.pdf>)

and private entities provide access to significant finance for research, agricultural extension and advisory services, testing and evaluation activities.

Public-private partnerships provide crosscutting capabilities to execute responsibilities in a collaborative way with diverse stakeholders. Through these capabilities, the partnerships strive to become a more innovative, integrated and effective contributor to develop science-based technological solutions and practices for achieving sustainable, resilient, inclusive agri-food systems and food security and nutrition *"leaving no one behind"*.

The public private partnerships could be transformative and foster innovative research in universities, labs, small businesses and the private sector. It may contribute various areas of work including technology development, operational experimentation, testing and evaluation, technology transfer and commercialization, building laboratory facilities and products, etc. However, coordination of the partnerships is critical to achieve targeted outcomes contributing effectively to the benefit of smallholder producers and achieving food security and nutrition.

The 12th G20 MACS meeting will explore the opportunities and risks of public – private partnership in agricultural R&D for achieving food security and nutrition.

Questions for Discussion:

- What are the priority areas of work to which public – private partnerships could be effective to achieve sustainable and resilient agrifood systems and food security and nutrition?
- In which ways G20 members could work together to achieve transformative public – private partnerships in sustainable agriculture and food security and nutrition?

Key Deliverables:

- Sharing experiences in public – private partnerships to achieve sustainable agrifood systems and food security and nutrition;
- Promoting enabling environment to strengthen collaboration between public institutions and private sector.