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Advancing Science and Innovation for a Sustainable Rural Transformation in the Near East and North Africa

Executive Summary

The Near East and North Africa (NENA) region needs to accelerate its commitments and apply additional efforts to overcome the multifaceted challenges it faces to eradicate hunger, food insecurity, and all forms of malnutrition and achieve the Sustainable Development Goals. Countries in the region would benefit from innovative policies, organizational processes, and practices; research and science- and evidence-based technological solutions; and effective cooperation and partnerships to address the complex and emerging issues.

This Information Note provides updates on science and innovation in the NENA region since December 2021 and a brief description of the FAO Science and Innovation Strategy's regional implementation plan with a special focus on leveraging the power of innovation, digital solutions, and agriculture technologies to benefit agricultural stakeholders, especially small-scale producers, to build resilience, improve productivity and profitability, foster sustainable use of natural resources, and enhance livelihoods. The note highlights the major events conducted within the regional implementation plan emphasizing key recommendations, with a thematic focus on climate actions.

FAO, in collaboration with regional partners, is committed to assisting Members in developing their national digital agriculture strategies and plans, support in creating the enabling environment (human capacities, partnerships, connectivity, soft and hard infrastructure) to further promote and invest in the deployment of sustainable digital solutions for agricultural transformation and climate action.

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I. Background

1. The NENA region is home to 419 million people, 40 percent of whom live in rural areas and one in five works in agriculture[1]. Limited land and water resources characterize the agricultural landscape in the region. Land and water resources – the basis of our food production – are finite and are under severe stress in the NENA, which has witnessed increased resources degradation over the past years. Climate change projections do not provide a positive scenario for the region, with higher temperatures and decreased rainfall resulting in more droughts and an increase in extreme weather events.

2. The Region is evidently one of the world's regions predicted to be most affected by climate change, which is already altering crop productivity and growth cycles. An increase in mean temperatures, floods and droughts affects smallholders the most, as well as vulnerable populations with low capacities to adapt and those experiencing conflict. Predictions of more frequent droughts and extreme weather events necessitate a pivotal change. This calls for a shift towards innovative strategies, adaptive technologies, and digital solutions, strengthened partnerships, and an emphasis on improving human capital to counter climate change repercussions and uphold the agrifood system.

3. Recently, attention to climate change has heightened in NENA. The region hosted the 27th Conference of the Parties to the UN Framework Convention on Climate Change (COP 27) in Egypt in 2022 and COP 28 in the United Arab Emirates in November-December 2023.

4. However, the impacts that climate change is having on agrifood systems, and appropriate adaptation and mitigation measures, do not yet receive adequate attention. To address these challenges, there is a need to transform the agricultural sector to be more productive and sustainable, applying innovative approaches to address the impacts of climate change, and scaling up climate-smart practices.

5. The FAO regional office conducted a regional consultation in December 2021, which identified pertinent priorities, needs, gaps, and trade-offs with respect to the FAO Science and Innovation Strategy, as pertinent to the region. Deliberations considered FAO's role and capacities at national and regional levels, and how to harness the benefits of science and innovation through technical/programmatic interventions and normative guidance and to identify key partnerships in science and innovation to support more inclusive, efficient, resilient, and sustainable agrifood systems in the region.

6. Subsequently, the FAO regional implementation plan for the Science and Innovation Strategy was developed in August 2022, addressing the most relevant actions and programmes, recommended by the Near East Regional Conference (NERC) at its 36th Session.

II. Promoting digital solutions for inclusive rural transformation

7. Digital inclusion is a critical component for encouraging inclusive growth, increasing agricultural production, and promoting sustainable agricultural practices. This entails alleviating obstacles and creating an inclusive environment that allows smallholder farmers, women, youth, and marginalized groups, to successfully access and use digital agriculture technology.

8. Youth are a key demographic group when it comes to science and innovation in the region. Roughly, 65 percent of the region's population is below the age of 35.[2] Yet countries in the region have not been able to capitalize on this demographic dividend. At least 25 percent of NENA youth are facing unemployment - more than double the global youth unemployment rate.[3] Youth, including those in rural areas, are reluctant to engage in traditional agriculture due to the prevalence of low and unstable income and poor working conditions.

[1] Priorities for FAO in the Near East and North Africa region under the FAO Strategic Framework 2022-31 – NERC 22/3

[2] UNDESA. 2022 Revision of World Population Prospects. UNDESA, Population Division. https://population.un.org/wpp/

[3] World Bank, WDI database. Data for 2022. Accessed 10 Aug 2023.

9. A reimagined agrifood system leverages innovation and technology and absorbs this valuable human capital. Young innovators and entrepreneurs are already paving the way for agriculture and rural transformation in the region with an increase in rural entrepreneurs and start-ups that offer new ways to produce more accessible, nutritious, and safe food using fewer resources while linking small producers to new markets.

10. FAO promotes investment in the skills of youth, mentoring them on the nuances of agriculture and rural development, and building the innovation and entrepreneurship ecosystems needed, to leverage science and technology in agrifood value chains. This includes the development of digital literacy training piloted in Egypt and Mauritania, as well as the launch of Agrination – the regional start-up competition for youth agripreneurs.

11. Attention is also given to reducing the digital gender gap, which is prominent in the NENA region, through advocacy, partnerships, and activities promoting rural women's digital literacy and use of digital solutions.

III. Harnessing the potential of technologies and digital solutions

12. There are numerous initiatives in the region which harness the potential of technologies and digital agriculture to address the challenges faced by smallholder farmers. Yet, various constraints hamper the widescale application and benefits. These are primarily related to digital literacy, the rural and gender-digital gap, affordability and access to digital technologies and information, institutional capacities, quality, relevance, and sustainability of digital services, and the enabling ecosystem.

13. Investments are needed in agrifood human capital and in digital solutions that fit the needs of small farmers. Mainstreaming digital technologies and skills in agricultural education and training at all levels is also needed to enable the appropriation of digital innovation for inclusive and sustainable agrifood systems, leaving no one behind.

14. Strengthening institutions and partnerships is key to facilitating innovation, co-creation, and overcoming gaps and vulnerabilities in the agrifood system. Exploring opportunities for partnerships among development and research organizations, and fostering public-private partnerships are essential to increase the outreach and sustainability of digital agriculture solutions at scale.

15. FAO in partnership with the International Telecommunication Union (ITU) advocates for creating an enabling environment, including the development of favourable policies and legal frameworks for inclusivity, data governance, and investing in data and systems interoperability, fostering partnerships and incentivizing investments and adaptation of digital technologies and solutions for sustainable agrifood system transformation.

16. A tripartite collaboration between FAO, the International Fund for Agricultural Development (IFAD), and the Islamic Development Bank (IsDB) started in September 2023. This initiative will identify and assess transferable, adaptable smart agricultural technologies and digital solutions that can be deployed for smallholder farmers to increase agricultural productivity. This includes technologies that are effective in supporting low-carbon agriculture development, improving resilience, contributing to poverty alleviation and employment creation, and reducing vulnerability to climate-related risks.

IV. FAO Science and Innovation Strategy and its implementation in the NENA

17. The FAO Council at its 170th Session endorsed FAO's first Science and Innovation Strategy (The Strategy). The Strategy is the result of an extensive, inclusive, and transparent consultation process launched in September 2021 throughout the Organization and with Members. The Strategy provides an organization-wide guidance, coherence and alignment of science, technology and innovation and is designed as a key tool to support the delivery of the FAO Strategic Framework 2022-31, which includes accelerators on innovation and technology, while science underpins its 20 Programme Priority Areas.

18. The Strategy builds on three mutually reinforcing pillars: strengthening science- and evidence-based decision-making; supporting innovation and technology at regional and country level; and serving Members better by reinforcing FAO's capacities.

19. Regional consultations on science and innovation took place in all the regions in order to provide inputs for the development of the Strategy, including identifying needs and gaps at regional and country levels and discussing science and innovation priorities. The FAO Regional Office for the Near East and North Africa (NENA) hosted the regional consultation on science and innovation in December 2021 where both the benefits and challenges of digitalization were widely recognized.

20. The 36th Session of NERC presented an update on the above-mentioned regional consultation. It recognized FAO's normative role as a comparative advantage, the challenge of bringing the normative work to the country level, and the need to integrate FAO's policy guidance in national plans and budgets to ensure impact. All regions highlighted the centrality of strengthening research and extension at country level and the need to enhance partnerships, particularly with research institutions and the private sector.[4]

21. Accordingly, FAO RNE drafted a regional implementation plan for the Science and Innovation Strategy in August 2022 drawing on planned initiatives under the four regional priorities, followed by consultations with the regional, sub-regional, and country offices to identify relevant actions and programmes under the Strategy's three pillars.

22. The regional implementation plan enlisted high-level actions, including FAO initiatives and innovative actions and programmes on water, energy, and food (WEF); Hand-in-Hand Initiative engaging Sudan, Syria, and Yemen; 1000 Digital Villages Initiative, promoting inclusive digitalization, in Algeria, Egypt, Jordan, Mauritania, Morocco and Tunisia; the One Country One Priority Product initiative; and combating transboundary animal and plant pests and diseases.

23. A special event entitled "Harnessing science, technology and innovation for advancing Water-Energy-Food nexus" was held in October 2022 in a hybrid format in association with the Cairo Water Week 2022. The event was organized in the framework of the FAO Science and Innovation Forum (SIF 2022). It highlighted the centrality of science, technology, and innovation for agrifood systems transformation, and how they can help address the complex issues associated with the water-food-energy nexus in the region.

24. The event discussed a water-energy-food-environment nexus approach to implement the 2030 Agenda while coping with water scarcity. It showed how science and innovation could be part of practical implementation and advance understanding of the importance of developing effective science-policy interface platforms. The event provided a space to explore ways to cope with water scarcity through a nexus approach and to discuss ways to support agrifood systems transformation through science, innovation, and dialogue.

25. In July 2023, FAO RNE organized the Digital Agriculture Solutions Forum (DASF 2023) in Amman, Jordan, in partnership with the International Telecommunication Union (ITU) and in technical collaboration with the Consultative Group of International Agricultural Research (CGIAR). DASF 2023 was organized under the umbrella of SIF 2023 and its overarching theme "Agrifood systems transformation accelerates climate action".

26. DASF 2023 is a continuation of joint efforts with regional partners such as ITU and United Nations Economic and Social Commission for Western Asia (ESCWA). It complements the ongoing regional efforts toward the development and implementation of the Arab Information and Communication Technology Strategy[5] (Arab Digital Agenda [ADA]) developed by the United Nations Economic and Social Commission for Western Asia (ESCWA) and the General Secretariat of the League of Arab States in collaboration with ITU and other organizations. The ADA got endorsed by

[4] Info Note NERC/22/INF/19

[5] ESCWA's vision on the work modalities for producing, developing and implementing the Arab Information and Communication Technology Strategy (The Arab Digital Agenda) - United Nations Economic and Social Commission for Western Asia (unescwa.org)

the Arab Telecom and Information Technology Council of Ministers (ATICM) at its 26th regular Session in December 2022 and was launched in October 2023 at the launch and deployment of the Arab Digital Agenda 2023-2033 and the Second Edition of the Arab International Digital Cooperation and Development Forum.

27. Held under the patronage of His Excellency the Prime Minister of Jordan, DASF 2023 gathered high-level officials, experts, and agribusiness professionals both in-person and online with a total of about 500 participants. The participants included delegates from the Ministries of Agriculture and Ministries of Information and Communication Technologies (ICTs) from 17 countries within the NENA region, international organizations, and digital solutions providers offering insights into practical applications, the service landscape, and the overall ecosystem. Speakers and panellists highlighted the need to position digital solutions at the heart of the transformation of agriculture towards more inclusive, sustainable, efficient, and resilient agrifood systems, amidst the rising challenges of climate change.

28. The forum showcased innovative practices and solutions, from the public and private sector, designed, implemented, and promoted to address some of the main challenges of the region. Key areas of focus included efficient water utilization (innovative digital solutions optimizing its use were showcased), access to markets (tools and platforms that bridge the gap between producers and markets, ensuring fair pricing and wider reach), skills development (equipping farmers with the necessary skills, underlining the symbiotic relationship between digital tools and human capability) and access to weather information (with climate change posing unpredictable challenges, the need for real-time weather information was highlighted, with the presentation of tools that help farmers adapt and plan more efficiently).

29. The exchange, lively dialogues, and collaborative spirit showcased the potential to harness digital agriculture solutions as tools of progress and as catalysts to propel the region's economic growth, and more critically, as instruments to alleviate hunger and poverty. Innovative digital solutions stemming from the region offered potential templates for broader applications. The public and private sectors' participation pointed to a holistic approach to addressing agricultural challenges and the potential integrative solutions that digitalization can bring.

Examples of successful initiatives from countries of the region

1. In Jordan, the National Agricultural Research Centre (NARC) has developed applications on extension (Ma'Al Muzare3), irrigation and water management, and further tools to improve farmers' performance.
2. In Egypt, various applications have been developed, promoted, and deployed targeting small holders to improve their performance, access to market and income (ElMufeed, Mozare3, FreshSource, Efinance Agrimisr).
3. In Lebanon, a farmers' registry was developed to facilitate extension services, digital inclusion, and farm business support.
4. Research is offering promising tools, the International Center for Agricultural Research in the Dry Areas (ICARDA) shared research on successful initiatives such as the digital conservation agriculture platform, Alliance Bioversity-CIAT with the use of artificial intelligence for crop breeding and for the good application of fertilizers, IRRI with the exploration of internet of things and combination of drones with other instruments.

30. The following takeaways from the DASF 2023 will guide FAO's support to Members towards an effective digital transformation of the agriculture sector in the region:

- **Bridging Research and Practice**: Digital Agriculture serves as the crucial conduit between scientific research and its practical application, ensuring that technological advancements are sustainable and grounded in robust evidence and scientific findings, enhancing their efficacy and relevance.

- **Relevance and Intercultural Sensitivity**: Digital solutions in agriculture must be tailored to address the specific challenges faced by communities, while also being cognizant of the digital capacities and cultural dynamics in place. Implementing solutions without accounting for human capital and societal limitations can lead to inefficiencies.

  Collaborative Data Collection: Given the existing data gaps and absence of an integrated agriculture information management system, a synergistic effort between governments, the private sector, and international organizations is vital. Such collaboration will ensure the effective design and deployment of digital data collection tools tailored to region-specific needs.

- **Coordination and Resource Optimization**: A well-coordinated approach among stakeholders in the digital agriculture domain is paramount. This will prevent duplication of efforts, ensuring optimal utilization of investments and maximizing returns.
- **Investment in Digital Infrastructure and Access**: Governments should prioritize and fund the enhancement of digital infrastructure while ensuring access and affordability, recognizing its foundational role in advancing inclusive digital agriculture.
- Strengthening **Data Governance and Upholding Data Privacy**: Every digital agriculture solution must have data privacy and user protection at its core. Establishing and vigilantly monitoring both the development and implementation of national and regional guidelines and standards is essential to protect users' information and safeguard against exploitation.
- The Power of **Partnerships and Stakeholder Integration**: The full realization of digital agriculture's potential hinges on strong, cross-sector partnerships, emphasizing collaborative effort over isolated endeavours. It is imperative to engage all stakeholders in dialogue on major decisions, ensuring a comprehensive and inclusive approach to digital agriculture challenges and solutions.
- **Women's Empowerment through Digital Agriculture**: Ensuring equal access to digital tools in agriculture can help improve women's access to key agricultural support services (e.g., rural advisory and financial) and markets. Digitalization holds the potential not only to provide women with new economic opportunities, but also to build their agency and decision-making (for example, in managing their incomes and savings), thus contributing to promoting gender equality.
- **Driving the Climate Agenda**: Digital agriculture holds the potential to expedite initiatives combating climate change, offering solutions that reduce environmental impact while bolstering productivity.
- **Inclusivity in Tool and Content Design:** The focus should not merely be on who possesses a digital tool, but on the tool's relevance to the community it serves. Tools should be designed and customized with the community's unique challenges and needs in mind.
- **Capacity Development:** A multi-faceted emphasis on capacity building is essential. This includes bolstering institutional capabilities, human capital development, and the necessary ecosystem to support innovations and promote digital solutions uptake.
- **Inclusive Technological Ecosystems:** Proactive measures should be in place to cultivate ecosystems that are technologically inclusive, ensuring no individual or community is left behind.

V. Next steps by the FAO Regional Office

31. Priority actions for the FAO Regional Office for the Near East and North Africa , in partnership with relevant regional and national partners and stakeholders, include:

- update the regional implementation plan of the Science and Innovation Strategy for the 2024-25 biennium;

- identify resource mobilization opportunities and nurture effective partnerships to further promote, invest and deploy agriculture solutions and innovations for a sustainable and inclusive rural transformation;
- support Members in enhancing the digital ecosystem, capacities, human capital, and institutions towards effective and inclusive digital transformation at regional and country levels;
- support Members in the development of digital (e-agriculture) national strategies and policies, based on the FAO-ITU E-agriculture Strategy Guide[6], aiming at further promotion, investment, and deployment of digital agriculture solutions for sustainable rural transformation including early warning systems;
- strengthen rural entrepreneurs, grassroots innovations, and localized solutions (digital and non-digital), and build a community digital ecosystem in partnership with national and international organizations; and
- facilitate regional cooperation on science, innovation and digital technologies, and promote knowledge exchange through the regional innovation platform.

[6] FAO-ITU E-agriculture Strategy Guide, http://www.fao.org/3/a-i5564e.pdf