



COMMITTEE ON AGRICULTURE

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Promoting more coherent and integrated agricultural innovation systems (AIS) by strengthening national agricultural research and extension systems

Executive Summary

National agricultural research systems (NARS) and extension and advisory services (EAS) are vital to unlock the potential of agricultural innovation and to achieve the Sustainable Development Goals (SDGs). However, these systems are constantly weakened by limited investment, inadequate functional and technical capacities, institutional fragmentation and insufficient coordination among pluralistic research and extension systems. The problem is further aggravated by weak linkages between agricultural research, extension and education, and by a lack of engagement of agricultural producers, their organizations, and policy- and decision-making authorities in the development and sharing of knowledge and innovation. Failure to promote coherent and integrated approaches to NARS and EAS, and make them more relevant to address emerging issues in a changing institutional landscape, may result in the continued stagnation of innovation and obstruct the scaling up of innovative solutions to achieve the SDGs.

Strengthening NARS for agricultural research for development (AR4D) and EAS for improved access to innovations by smallholder producers requires a more coherent and integrated agricultural innovation system (AIS) approach (also referred to as agricultural knowledge and innovation systems or AKIS) to promote efficient, inclusive, resilient and sustainable agrifood systems.

Efforts to strengthen NARS and EAS should start with updating policies and strategies taking into consideration needs for capacity development, institutional coordination, digitalization, infrastructure development, knowledge management, monitoring and learning at national, regional and global levels. Reorienting NARS and EAS can involve shifting their paradigm from a focus on agricultural production to a broader set of services covering value addition, market linkages, nutrition, and addressing global challenges such as climate change. The new paradigm could include a change in services from the transfer of technologies to the promotion of co-creation and learning, increasing capacities to innovate, and improving access to innovation and information. The efforts in promoting this new paradigm is closely aligned to the scope, guiding principles and outcomes of the FAO Science and Innovation Strategy and work of the Office of Innovation.

Suggested action by the Committee

The Committee is invited to:

- a) *encourage* Members to review and assess NARS and EAS and update relevant policies, plans and strategies to promote more coherent and integrated AIS, and increase investments in research and extension;
- b) *encourage* Members to participate in global and regional initiatives to review and assess NARS and EAS, strengthen their functional capacities to promote the co-creation of innovation for resilient and sustainable agrifood systems; and
- c) *provide* guidance for the development and promotion of multistakeholder coordination mechanisms, including research and innovation platforms and hubs subject to available resources, with the participation of AIS actors at local, national and regional levels to improve the exchange of knowledge, capacity development, co-learning and partnerships.

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I. Introduction

1. National agricultural research systems (NARS) and extension and advisory services (EAS) play a pivotal role in the co-creation of innovation and in making them available and accessible to smallholder farmers.¹ NARS and EAS are central to develop and promote innovation and technology, two of the four accelerators in FAO Strategic Framework 2022-31 that speed up progress and maximize efforts in meeting the SDGs. However, these institutions are severely constrained due to: chronic underinvestment; significant gaps in technical and functional capacities; institutional fragmentation; weak coordination across agricultural sectors and their institutions; the lack of enabling policies to promote demand-driven research and extension; and the absence of incentives for scaling-up of innovations.

2. The gaps between research and extension and the demands of farmers and their organizations have widened due to the development of a complex institutional landscape and the multiple challenges faced by the smallholders and family farmers. The situation leaves more than 75 percent of them with inadequate access to innovation, extension and advisory services. FAO is systematically responding to the recommendations of the 27th Session of the Committee on Agriculture (COAG)² to address this huge gap and to enable smallholders and family farmers to access and participate in appropriate innovation, information and advisory services for sustainable agrifood systems.

3. Investments in agricultural research and EAS are inadequate, especially in low- and lower-middle-income countries. For example, the agricultural research intensity for all countries worldwide was 0.72 percent, meaning that for every 100 dollars of agricultural GDP, only 72 cents is spent on agricultural research and development (R&D). For low-income countries it is even less at 0.34 percent.³ The share of global public sector agricultural research spending by low-income countries is a dismal 2 percent. Recent data indicate that the share of food and agricultural R&D in the total global R&D spending has declined from 8 to 5 percent from 1981 to 2015.⁴

4. However, evidence from studies consistently shows that investments in agricultural research for development (AR4D) have very high rates of return.⁵ NARS and EAS are diverse; they include public, private and non-governmental organizations that invest in and contribute to the co-design and sharing of innovation. However, lack of coordination, weak linkages between them and the lack of engagement of producers, their organizations and policy- and decision-making authorities reduce effectiveness of demand-driven research and extension. Therefore, research and extension services must be inclusive and responsive to the needs of all agrifood system actors, including women, youth and other vulnerable groups.

5. The scalability and sustainability of innovation and research results depend on the capacity of NARS and EAS to support multistakeholder engagement processes and enable policy environments. Therefore, the capacities of these systems must be enhanced, giving them a clear mandate for AR4D and EAS. Promoting more coherent and integrated agricultural innovation systems (AIS)⁶ that combine both research and extension as main pillars allows the necessary paradigm shifts to address existing gaps and weaknesses related to research–extension–producer–consumer linkages. Strong and well-connected NARS and EAS are vital to improve capacities for co-design and ensure better access

¹ FAO. 2020. Transforming agricultural research and extension systems. Unlocking the potential of agricultural innovation to achieve the sustainable development goals, Rome.

<https://www.fao.org/3/ca8737en/CA8737EN.pdf>

² Report of the 27th Session of the Committee on Agriculture. <https://www.fao.org/3/ne021en/ne021en.pdf>

³ Beintema, N., Nin Pratt, A. & Stads, G.J. 2020. ASTI global update 2020. International Food Policy Research Institute, Washington DC, USA. <https://www.asti.cgiar.org/publications/global-update-2020>

⁴ Alston, J.M., Pardey, P.G. & Rao, X. 2020. The payoff to investing in CGIAR research. SoAR Foundation. <https://www.instepp.umn.edu/products/payoff-investing-cgiar-research>

⁵ SPIA. 2019. Impact of CGIAR's Agricultural Research for Development: Findings and Lessons from the Strengthening Impact Assessment in CGIAR (SIAC) Program. Rome: Standing Panel on Impact Assessment. https://cas.cgiar.org/sites/default/files/pdf/results_synthesis-siac_0.pdf

⁶ AIS are networks of actors (individuals, organizations and enterprises) that bring existing or new products, processes, and forms of organization into social and economic use, together with supporting institutions and policies in agriculture and related sectors.

to innovation by smallholders and family farmers in order to accelerate progress and maximize our efforts in meeting the SDGs.

II. Paradigm shift from linear models of agricultural research and extension and advisory services to participatory approaches

6. The traditional approach to agricultural research by NARS emphasized developing new technologies or products mainly through on-station research; these were then supposed to reach farmers via the public extension system. This approach fails to consider innovation as the product of social processes that include interactions outside of the formal research system. After the recognition of the weaknesses in this linear approach to technology development in NARS and dissemination by EAS, several participatory approaches were promoted with the aim to enhance coherence and integration by engaging multiple stakeholders.

7. The participatory approaches to AR4D and EAS (e.g., farming systems research, rapid appraisal of agricultural knowledge systems, participatory technology development, experiential learning, participatory innovation development, etc.) promote a paradigm shift from the linear model to the AIS model, which involves multiple sources of innovation. In the AIS model, agricultural innovation takes place in a dynamic environment that involves researchers, extension and education providers, agricultural businesses and enterprises, farmers and bridging institutions that facilitate and promote innovation processes. Within the AIS model, the importance of integrated agricultural research for development (IAR4D) was recognized. IAR4D emphasizes multisectoral and multidisciplinary research with an agrifood systems perspective.

8. The AIS model is used to bring different actors together to facilitate collaboration and promote collective efforts to bring change at various levels. The AIS model embraces a systems approach to research and extension, and emphasizes fit-for-purpose solutions, considering current and expected skills and capabilities. Efforts to promote more coherent and integrated AIS by strengthening NARS and EAS with a multistakeholder approach should take into consideration needs for functional capacity development, institutional coordination, digitalization, knowledge management, performance tracking and strengthening of evidence-based policies at national levels.

III. FAO's work in agricultural innovation systems

9. FAO is supporting its Members in their efforts to strengthen the capacities of national AIS by facilitating the development of enabling policies, building organizational capacities (both technical and functional) and reinforcing innovation processes through multi-stakeholder mechanisms, including innovation partnerships, platforms and hubs, policy dialogues, etc. FAO provides support to ensure that policies are conducive to improving effectiveness of innovation processes at all levels by putting in place mechanisms for bottom-up policy processes. FAO's comparative advantage lies in its capacity to bring together multiple stakeholders, including national researchers, EAS providers, global and regional research and extension organizations, academic and research consortia.

10. FAO hosts the Secretariat of the Tropical Agriculture Platform (TAP), a multistakeholder facilitation mechanism comprising 52 global, regional and national partners involved in agricultural research, education and extension, as well as international technical, development and funding agencies. The TAP, launched as a G20 initiative in 2012, contributes to: (i) developing innovation capacities in three dimensions: the policy/enabling environment, the organizational level and the individual level; (ii) strengthening relevant technical and soft skills of research, extension and education actors; and (iii) improving the exchange of knowledge and information to enhance linkages for joint learning.

11. FAO, together with TAP partners, developed a Common Framework on Capacity Development for AIS⁷, which was put into practice through the Capacity Development for AIS (CDAIS) project funded by the European Union, and was implemented (2015-2019) by FAO and Agrinatura in eight countries (Angola, Bangladesh, Burkina Faso, Ethiopia, Guatemala, Honduras, the

⁷ <https://tapipedia.org/framework>

Lao People's Democratic Republic and Rwanda). The experiences of the CDAIS project are being scaled up at country and regional levels through a follow-up project entitled Developing Capacities in Agricultural Innovation Systems: Scaling Up the Tropical Agriculture Platform Framework (TAP-AIS). This project, funded by the European Union, is being implemented (2019-2024) in nine countries (Burkina Faso, Cambodia, Colombia, Eritrea, the Lao People's Democratic Republic, Malawi, Pakistan, Rwanda and Senegal).

12. FAO has developed a methodology for the assessment of AIS that considers the pluralism of service providers, new functions and system-level capacities for agricultural innovation.⁸ The objectives of an assessment of AIS are threefold: (1) to take stock of, and characterize, the current status of AIS and provide insights into factors that enable, foster and promote innovation; (2) identify critical gaps, needs, opportunities, good practices, etc.; (3) and support evidence-based capacity development and policy processes to strengthen AIS. The AIS assessment methodology is applied in nine countries through the TAP-AIS project, while an EAS assessment methodology has also been applied in nine additional countries (Azerbaijan, Ecuador, Kyrgyzstan, Liberia, Madagascar, Tajikistan, Tunisia, Uganda, Ukraine and Uzbekistan). For introduction of new digital tools and approaches, FAO, together with the Centre for Agriculture and Bioscience International (CABI), conducted a study on needs for capacity development for EAS in sub-Saharan Africa.⁹

13. FAO is providing support to its Members to strengthen their capacity to innovate using the AIS approach, and put in place multistakeholder mechanisms and platforms that support the scaling-up of innovation. A training manual on AIS assessment was developed to provide guidance to trainers at national level. FAO has developed practical tools for monitoring, evaluation and learning (MEL), such as an outcome mapping factsheet and a MEL system guide. FAO has established commodity-based innovation partnerships and has trained innovation facilitators to bring together different actors of the value chain and foster collaboration. At national level, capacity development is focused on organizational development and collaboration, using various mechanisms such as multistakeholder innovation platforms, hubs, dialogue processes, intersectoral working groups, innovation fairs and communities of practices.

14. FAO has developed an indicator framework for the assessment of AIS and EAS based on the outcomes of an expert workshop held at the FAO headquarters in Rome in 2019.¹⁰ The framework has a flexible design and consists of three complementary modules (core, optional and contextual). The flexible format allows adjustments to measure the performance and impact of micro or local AIS and programmes. The framework is being validated through the TAP-AIS project to support informed decision-making and evidence-based investment, policies and programmes.

15. Based on the recommendations of the International Symposium on Agricultural Innovation for Family Farmers – Unlocking the Potential of Agricultural Innovation to Achieve the SDGs¹¹, held at the FAO headquarters in Rome in November 2018, FAO has prepared a paper that reviews existing system approaches and guidelines to reinforce integrated policies and investments to strengthen AIS. In addition, a guide on policy-making for inclusive EAS was prepared to support transformative changes in EAS at the pluralistic system level, within the scope of AIS.¹²

16. FAO is supporting multi-actor agricultural innovation platforms to promote the co-creation of innovation and knowledge and the sharing of good practices. For example, the multi-actor innovation platform for development of sustainable and inclusive local food systems in Azerbaijan involves rural

⁸ Assessment of Agricultural Innovation Systems (AIS) A contribution to developing STI roadmaps for SDGs. <https://www.fao.org/3/cb4566en/cb4566en.pdf>

⁹ A policy brief on empowering smallholder farmers to access digital agricultural EAS is available at www.fao.org/publications/card/en/c/CB5944EN.

¹⁰ FAO. 2021. Assessment metrics for agricultural innovation systems (AIS) and extension and advisory services (EAS). Technical workshop report. <http://www.fao.org/3/cb7913en/cb7913en.pdf>

¹¹ FAO. 2019. Proceedings of the international symposium on agricultural innovation for family farmers, Rome. <https://www.fao.org/3/ca4781en/CA4781EN.pdf>

¹² A brief providing policy recommendations to reform and strengthen EAS systems for smallholders is available at www.fao.org/3/cb7908en/cb7908en.pdf.

communities in co-innovation. Meanwhile, the science and technology backyards (STB)¹³ model piloted in Malawi brings together agricultural education institutions, agricultural research systems, extension and advisory service providers and farmer groups to address local problems through innovation. Research and innovation platforms on sustainable date palm production systems, set up together with the Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA), allow for the sharing of innovations, technologies and experiences among FAO Members.

IV. Towards more coherent and integrated agricultural innovation systems

17. The redesigning of NARS and EAS to accommodate current and future needs should encompass strong system linkages, integrated institutional arrangements, renewed research and extension policies, strategies and programmes, reformulated organizational mandates, strengthened financing mechanisms, new business models and capacity development (functional and technical) to enhance collaboration and coordination among agricultural education, research and extension.

18. Efforts to redesign agricultural research and extension systems should capitalize on the pluralism of NARS and EAS and promote AIS. The AIS approach should facilitate the shifting of the paradigm and the widening of the scope of NARS and EAS from a focus on agricultural production to a broader set of solutions and services covering income generation, value addition, market linkages, nutrition, climate resilience, poverty alleviation and improved well-being of small-scale producers. More coherent and integrated AIS should broaden the scope and engage diverse actors, women and men from different age groups, different sectors and types of organisations, to ensure inclusiveness and equitable access to innovations. The integrated AIS should ensure that NARS and EAS are responsive to local needs, developing integrated solutions focusing on local innovations.

19. Assessment of AIS and scaling capacity development are the critical first step to advance development of coherent and integrated AIS. FAO is providing support to the Members to enhance the linkages between research, extension and producers through innovations to achieve greater coherency and connectivity of mission and goals and to promote regular and constructive exchange and collaboration.¹⁴ FAO has developed diagnostic tools and methodologies to assess the status of AIS and their performance. As part of the support, EAS assessments have been carried out in over 60 countries in the past two years, and FAO will continue to expand this assessment jointly with national institutions to identify the capacity needs and implement capacity development programmes.

20. Rethinking NARS and EAS will not be possible without reorienting research and extension policies and increasing investments based on evidence and demands. Digital augmentation, strong bridging institutions, relevant policies, targeted investments and the use of innovative incentives and funding mechanisms are integral parts of the process. FAO's indicators framework for AIS and EAS helps increase transparency, target policy and investment efforts, and reduce the risks in the performance of AIS. In addition, FAO is developing a methodology for a global foresight analysis of EAS based on the wealth of knowledge from these assessments as well as on vast knowledge on global and regional trends and country specificities. Expanding this analysis to AIS can provide additional insights and lead to a more coherent and integrated AIS.

21. FAO's technical support focuses on developing common frameworks for capacity development, guidelines, training resources, and indicator frameworks, to promote mechanisms to engage multiple stakeholders in the co-creation of innovation and knowledge, and to make these accessible to multiple agrifood system actors through NARS and pluralistic EAS. These areas of technical support will help to promote more coherent and integrated AIS consistent with the priorities of the current draft FAO Science and Innovation strategy. Any progress on these fronts requires the support of the Members to promote comprehensive AIS assessments, develop enabling policies and investment systems, and create multistakeholder institutional mechanisms to address the growing

¹³ FAO. 2021. An innovation in agricultural science and technology extension system – case study on science and technology backyard, FAO, Rome: <https://www.fao.org/3/cb2939en/cb2939en.pdf>

¹⁴ Enhancing linkages between extension, research and producers through innovations; <https://www.fao.org/3/cb2110en/CB2110EN.pdf>

demands of agrifood system actors for integrated solutions and access for smallholders and family farmers.