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# FAO REGIONAL CONFERENCE FOR LATIN AMERICA AND THE CARIBBEAN

## Thirty-sixth Session

Managua, Nicaragua, 27-29 April 2020

## Innovation and Digital Agriculture

### Executive Summary

The global food system continues to face considerable challenges in being able to provide enough food of adequate quality to feed an ever-growing population. The world is also changing at a fast pace with the emergence of an array of technologies. Digital technologies and other forms of innovation offer unique opportunities for improving food systems and rural societies, and in helping to achieve the Sustainable Development Goals. This document highlights key strategic areas of work of FAO aimed at promoting innovation in the region, to improve: (a) food, nutrition and health; (b) climate resilience; (c) agroecosystems and landscape management; and (d) productivity of farm and non-farm employment. The proposed International Digital Council for Food and Agriculture<sup>1</sup> is a centrepiece of FAO's strategy on innovation.

### Suggested action by the Regional Conference

The Regional Conference is invited to:

- Welcome the commitment of FAO to contribute to strengthening national strategies and systems for agrifood innovation, as well as the emphasis on digital innovation;
- Emphasize the importance of institutional change to scale up the use of digital tools in food systems, agriculture and rural development, in particular among small and medium-sized

<sup>1</sup> FAO, 2020. Realizing the potential of digitalization to improve the agrifood system, proposing a new International Digital Council for Food and Agriculture, a Concept Note. Rome.

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family farmers and poor and vulnerable rural communities, harnessing their potential for inclusive and sustainable development;

- Taking note of the Global Forum for Food and Agriculture (GFFA)- approved concept note proposing an International Digital Council for Food and Agriculture at FAO, assess the potential value and share suggestions for establishing an inclusive, multi-stakeholder forum to engage governments, the private sector, farmer organizations, research institutions and international organizations to exchange ideas on how to maximize the potential of digital technology to improve agri-food systems, and identify and suggest measures to address shared concerns.
- Request that FAO support member countries in the region in training, institutional reform, governance, monitoring and evaluation, impact assessment and related activities to improve the effectiveness, efficiency and inclusiveness of public agricultural innovation systems and investments.

*Please send any questions about this document to:*

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## I. Introduction

1. Rural societies, agriculture and food systems in Latin America and the Caribbean – despite their heterogeneity – face a combination of unprecedented challenges<sup>2</sup>. None of these challenges can be met without fostering and embracing innovation. Technological and institutional change should, therefore, be high on the agenda of policy-makers, civil society, the private and public sector, and national, regional and international organizations, including FAO. Current evidence shows that there is a critical need to strengthen agricultural research, and technology and innovation systems (including digital innovation) at the national and regional levels. It is particularly important to perform a comprehensive review and update of **innovation policies for agriculture and food systems** in the region.<sup>3</sup>

## II. Strengthening innovation to transform rural areas in Latin America and the Caribbean

2. It is a priority of FAO to support national and regional efforts to promote research, technology and innovation in agriculture, food systems, and rural development, in order to achieve impacts on a large scale. Of particular importance is the identification of new public-private research associations and partnerships, new funding mechanisms and research, technology and innovation policies that promote new investments. FAO proposes to take a fresh look at a broader set of **food and agriculture innovation priorities** in the context of sustainable food systems and rural development, focusing not only on short-term production challenges but also on longer-term natural resource management, value chains, nutrition, bioenergy and biomass, and inclusive rural prosperity.

3. There is broad agreement in the global food and agricultural research community on several common **research challenges** such as increasing nutrient use efficiency in crop production systems, reducing soil loss and degradation, utilizing genetic diversity for crop improvement, improving water use in agriculture, developing precision crop and livestock production systems, facilitating the early detection of plant and animal diseases and of foodborne pathogens, and reducing food loss and waste throughout the supply chain. On the food consumption side, research agendas include investigation into the relationship between highly processed products, malnutrition and non-communicable diseases; determinants of changes in food consumption patterns; innovative policies to facilitate physical and economic access to healthy diets, a healthier food environment or changes in consumer behaviour. Research also includes linkages with economic inclusion, rural development and social policies that combat rural poverty, hunger and malnutrition. Such challenges become even more relevant taking into account major global trends such as changing consumer needs, climate change and declining public funding for agricultural research.

4. Four major goals can be identified for the transformation of food systems: (1) improving the **efficiency** of food and agricultural systems; (2) increasing the **sustainability** of agriculture; (3) increasing the **resilience** of communities, agriculture and ecosystems to adapt to climate change and extreme events; and (4) increasing **social inclusion**, contributing to opportunities for employment and income generation from different sources in the food systems. The region offers a great opportunity to seek innovative, tangible and large-scale results on all those fronts, particularly if it continues being the largest net food exporting region (a challenge for increasing productivity and resiliency), as well as maintaining its significant role as a provider of global environmental services

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<sup>2</sup> The challenges presented for discussion in this Regional Conference are summarized in documents: LARC/20/2, LARC/20/3, LARC/20/4, LARC/20/INF/11, LARC/20/INF/16 and LARC/20/INF/17.

<sup>3</sup> The **innovation systems** concept stresses that innovation is neither research nor science and technology, but rather the application of knowledge (of all types) to achieve desired social and/or economic outcomes. According to FAO (2018) **agricultural innovation** is the process whereby individuals or organizations bring new or existing products, processes or ways of organization into use for the first time in a specific context in order to increase effectiveness, competitiveness, resilience to shocks or environmental sustainability and thereby contribute to food security and nutrition, economic development or sustainable natural resource management.

such as biodiversity, water, soils, forests and other ecosystem services (a challenge for achieving sustainability).

5. The necessary transformation of food systems in the region offers an opportunity to focus on inclusiveness, taking into consideration the vast inequalities in income and access to technology across rural and urban areas, in agriculture and in food systems. Furthermore, the very serious overweight and obesity epidemic (combined with persistent hunger) as well as the mixed agricultural research and innovation capacity at national levels, add even more pressure to the need to promptly develop a **regional high-impact, large-scale food and agricultural innovation roadmap**.

6. One of the most promising aspects to increase productivity is **the digital connection between biotechnology, information and communications technologies (ICTs)**. This growing digital agricultural innovation field includes the development of highly sensitive, field-deployable sensors and biosensors for rapid detection and monitoring; the integration of data sciences (open data and big data), artificial intelligence, software tools for automation and remote sensing, and systems models to enable advanced analytics for managing food and agricultural systems (including microbiome science). It also includes the ability to carry out routine gene editing of agriculturally important organisms to allow for rapid improvement of traits important for productivity and quality.<sup>4</sup>

7. In addition to the very significant developments in life sciences, a key component of an agricultural innovation agenda is **digital technologies** – such as ICTs, data science and artificial intelligence – that have a major potential role in improving agriculture, food systems and livelihoods. Given the very fluid interaction between rural and urban areas, these frontier technologies could even help narrow rural-urban gaps. There are many digital agriculture tools and applications, mainly developed for commercial agriculture but with a huge potential for use within small-scale family farming in developing countries. FAO has recently summarized some of the on-going and forthcoming applications.<sup>5</sup>

8. This fast-growing digital revolution offers risks and opportunities. On the one hand, it could further aggravate inequalities among small-scale family farms and large-scale and capital-intensive corporate farms. It could also exacerbate the digital gaps between urban and rural areas. Furthermore, there are important differences between countries. For example, the ICT Development Index (IDI), comparing developed countries and the average for Latin American countries, shows important differences in access (7.52 points out of a 10.0 maximum for developed countries compared to the 5.21 points reached by Latin American countries). ICT-related technology companies in the agricultural sector are strongly concentrated. For example, Brazil had 51 percent of all the ventures surveyed and Argentina had 23 percent of the regional total. Chile, Colombia, Uruguay, Peru and Mexico follow in order of importance.<sup>6</sup>

9. On the other hand, digital technologies could provide much needed management practices and access to markets as well as attracting a new generation of small-scale young entrepreneurs to rural

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<sup>4</sup> National Academies of Science. 2019. *Science Breakthroughs to Advance Food and Agricultural Research by 2030*. Washington DC, USA.

<sup>5</sup> They include technologies that are applied at farm level and can be grouped under “precision agriculture” and include satellite imagery, remote sensing, Internet of things (IOT), drones, artificial intelligence, cloud, digital networks, Global Positioning System (GPS), and yield monitoring. Precision livestock technologies include radio frequency ID (RFID), livestock-applied sensors (ear/tail tags and similar), automatic milking, feeding and monitoring systems. Robotics and associated technologies include agricultural robots, auto-steering equipment, variable rate technology and on-board computers. Distributed ledger technologies (DLT) refer mainly to blockchain. FinTech (financial digital technologies) refers to the use of digital technologies in the rural finance sector. E-commerce and digital marketplace are the main digital solutions related to marketing and trade of agriculture inputs and outputs. Virtual Reality (VR) is increasingly used in agriculture training and extension. FAO. 2019. *Disruptive technologies for agriculture in Latin America and the Caribbean. Concept Note*. Investment Centre. Rome.

<sup>6</sup> International Telecommunication Union (ITU). 2019.

areas. The development of ICTs in rural areas can contribute to different sectors of rural economies. A few examples follow:<sup>7</sup>

- (a) *Research and development*: the arrival of sensors to experimental stations opens up broad research perspectives. Farms, increasingly connected, also become places of collaborative experimentation.
- (b) *Disaster risk management*: satellite imagery, drone mapping, and big data analytics can significantly contribute to a better understanding of risks related to natural disasters, food chain and socioeconomic crises. They can facilitate access to relevant information on hazards and threats so as to minimize these in a timely manner, including improved forecasting, modelling, monitoring and risk mapping in support of opportune decision-making.
- (c) *Bringing agricultural extension services closer to farmers*: providing real-time or near real-time information on weather and farm production, and timely recommendations in order to optimize resource efficiency, such as irrigation schedules, water and soil requirements. Manage pests and diseases, reduce emissions (or generate mitigation co-benefits in the case of small-scale farmers), improve access to markets, and increase climate resilience.
- (d) *Improved resource management as a result of connected objects*: the emergence of robotics together with artificial intelligence supports the farmer in the management of herds and crops, which helps with decision-making, increases precision and reduces labour intensity.
- (e) *Collaborative learning, advice and training*: data collected on a large scale at low cost can accelerate collaboration when it is feasible to share data, knowledge, and materials, while the smartphone, associated with decision support tools, also contributes to the intellectual independence of the operator. Counselling and training do not disappear, but can be virtual and relocated.
- (f) *Collaborative learning*: data collected on a large scale at low cost accelerates collaborations when it is feasible to share data, knowledge, and materials.
- (g) *Cost reduction optimizing the use of inputs* –machinery, seeds, agrochemicals– through the implementation of variable management innovation mechanisms.

10. In relation to the food value chain, market and consumption, further examples of ICT contributions are:

- (a) *Reducing food losses* using digital monitoring of the entire chain (for example, product storage conditions), implementing reverse logistics, reducing transport costs and identifying the dietary habits of the population, in different areas. In addition, it can help promote the circular economy to avoid food loss and waste.
- (b) *Reducing costs* associated with matching producers and consumers, for example through e-commerce.

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<sup>7</sup> Trigo, E. and Elverdin, P. 2019. *Los sistemas de investigación y transferencia de tecnología agropecuaria de América Latina y el Caribe en el marco de los nuevos escenarios de ciencia y tecnología. 2030 - Alimentación, agricultura y desarrollo rural en América Latina y el Caribe*. No. 19. Santiago, Chile. 18p. License: CC BY-NC-SA 3.0 IGO.

- (c) *Improving nutrition and health* through an increase in household income, gender equality, and food and nutrition security resulting from the opportunities created by technology.
- (d) *Making the food value chain more transparent* through increased transparency improves product traceability. Traceability along the value chains brings the producer closer to the consumer and facilitates exchanges as transactions become more transparent and agile, for example with the use of blockchain technology. Traceability can also result in informed consumer choice related to price, nutrition, production practices, and environmental and biodiversity impacts.

11. To effectively contribute to the 2030 Agenda for Sustainable Development commitment of leaving no one behind, digital innovations must be promoted in two dimensions. First, products and services must be geared towards fostering more inclusive growth by allowing family farmers, small and medium-scale rural entrepreneurs and other rural inhabitants to participate in, and benefit from, the growth process. Second, the access to and use of these technologies by low-income rural households requires addressing the vulnerabilities that they face in developing sustainable livelihoods.

### **III. Elements of a FAO regional agenda for innovation in food systems, agriculture, and rural development**

12. Taking into consideration the concepts briefly summarized above, and in the framework of the priority themes submitted by FAO to the 36<sup>th</sup> Session of the Regional Conference,<sup>8</sup> the following are the focus areas for FAO's work on innovation in the region:

- **Transforming food systems for healthy diets for all:** these innovations are related to sustainably increasing productivity and the development of foods of high nutritional value, as well as nutrition-sensitive agriculture and identifying and promoting highly nutritious products from the wide biodiversity of the region; identifying and supporting the implementation of policy innovations, technological strategies (e-commerce of fresh food) and business models supporting food distribution chains and supermarkets to ensure a greater supply of nutritious and healthy food to the entire population, especially the poorest and most vulnerable; identifying and exchanging experiences to improve and modernize the operation of supply centres and traditional retail stores, to facilitate access to fresh and healthy food for both urban and rural populations; and promoting information on food composition and easily accessible nutrition education.
- **Hand-in-Hand towards prosperous and inclusive rural societies:** promoting technologies in agricultural sectors and food systems (including microelectronics, data science, artificial intelligence, remote sensing and distributed ledger technologies, such as *Blockchain*) and biotechnology (including new genetic improvement tools), can lead to increased agricultural productivity, cost reduction and employment generation for the rural population. Innovative policies may also be necessary to reduce the barriers faced by the most vulnerable populations and territories in accessing these technologies. Innovations in climate smart agriculture could improve adaptation to climate change, while additional benefits flow from modern crop improvement, and enhanced livestock production and management techniques for forestry, fisheries and aquaculture. Territorial innovation laboratories could catalyse and connect territorial innovation processes to create solutions through the use of technology and sustainable management processes.

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<sup>8</sup> LARC/20/2 – Transforming food systems for healthy diets for all; LARC/20/3 – Hand-in-Hand towards prosperous and inclusive rural societies; and LARC/20/4 - Sustainable and climate resilient agriculture.

- **Sustainable and climate resilient agriculture:** the promotion of technologies and institutional innovation to allow for an efficient use of natural resources, biodiversity conservation and eco-systemic services, adaptation to climate change and disaster risk reduction. This includes, but is not limited to, land and water management for resiliency and risk management; diversification of land use, land restoration, and the sustainable management of farms and landscapes; policies for improved ecosystem services and the promotion of low emission livestock. Innovations in climate adaptation and mitigation contribute to reducing the impact of climate risks, strengthening national research organizations to deliver climate-adapted and more nutritious varieties, incorporating local knowledge and policies to promote low-emission agricultural practices and technologies, while also increasing access to climate information services, site-specific agriculture and innovative financial partnerships.
- **Institutional innovations:** these cut across the three themes mentioned above. They include strengthening capacities to develop innovative policy agendas for science in the member countries; improving biosafety, trade and market regulations; increasing national and regional public research investments and partnerships to tackle regional issues collectively; and building new long-term partnerships with international financial institutions.

#### IV. International Digital Council for Food and Agriculture

13. The need for an inclusive and multi-stakeholder forum to discuss the potential of digitalization of food was reflected in January 2019, during the GFFA, where approximately 74 ministers for agriculture from around the world requested FAO "to draw up, in consultation with stakeholders: African Development Bank (AfDB), Technical Center for Agricultural and Rural Cooperation (CTA), International Fund for Agricultural Development (IFAD), International Telecommunications Union (ITU), Organisation for Economic Co-operation and Development (OECD), World Organisation for Animal Health (OIE), World Bank (WB), World Food Programme (WFP) and World Trade Organization (WTO) a concept for considering the establishment of an International Digital Council for Food and Agriculture that will advise governments and other relevant actors, drive the exchange of ideas and experiences and consequently help everyone harness the opportunities presented by Digitalization".

14. In January 2020, FAO and other International Organizations presented the GFFA with a concept note proposing a new 'International Council for Food and Agriculture', a multi-stakeholder forum that will work closely with existing mechanisms to identify the benefits and risks of digitalization, facilitate dialogue between all stakeholders and propose measures to build trust and promote adoption of digital technologies that can help realize the objectives of the 2030 Agenda and the SDGs. The final communiqué of the GFFA stated: "We, the agriculture ministers of 71 nations, hereby thank FAO and the other International Organisations for developing a concept for the establishment of an International Digital Council for Food and Agriculture, as we requested in the 2019 GFFA Final Communiqué (<http://fao.org/digital-council>). We welcome the FAO's efforts on the concept and call upon FAO's governing bodies to support a process for its establishment."