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Policy Brief

DIGITAL TRANSFORMATION OF AGRI-FOOD SYSTEM: POLICY PATHWAYS FOR GREATER SOCIO-ECONOMIC INCLUSION, SUSTAINABILITY, AND INTERNATIONAL COOPERATION

Task Force 4

Food Security and Sustainable Agriculture

Venkatachalam Anbumozhi, (Economic Research Institute for ASEAN and East Asia)

Suresh Babu, (International Food Policy Research Institute)

Carlos Andrea Bollino, (King Abdullah Petroleum Studies and Research Centre)

Siti Mustaqimatud Diyanah, (Economic Research Institute for ASEAN and East Asia)

Vyta W. Hanifah, (National Research and Innovation Agency)

Syarif Hidayat, (National Research and Innovation Agency)

Masanori Kozono, (Economic Research Institute for ASEAN and East Asia)

Amit Kumar, (Research Information System for Developing Countries)

Agus Eko Nugroho, (National Research and Innovation Agency)

Risti Permani, (The University of Queensland)

Sahara Sahara, (IPB University)

Mat Syukur, (Ministry of Agriculture)

Irwanda W. Wardhana, (National Research and Innovation Agency)

Abstract

Digital transformation provides opportunities for agri-food systems to monitor and manage global soil, climatic and genetic resources; address pervasive information asymmetries among the stakeholders along the agri-food value chains. It serves as a foundation for a more efficient, equitable, and environmentally sustainable economic development including urban, peri-urban agriculture, and rural growth. However, challenges to maximizing the intended benefits and lowering the costs of organizing the transformations for equitable access by all stakeholders require innovative policy and strategic approaches. This brief investigates the extent to which policy pathways can accelerate the inclusive digital transformation that can also address the potential risks of the digital divide, highlighting the need for improved inter and intra-ministerial coordination and global governance architecture.

Challenges

Digital technologies- such as precision farming, sensor-based traceability system, block-chain networks, e-commerce platforms, and fintech services are rapidly transforming the agri-food systems by overcoming the long-standing costs of production, distribution, processing, marketing, and information asymmetries. In advanced economies of the G20, digital technologies are used to improve the monitoring, cataloging, and dissemination of data to ensure that agriculture and food production services are delivered with a small environmental footprint (Anbumozhi et al., 2021). This is not the case, however, with the developing countries. They tend to have different (lower) capacity and capability to access digital information and communication technologies. To address this issue requires investment in assets such as devices and software as a part of an attempt to reduce digital divide between and within countries. In the absence of such investments, digital inequality can be exacerbated by reinforcing the same spatial, social, and economic divides as in the previous agricultural revolutions.

Despite technological advancement, small farm households, women, and young entrepreneurs in many developing countries continue to face limited access to better knowledge, farm equipment, trainings, and many other constraints in adopting and implementing digital technologies. Moreover, the implementation of emerging digital technologies requires access to mobile networks and internet services. While almost two-thirds of the global population is connected to the internet, the quality, reliability, and costs of internet access differ significantly among and within countries. Implications of such unequal access to digital technology should be carefully assessed, analyzed, and addressed given their possible effect on digital poverty and inequalities, which can further contribute to the developmental gaps (Mondejar et al., 2021).

Moreover, in many G20 countries, policy coordination remains a challenge. Digital agriculture policies emanate from multiple institutions and entities and were put in place over time across different jurisdictions ranging from the executive, legislative, and banking authorities, and with varied commodity focus (Indonesian Ministry of Trade, 2021). Such policy silos create inefficiencies and high transaction costs for organizations, businesses, and individuals to operate and invest in digital technologies, hence, limiting innovations for their application in food systems (OECD, 2020).

Emerging global experiences suggest the development and ownership of digital technologies and data platforms can lead to a concentration of knowledge, power, and revenue. Such concentration on a few technology actors and first movers can perversely accelerate the digital divide within and across the countries. Further, a lack of transparency around issues such as

data ownership and privacy, for instance, contributes to farm producers' reluctance to share data (Wiseman et al., 2019).

Digital transformation to achieve sustainable development goals (SDGs) is fraught with challenges at the global level. Opportunities to harmonize digital transformation strategies that support SDGs, across the countries, and share international experiences are evident but international progress on this front remains sub-optimal. Digital information and technology services typically involve high upfront costs but nearly zero cost to replicate (World Bank, 2016). Sharing best practices and mutual learning from other countries will reduce externalities and market failures whereby significant gaps exist between public and private benefits (Anbumozhi et al., 2021).

The proliferation of bilateral and regional trade agreements and increased interconnectedness of economies through global food value chains also means that the success of the digital transformation is not only determined by domestic regulatory frameworks but also by international governance architecture (OECD, 2020). Data security, standards for digital technologies, intellectual property rights, and lack of benchmarks have increasingly become a challenge for steering digital agri-food systems to deliver the benefits of food security and sustainability. Table 1 in the appendix lists key challenge areas and outlines the pathways for improved efficiency, resilience, and sustainability.

Proposals for G20

For digital technologies to optimally enhance production efficiency, equity, and environmental sustainability in the agri-food systems, the private sector and public sectors need to work with the farming community to create a thriving digital eco-systems. Creating an enabling environment for digital transformation along the food value chains requires a variety of policy actions at territory, agriculture sector, cross-sectoral and global levels to be put in place. Strategic public policy interventions and investments recommended for G20 are listed below:

RECOMMENDATION 1
THE G20 SHOULD DEVELOP AN ACTION PLAN FOR SUSTAINABLE, INCLUSIVE, AND EQUITABLE DIGITAL TRANSFORMATION OF AGRICULTURE, WHICH WOULD LEAD TO PUTTING IN PLACE A TIERED APPROACH

G20 should develop a concrete and concerted strategy to encourage its members to invest more in digital infrastructure and help other countries do the same with the aim of bridging the divide in access to digital technologies. Such a strategy will help initiate and strengthen institutional mechanisms across countries and regions to ensure that the digital transformation of the agricultural sector leads to an inclusive, sustainable, and equitable ecosystem while at the same time leveraging digital technologies for greater productivity, efficiency, and safety. Following the strategy, the G20 should develop an action plan for sustainable, inclusive, and equitable digital transformation of agriculture, which would lead to developing mutually agreed institutional mechanisms and protocols. This would be an *Action Plan for* Sustainable, Inclusive, and Equitable Digital Transformation of Agriculture, that aims to create a tiered institutional approach as shown in Figure 1 of the appendix by following a multi-stakeholder approach to steer through the development, adoption, and diffusion of the digital technologies. Such an Action Plan would comprise the Tier 1, Tier 2, and Tier 3 enablers, and modalities required to implement the Plan such as capacity building programs, skill development, funding, and international and regional cooperation. It could also leverage innovative public-private-community partnership models and microfinance solutions to support small farmers as well as Micro Small and Medium-Sized Enterprises.

The role of digital technologies within the agricultural sector has been gaining traction, more so, in the form of Digital Agriculture and Precision Agriculture. As recognized well in the previous

G20 declarations, digital technologies can help make food systems more efficient with potential benefits including increased productivity, increased cost-efficacy, and greater access to market opportunities, by leveraging them in both upstream and downstream activities appropriately within the food value chains, such as trade and commerce. In these activities, digital technologies like fintech, e-commerce and blockchain, have already been used, but mostly by those who could have the skills and resources to acquire and adopt them. Therefore, in addition to efficiency and cost-effectiveness, it is important to develop an institutional mechanism to make the transformation inclusive, sustainable, and equitable as well. A policy response mechanism at the national level within G20 should be structured along the pathways of ensuring the enabling environment for digital transformation to maximize the production efficiency gains and influencing the incentives and decisions of other key stakeholders including the private sector with the goal of maximizing equity and sustainability.

Given the inherent challenges within the developing countries such as having deficient technological and digital infrastructure, inadequate access to internet and electricity, poor digital literacy, and fragmented informal value chains, the task of enabling sustainable, inclusive, and equitable digital transformation in the agricultural sector is not going to be easy. Additionally, digital transformations would entail high upfront and operating costs in addition to the well-established digital physical infrastructure. Lack of regulation and governance mechanisms within the developing countries around digital technologies such as blockchain and fintech as well as interoperability, data protection, privacy, and usage issues, act as additional challenges for the developing countries.

Finally, as part of developing an institutional mechanism as part of the Action Plan, G20 should support the setting up of a Digital Agriculture Dashboard, which would map the state of digital readiness within the agricultural sector and among the various stakeholders, such as farmers (big as well as small/marginal farmers), enterprises (large as well as Micro, Small and Medium Sized Enterprises), extension service providers, regulators, and consumers. Such a mapping exercise would gather data including that on the Agriculture Digitalization Index (both Tier 1 and Tier 2 Enablers) (as prescribed by Schroeder et al., 2021) as well as data on the digitalization of Agri-Food Value Chain across the countries, enterprises, and farmers. Such a Dashboard would greatly help in assessing the gaps, barriers, and challenges, thus leading to the shaping of an inclusive, sustainable, and equitable digital transformation of the agricultural sector. In addition to the proposed Digital Agriculture Dashboard, an interactive platform comprising of representatives from agriculture, Science and Technology (technology providers), finance (digital payment gateways), trade and commerce (e-commerce), from across the national, regional as well as multilateral forums, can be set-up for providing continuous technical, financial, and regulatory assistance and guidance to the stakeholders. Such a tiered approach would help the G20 in setting-up a concerted strategy to encourage its members to invest more

in digital infrastructure and help other countries do the same to bridge the divide in access to digital technologies.

RECOMMENDATION 2

G20 SUPPORTS NATIONAL AND INSTITUTIONAL CAPACITY BUILDING THAT ENABLES FARMERS, PARTICULARLY WOMEN AND YOUTH TO APPLY DIGITAL TECHNOLOGY TO ENHANCE PRODUCTIVITY, INCLUSIVITY, AND SUSTAINABILITY

Building national capacity to develop national policies and strategies on digital technology for the transformation of the agri-food systems is primarily the responsibility of country governments. However, G20 should support and give a priority for the development of such capacity building by, among other things, helping to identify digital capacity building programs necessary for the transformation of agri-food systems. Developing technological and human capacity of national ministries of agriculture, for example, influences the extent of change they can bring to foster the digital transformation of the farming community. Having the right skills and capacities is pivotal to designing digital transformation strategies and effectively implementing them for enhancement of productivity, inclusivity, and sustainability.

Following capacity strengthening of digital technology policy and strategy, G20 should support the development of strategic approaches to institutional capacity building to improve the role and function of agricultural research, extension, and cooperative organizations in digital technology transformation. For example, organizing and institutionalizing human resources' activities through production and service cooperatives are appropriate solutions for agricultural and social development (Zhang et al., 2020). Literature underlines the positive roles of agricultural cooperatives in sustainable rural employment (Feisali & Niknami, 2021), linking smallholder farmers with markets and mobilizing local resources through collective participation (Brandão & Breitenbach, 2019); exhibiting greater levels of cooperation amongst cooperative members (Tremblay et al., 2019); leveraging collective management of the agricultural region and establishing horizontal coordination to influence and control other stakeholders (Hannachi et al., 2020).

In the digital transformation era, building better farmer institutional capacity is a necessary effort to bring agricultural digitalization into food production systems, especially for smallholders. Digital agriculture is portrayed as having the potential: to enhance the productive capacity in cost- and labor-efficient ways (Lioutas et al., 2021); to be more consistent, time and resources efficient, and easier to share information (United Nations, 2017).

The application of digital agriculture promises to unlock productivity by overcoming asymmetric information, to reduce market inefficiencies and risks through information-based knowledge, extension services, and innovation in supply chain management (Kieti et al., 2022). Furthermore,

digital technologies in agriculture create greater transparency to enhance competitiveness, to increase production capacity, and to improve farmers' "negotiation power in global value chains" (Kos & Kloppenburg, 2019). Specifically, the application of proper Information and Communication Technologies (IICT) for digital agriculture could overcome the digital divide in targeted smallholder farmers by providing accessible and usable applications adjusted to their needs (Herdon, et al, 2015).

Nevertheless, agricultural digitalization is also argued to have externalities in technological costs and risks (Lioutas et al., 2021). To suit changing environmental conditions, an organization can make some adjustments based on potential changes and learning pathways to cope with negative externalities of digitalization. Therefore, an institutional capacity building program is necessary because it would provide an adaptive learning process (Charatsari et al., 2020) and an opportunity for smallholders to get collective access to digital technologies. The program will improve top managers' and smallholders' capacity to tap into digital innovations. Smallholders' involvement will lead to valuable social learning and capacity building (Ingram et al., 2022).

Having a strong digital capacity as part of the output from institutional capacity building enables, firstly, reduction of the digital divide for smallholders. Most smallholders could afford to buy the devices; however, they experience a lack of digital operational skills, limited technological infrastructure, low discoverability of digital ecosystems, and underutilization due to data privacy (Kieti et al., 2022). Hence, modernizing the extension service or advisory and technical support from the public and private sectors is crucial for digital skills enhancement among smallholders. This could be presented, for instance, as e-government in providing more accessible public information, e.g., weather updates, digital financial literacy, digital technology literacy, etc. To support this, G20 could facilitate a forum for sharing knowledge and best practices among members on the application of digital technology in agriculture.

Secondly, a strong digital capacity of farmer organizations enables smallholders' risk profiling to minimize the operating costs and risks of financial technology. This would provide inclusiveness to get an access to financial sources digitally so that smallholders could have greater sources of capital for modernizing agricultural inputs to increase farm production (Blekking et al., 2021; Syukur, 2020). To obtain know-how in accessing digital financial technology, there is a need to enhance smallholders' attitude toward the use of ICTs through modern extension services in providing digital literacy and technical assistances. Low level of engagement in ICTs is argued to be a reason for the existing of digital divide, peculiarly in rural areas (Bowen & Morris, 2019). G20 could facilitate the exchange of capacity building program among member countries, targeted not only for farmers' organization but also for the government that will provide the facilitation of modern extension services.

Lastly, institutional capacity building for farmer organizations should involve women and youth participation, particularly in high value markets (Ola & Menapace, 2020). The Covid-19 pandemic has induced uptake of digital technologies bringing numerous chances for added value of agricultural digitalization. The benefits of digital technology can motivate and attract women and youth to contribute by maximising the farm's productivity and enhancing product quality (Abbasi et al., 2022). It would facilitate the tailoring policy instruments to a specific agricultural problem, such as concerning women and youth, which then will increase efficiency and effectiveness of agricultural policy by Ministry of Agriculture (Ehlers et al., 2021). Moreover, this solution corresponds with the Broadband Commission's policy recommendation to incorporate gender in national broadband plans and strategies and to advance gender equality in the implementation (https://www.broadbandcommission.org/recommendations/). The role of G20 in the focus solution on women and youth could be to facilitate mentoring for bilateral cooperation to support the inclusion of digital agriculture among members. For instance, G20 could initiate building professional networks with two types of countries: the one that has better experiences in engaging women and youth to apply digitalisation in agricultural sector; and the one that is lagging behind.

Above all, the main role of G20 in addressing digital divide should involve preventing the big data divide in digital agriculture by promoting the free flow of data in the country level (https://www.broadbandcommission.org/recommendations/). Experience from Canadian government to incentivize digitization for many actors of food systems including corporate entities and farmers to rebalance power of using innovation (Bronson and Knezevic, 2019) could provide a good insight for G20 members.

RECOMMENDATION 3

G20 SHOULD ADOPT A DATA-SUSTAINABILITY-INNOVATION NEXUS APPROACH TO ADDRESS CROSS-SECTORAL ISSUES TO ADVANCE DIGITAL TRANSFORMATION OF AGRI-FOOD SYSTEMS

G20 has a role to play in developing framework that enables data sharing across sectors to address food security and nutrition issues as well as developing climate resilient food and agricultural systems. Such a framework should be able to bring all actors and players in the digital technology world, including the private sector who should be incentivized to allow using their data for public policy and research, while respecting data privacy concerns.

Data are the fuel that drives the digital transformation. Developers of digital innovations in agri-food systems are dependent on access to high quality data and internet networks to maximize sustainability gains. The G20 countries should consider "the data-sustainability-innovation nexus" to prioritise and act on cross-sectoral policy themes and mobilise public investment and

resources towards improving digital agriculture. This recommendation is proposed by taking into account lessons from approaches to sustainable development goals (Boas et al., 2016) and water, food, and energy issues (Biggs et al., 2015; Faeth and Hanson, 2016) in tackling cross-sectoral challenges. The nexus approach provides an impetus to raise awareness of the message that policy domains related to agricultural digital transformation are intertwined. Digital agriculture interventions are not panacea and need to be supported by investments in other sectors such as infrastructure, telecommunication, energy, etc. The nexus approach presents economies of scale and scope, hence benefitting policymakers from lower transaction costs.

The proposed nexus focuses on three areas, i.e., data, sustainability, and innovation which were derived from a review of policy discourse and the literature. Previous studies highlight connectivity, transparency, and data governance (Ehlers et al., 2021; Fielke et al., 2020; Weersink et al., 2018); sustainable development, financial inclusion, climate change, and the environment (Lindblom et al., 2017; Mondejar et al., 2021; Weersink et al., 2018) as key themes in digital agriculture. Meanwhile, the G20 Agriculture Ministers' Meeting communique in 2021 underlined "the importance of digital transformation in agriculture, fostering innovation while protecting data privacy, data security and the intellectual property rights and investment in research and development (R&D) and knowledge transfer to farmers" highlighting other areas of concerns.

The nexus, therefore, represents three policy themes, namely: i) data governance (including issues such as data privacy, transparency, data domains, etc.); ii) sustainability and inclusiveness; and iii) innovation enablers (including infrastructure, taxation, finance, competition, cross-sectoral R&D, etc.). Their trade-offs, cross-sectoral implications, policy domains, and decision-making should be assessed in the initial stage of the nexus approach adoption. Data, for instance, are a key input for innovation. Yet, the lack of transparency regarding data sharing may hinder stakeholders along the agri-food value chain to adopt innovation.

To ensure the successful adoption of the nexus approach, a three-tier approach as illustrated in Figure 1 in appendix could be adopted and appropriated. Since key interventions required for nexus approach lies outside the competencies of agriculture ministry, a cross-sectoral strategy is warranted. Policies and public expenditure of cross sectoral actions need to ensure that digital transformation does not create or add to existing inequalities. Governments can also support access to finance for local entrepreneurs who develop green digital technologies. Although various opportunities exist to finance climate friendly technologies, entrepreneurs in developing countries have little knowledge of them. First, the G20 should focus on raising countries' awareness of the cross-sectoral policy themes and the nexus approach. At the minimum, the G20 should encourage the sharing of best practices between G20 countries to address the data-sustainability-innovation nexus and cross-sectoral policy themes at the national level. Once

support is gained from its member countries, the G20 should also incorporate specific targets for establishing public or stakeholder led data platforms or G20 level data cooperative, to ensure continued progress towards addressing cross-sectoral policy coordination. At the national level, a relevant example of the institutional arrangement is the Agricultural Innovation Australia (AIA), which is a not-for-profit, public company established in 2020 to facilitate joint investment and collaboration in cross-industry industry issues along agriculture, fisheries, and forestry value chains. The AIA attracts investment from public, private, not-for-profit, and global commercial entities and recognises the need to shift investment towards cross-sectoral outcomes (DAWE, 2022). In Japan, an agricultural data collaboration platform call WAGRI https://wagri.net/en-us/aboutwagri#sec1 was established in 2017. WAGRI provides useful data and facilitates data sharing across the stakeholders and sectors. The G20 should also support non-G20 countries to develop a national strategy for digital food and agriculture, for example, by using frameworks such as the FAO and ITU's e-agriculture strategy that incorporates other relevant sectors such as the banking and ICT sectors (FAO & ITU 2017).

Secondly, at the G20 level, efforts should be directed toward bringing the data-sustainability-innovation nexus into the limelight of global institutions. The water-energy-food nexus, for instance, gained traction since the report by the World Economic Forum (WEF) and the Bonn conference in 2011. Since then, the water-energy-food nexus concept has stimulated policy, research, and international development programs as well as financial decisions. In practice, there are three aspects critical to act on this recommendation. First, having a concept report developed through a multi-stakeholder consultation process is critical for the reviewing of cross-sectoral policy themes and interlinkages between them. Secondly, a close coordination with other international institutions such as the FAO, the World Bank, and various development and knowledge partners is critical. This is further outlined in Recommendation 4. Thirdly, the nexus approach will also require coordination between the G20 Agriculture working group and other working groups such as Digital Economy; Environment and Climate Sustainability; Development; Trade, Industry, and Investment; among others. Strategies captured in the proposed concept note should be implemented into respective working groups' agenda and a dedicated inter-working group platform should be organised to allow regular monitoring of each working group's progress.

RECOMMENDATION 4

THE G20 SHOULD CHAMPION AN INTERNATIONAL GOVERNANCE STRUCTURE TO SUPPORT DIGITALLY ENABLED SUSTAINABLE AGRICULTURE SOLUTIONS (FOR THE SDGs)

The high-tech data-heavy character of the digital revolution in agriculture that has the potential to comprehensively solve production challenges has also raised concerns over issues of sustainability, monopoly of technology providers, data privacy, and national sovereignty (Bronson and Knezeic, 2016: Carolan, 2017 and Wolfert et al., 2017). So, an important role for G20 policy makers is to put in place a legal, regulatory, and governance framework to address the negative consequences and risks associated with digital technology. A list of policy recommendations appeared in G20 communique and T20 proposals are summarised in Table 2 in Appendix 3.

According to World Bank's Enabling the Business of Agriculture (EBA) report, countries with high quality information and communication technology regulations tend to also perform well on GSMA mobile connectivity Index (World Bank, 2017). In contrast, arbitrary regulatory changes and lack of coordinated trade and investment policies create high transaction costs and drive-up prices for end users (Samarjiva & Zainudeen, 2010). To ensure a wider use of secured data, it is essential for data to be shared on large platforms governed jointly by the public and private sectors grounded on the principles of transparency. Incompatibility of digital technologies and related soft wares across countries could create information asymmetries among big technology companies, small agribusinesses, and farmers.

The risk of power imbalances and losing the bargaining power of farmers depend on whether digital agriculture solutions are based on closed proprietary systems or open flexible systems (Wolfert et al., 2017). Self-regulation and standards set by industry would help to address these challenges. So far industry self-regulation by developing common standards has kept this challenge in check. For tractors and farm equipment, the ISO BUS standard and for precision farming, the Agri Net Standard has been established. As in the software industry, regulations may be required for big agricultural tech companies to make their software and data processing system compatible with farm management systems so that farmers can use their existing hardware and software. Similarly, G20 governments could encourage interoperability between mobile phone operators and financial institutions to improve the financial inclusion of smallholder farmers. Interoperability is the ability of digital money operators to connect with each other and with the banking system. For smallholder farmers, this means they can send and receive money across all mobile networks in real-time.

Agricultural policy support should also incentivize farmers to adopt digital technologies that bring environmental benefits. This could be done by repurposing distortive support toward digital technologies with environmental co-benefits. For instance, renting precision agricultural

equipment through digital platforms has a lower carbon footprint than buying (Anbumozhi et al., 2021). However, some regulations may discourage farmers from benefitting from digital solutions. For example, data security regulations and the cumbersome licensing procedure often prevent the potential benefits of digital technologies from reaching farmers.

To realize the overarching opportunities to accelerate digital technology transformation process in agriculture that also contribute towards achieving Sustainable Development Goals (SDG), new governance models such as sandbox regulations and platforms models ought to be explored at the G20 level. G20's Financial Stability Board founded in 2009 can be considered as a model to facilitate that kind of global coordination. The rationale for and relevance of proposed mechanisms such as the Sustainable Technology Board (STB) (Stephenson et al., 2021) and the Digital Stability Board (DSB) (Fay & Medhora, 2021) should be considered in support of the G20 Agriculture Cooperation framework. The current global food price inflation crisis emerging from the Ukraine-Russian war and the COVID-19 pandemic recovery plans could be an opportunity to revisit these proposals and their implementation.

In order to realize the key SDGs such as food security, climate change, and biodiversity preservation, from the implementation perspective, the G20 Agriculture Working Group must take into account other ongoing global initiatives such as the UN World Summit on the Information Society (WSIS), the e-Agriculture Community of Practice (CoP), the International Telecommunication Union (ITU) and its Global Symposium for Regulators, The World Bank's Digital Development Partnership (DDP), the OECD Going Digital Project, in addition to G20 Meeting of Agriculture Chief Scientists (G20-MACS).

The G20 should also identify and promote essential safeguards to ensure sustainable digital agriculture and minimize unintended consequences (e.g., developing international standards and regulations). The International Platform for Digital and Food Agriculture being proposed as a multi-stakeholder forum (FAO, 2020) could be supported by G20 Agricultural Working Group, to shape international digital agriculture and data sharing policy. This enhanced platform will develop synergies by closely working with and receiving guiding principles from the G20 Working Groups on agricultural, digital economy, trade and investment, and the 2030 agenda. This could be seen as a strategic approach to maximise the potential benefits of digitalization of agri-food systems and fostering a coherent, inclusive, and sustainable global governance architecture to guide the transformation.

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Appendix

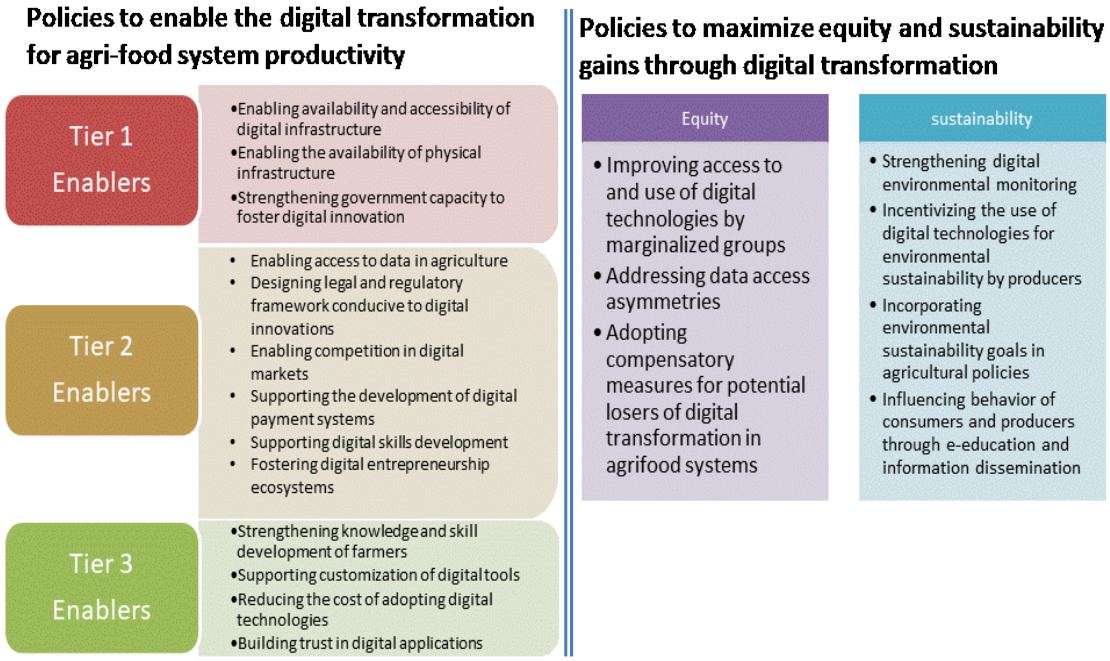
Appendix 1

Table 1. A matrix of key policy challenges and possible action agendas

Challenge areas	Enablers in the Policy Solution area
Project Related -Technology-specific and market factors that limit the adoption of and investment in digital technology (e.g. fintech, blockchain, e-commerce) -Unintended consequences of digitalization at the local level (eg, job losses)	Territorial -promoting projects to make agriculture more knowledge-intensive and high tech, targeted for small farms, often missed part of previous revolutions -Steer research institutes, tech companies, to identify and manage potential imbalances and negative consequences of digitalization -Innovate new public-private-community partnership models and microfinance solutions in support of early-stage digital tech
Adequacy of Agriculture Sector -Resource adequacy challenges of agricultural sector - Limited no of champions to advocate co-benefit approaches - Lack of female and youth participation	Agriculture sector Pathways -Provide policy, enabling environment and safety nets to enable digital technologies that contribute towards improved agriculture production, increased food security, and reduced emissions/pollutions. -Build education, literacy, and necessary skills for deploying technologies that empower the women workforce in farmers and markets. -Targeted support for nurturing entrepreneurship involving local youth in designing digital solutions for integrated development
Policy Coordination Lack of policy coordination and safeguards	Cross-Sectoral Synergy -Governmentwide approach to develop responsible digital tech strategies.

-The wide range of policy issues related to digital transformation -Pursuit of sustainable development goals	-Joint approach by innovation, ICT infrastructure trade, finance and environment ministries to ensure better social and environmental safeguards and manage the digital transformation in a holistic way
<u>International Cooperation</u> Absence of international technological architecture to support digital-enabled solutions for SDG goals such as food security -Lack of coordinated efforts by governments and big tech companies to identify and manage the systemic global risk emanating from the digital revolution in agriculture sector	<u>Global governance focusing on the G20 process</u> urating and consolidating standards r domestic and global supply chains Establishment of Global Platform for gital Food and Agriculture, a real-time owledge hub that would democratise tical knowledge and data for vernments, business, and society rovide adequate oversight and pervision to technology and financial stitutions to bring stability and unlock the tapped potentials

Appendix 2



Note:

Tier 1 enablers include availability and accessibility of digital and other physical infrastructure

Tier 2 enablers include access to data, availability of digital platforms, digital payment systems, digital skills and digital entrepreneurship eco-system

Tier 3 enablers include other public support mechanisms in facilitating the broader adoption of digital agriculture technologies and capacity building of the farmers

Figure 1 An Integrated Policy Action Framework for Fostering Productivity, Inclusion and Sustainability

Appendix 3

Table 2. A list of policy recommendations appeared in G20 communique and T20 proposals

Enhancing food supply chain resilience through the utilisation of digital and sequence information technologies	SusTech solutions: enabling new technologies to drive sustainable development	Exploring the development-technology nexus via a digital transformation paradigm shift in development strategy in the digital age	A global governance framework for digital technologies	Digital inclusion strategies for the G20 – Lessons in public-private cooperation from India and Africa	Leveraging the Digital Transformation for Development: A Global South Strategy for the Data-driven Economy

1. Increase tax incentives for critical digital technologies 2. Generate innovative public-private financial instruments 3. Promote technical advisory support for agri-businesses 4. Reach a consensus on the definition of digital sequence information (DSI) and promote it in international fora 5. Enable policy frameworks to make strategic data available to specific users 6. Invest in targeted research and development (R&D) funding for DSI-based selective breeding 7. Collaborate to develop and shape food security at the individual household, national and regional levels	1. Create a Sustainable Technology Board (STB) (modelled after the Financial Stability Board) as a mechanism for coordination, cooperation, and scaling of SusTech solutions STB would be structured to deliver three core functions: provide a platform for cooperation, generate analysis and options, develop standards and guidelines. 2. Develop solutions to SusTech adoption: from right skilling, TechFin, investment incentives, to regulatory sandboxes.	1. Prioritise the development of an enabling ecosystem where digital transformation can thrive 2. Develop a robust roadmap to technology advancements 3. Make sustainability a core agenda of digital transformation policies 4. Consider digital privacy and security 5. Bridge the digital divide	Create a Digital Stability Board (modelled after the Financial Stability Board) with the following broad objectives and structure: 1. Coordinate the development of international governance in standards, regulations, principles, and policies across the big data value chain 2. Monitor implementation of principles, standards, and policies 3. Assess vulnerabilities and risks arising in the digital economy, where international coordination is required 4. Innovate digital governance 5. Disseminate best practices that could be implemented at the national level, and ensure that relevant bodies and civil society	1. The G20 endorses open public digital infrastructure to coordinate public-private cooperation in the digital economy 2. The G20 endorses alternate innovative mechanisms, including financing for digital inclusion projects	1. Formulate a comprehensive plan for governance of the digital economy (including concrete tasks such as investment promotion, infrastructure prioritisation, market regulation or developing privacy guidelines) 2. Consider the long-term implications of conditionality of co-operation with a given international partner (not only investment conditionality and technology transfer, but also data localization and usage, etc)

8. Support breakthrough development and innovations to promote commercialization of new plant varieties and technologies that improve food value resilience			are part of the DSB discussions		