Seeing Everything from Nowhere: A Human Rights Assessment of the United Nations Food and Agriculture Organization's Data Governance

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Aknowledgements

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Founded in 2000, IT for Change is a Southern NGO rooted in feminist principles and committed to advancing digital justice through the democratization of digital technologies. It holds Special Consultative Status with the United Nations Economic and Social Council (ECOSOC).

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Executive Summary

This study critically examines the Food and Agriculture Organization's (FAO) data governance framework, assessing its alignment with human rights principles and its implications for marginalized groups, including Indigenous Peoples, peasants, women, and workers. It evaluates whether FAO's digital initiatives, particularly its digital public goods (DPGs) and digital public infrastructure (DPI), uphold equity, transparency, and participatory decision-making in agri-food systems.

The analysis reveals significant gaps in FAO's current data governance model. While the organization has established basic data protection measures through its FIRST principles (Fairness, Integrity, Responsibility, Security, and Transparency), these frameworks fail to adequately incorporate human rights protections. Three fundamental shortcomings emerge from this examination: the absence of specific safeguards for traditional knowledge and non-personal data of small-scale food providers; unequal access to the benefits of digital initiatives; and the systematic exclusion of marginalized groups from decision-making processes that shape technologies affecting their livelihoods.

A central concern is FAO's growing dependence on US-based technology corporations for cloud services and digital infrastructure. This reliance creates exclusion risks for countries under US sanctions and raises questions about corporate influence over public data systems. The study finds that contracts with private providers remain undisclosed, while risk assessments focus narrowly on technical safety, ignoring broader structural risks such as digital colonialism and corporate monopolization of agricultural data.

The research highlights how FAO's DPGs and DPIs fail to meet key public interest criteria. Platforms like the Hand-in-Hand Geospatial Platform demonstrate accessibility limitations due to corporate dependencies, while design processes prioritize efficiency over equity. The study documents how current digital tools better serve transnational agribusiness than small-scale food producers, reinforcing existing power asymmetries in food systems.

The chronic underfunding of UN digital infrastructure emerges as a root cause of these challenges, forcing FAO into partnerships that may compromise its public interest mandate. The analysis shows how multistakeholder governance approaches have proven inadequate for rights protection, highlighting the need for binding multilateral standards.

The study concludes with concrete recommendations to align FAO's digital transformation with human rights and public interest principles and food sovereignty. Key proposals include establishing participatory mechanisms for marginalized groups, diversifying technology providers, implementing transparency measures for corporate partnerships, and developing human rights-based frameworks for data governance. These reforms are presented not as technical adjustments, but as fundamental requirements for achieving FAO's mandate of eradicating hunger in the digital age.

1. Introduction

This study examines Food and Agriculture Organization's (FAO) role in the digital transformation of agri-food systems. Under its 2022–2031 Strategic Framework[1], FAO treats data and technology as key 'accelerators' across all programs. Its initiatives reflect a growing emphasis on data collection, analysis, and digital public goods (DPIs)—transforming how agricultural services are delivered. FAO's data on agri-food systems comprises a large spectrum of information including genetic information from crop germplasm, crop yields, livestock and environmental, socio-economic and geospatial data.

The study asks: What Information Technology (IT) infrastructure does FAO use? What are FAO's main digital initiatives and collaborators? How does it govern data? It then assesses FAO's data governance through a human rights lens, particularly its impact on the Global South's ability to control data infrastructure and computing power with the aim of upholding food sovereignty and related rights.

FAO's influence is twofold: it sets global standards and shapes policies in the Global South through technical support. Its current approaches may influence future data governance norms.

As a UN agency, FAO must uphold human rights. It has adopted the guidance of the UN Secretary General's Data Strategy and of multi-stakeholder voluntary commitments, all of which center human rights.[2] FAO's own Science and Innovation Strategy embraces a rights-based guiding principle.[3] A human rights assessment will highlight values and perspectives that tend to be neglected and contribute to critically examining current assumptions, blind spots, dilemmas, tensions and unintended effects. Placing the economic, social and cultural human rights of Indigenous Peoples, women, peasants and workers at the center of regulatory frameworks and legislation on the development and use of digital technologies is crucial for food systems.

They face serious challenges, including the digital divide, dispossession of land and seeds[4] and unequal participation in use of data, negative exclusive property regimes over data, exclusion of certain types of data, unethical tracking and targeting, price discrimination and manipulation of farmer's behaviors, and market dominance by organizations and bodies that control the data.[5] This is particularly problematic in the larger context of increasing corporate control over food systems: Big Tech and finance corporations are re-shaping agribusiness towards even greater concentration of market power.[6]

1.1 Methodology and analytical framework

To answer the first set of questions on FAO's activities, we conducted desk research of FAO governing bodies' documents and its website, along with interviews of selected FAO officials under Chatham House Rules. Not all interview requests were answered, and access to key documents—such as memorandums of understanding and risk assessment frameworks—was limited.

To assess FAO's implications on economic, social, and cultural rights, we referenced international human rights law[7], with particular focus on General Comment No. 25 (2020) on Science by the UN Committee on Economic, Social and Cultural Rights.[8] This comment provides guidance on applying a human rights approach to science and technology in relation to the right to food and connected rights. We also incorporated the 2023 UN Committee on World Food Security (CFS) policy recommendations on Food Security and Nutrition (FSN) data[9], which emphasize human rights principles, traditional knowledge protection, and participatory data mechanisms. Given the emerging nature of digitalization in food systems, we supplemented our framework with the Global Partnership on Artificial Intelligence's Data Justice framework[10], which aligns with the right to science and CFS recommendations. Annex 1 shows how these frameworks intersect and inform the assessment questions we developed.

Beyond the human rights framework, this study examines the capacity of Global South countries to meet their human rights obligations. Article 1 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) establishes the right to self-determination[11], including control over natural resources and economic development. This right applies to the current process of digitalization. Realizing this right in the context of the global economy in general, and the emerging data economy in particular, requires an effort to re-shape the global economy and to regulate the data economy in a way which allows developing countries to benefit. Global South countries face the threat of being trapped in a subordinate role—providing raw data to dominant US and Chinese platforms while paying for processed digital intelligence. This dynamic could further reinforce global inequalities, creating newer forms of digital dependencies.

Under current regulations, the data-driven economy is unlikely to support attainment of Sustainable Development Goals (SDGs) and realization of human rights. Instead, the growing power of global platforms—which control data and capture its value—may deepen economic disparities both between and within nations. To break this cycle, the UN Commission on Trade and Development emphatically recommends policymakers to explore alternative digital economy models that ensure fairer value distribution.[12]

FAO claims its digital public goods and digital public infrastructure initiatives support equitable agri-food systems. Is FAO, thus, contributing to building alternative digital economy models that will benefit developing countries and their populations? It is not in the scope of this study to investigate the impacts of FAO activities on the ground. Instead, we will examine how FAO has designed its DPGs and DPIs to answer this question. For assessing the design, we will take as reference the notion of 'public' in international human rights law[13], as well as in the conceptual work of economists David Eaves, Mariana Mazzucato and Beatriz Vasconcellos.[14] We have combined both frameworks to identify the criteria for truly public digital goods and infrastructures (Refer to the second part of the table in Annex 1). Finally, this study will also draw from the Universal Digital Public Infrastructure Safeguards Framework developed in 2024 by the DPI Safeguards initiative, a global multi-stakeholder effort convened and supported by the Office of the UN Secretary-General's Envoy on Technology (OSET) and the United Nations Development Programme (UNDP).[15]
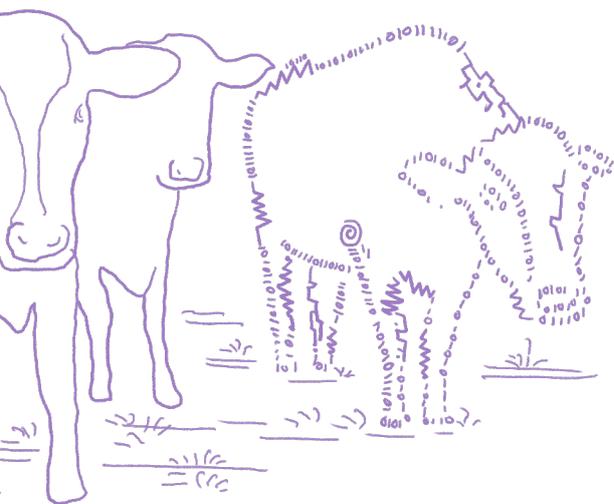
2. FAO's Information and Technology Infrastructure

FAO employs a hybrid IT infrastructure, maintaining legacy on-premises systems for critical functions, while transitioning to an interoperable multi-cloud ecosystem following its 2021 Cloud Adoption Strategy.[16] Although cloud adoption began earlier[17], the 2021 strategy formalized this shift. FAO's multi-cloud ecosystem now includes AWS, Google Cloud Platform (GCP), Microsoft Azure, Oracle, and the UN International Computing Centre (UNICC).

FAO actively promotes cloud adoption across the UN system, exemplified by its 2023 UN Cloud Alliance with AWS, which includes partners like the World Food Programme (WFP).[18] Beyond cloud services, FAO partners with organizations like the Organisation for Economic Co-operation and Development (OECD) to modernize its Statistical Working System (SWS) and Statistics Data Warehouse (SDW) using the open-source Stat Suite platform. This cloud-agnostic system, hosted on AWS, is used by UN agencies, national statistical offices, and regional bodies, fostering global interoperability.[19]

3. Overview of FAO's Major Digital Initiatives and Network of Collaborators

Annex 3 lists FAO's key digital initiatives and partners, highlighting its strategic priorities. Geospatial and remote sensing data feature prominently, underpinning half of its major efforts. These focus on soil health, water productivity, land cover, forest monitoring, livestock diseases, and crop forecasting, with improved data integration and accessibility.

For crisis response, FAO developed two systems: one mapping overlapping environmental, climate, and socio-economic risks, and another streamlining food aid delivery in emergencies. Three initiatives target smallholder farmers, addressing soil management, extension services, and deforestation compliance, alongside a knowledge-sharing platform for family farming.

In terms of collaborations, FAO primarily supports national governments in Eastern Africa (Kenya, Rwanda, Tanzania, Uganda), Southern Africa (Zambia, Zimbabwe), North Africa (Egypt, Morocco, Tunisia), as well as Jordan, Senegal, Bangladesh, Sri Lanka, and Ecuador.

As for private sector partners, the Gates Foundation supports several initiatives, including FAO's Geospatial Platform[20]. A partnership with Google Earth Engine (GEE) grants FAO access to geospatial data, computing power, and storage, while collaboration on the Open Foris platform has led to the development of a series of applications. Google Cloud Platform serves as one of FAO's primary cloud providers, alongside AWS, Microsoft Azure, and Oracle. FAO is also working with AI71, a United Arab Emirate's company specializing in open-source large language models, to develop AgriLLM—an AI-driven agricultural solution.

4. FAO's Data Governance

FAO's 2022-2031 Strategic Framework positions data, technology and innovation as core 'accelerators' across all programs, with specific focus on assembling, analyzing and improving access to agricultural data.[21]

4.1 Modernizing FAO's statistical work

FAO's data strategy focuses on modernizing statistics and integrating data systems. While not producing original data, it compiles national reports, fills gaps, and disseminates global findings. A 2020 evaluation identified challenges including poor coordination, outdated methods, incompatible platforms, and limited open data use. Key reforms include, among others, adopting UN data frameworks, modernizing systems with a new Statistical Working System and integrated Data Warehouse, implementing open data policies (CC BY 4.0 license) and creating a Data Lab using open-source tools.[22]

FAO appointed its Chief Economist as Executive Data Champion to lead a high-level Data Coordination Group overseeing policies and governance.[23] Regionally, it maintains statistics commissions for Africa, Asia-Pacific, and Latin America/Caribbean, engaging member states through FAO's Regional Conferences and governing bodies.[24]

4.2 Data protection policy

FAO's Data Protection Policy, issued in 2022, encompasses a range of data, including technical program data, member state statistics and various categories of agri-food system information.[25] It established five core FIRST Principles: Fairness, Integrity, Responsibility, Security, and Transparency. It introduced a four-tier confidentiality classification system ranging from public to strictly confidential data, along with detailed procedures for data handling, transfer protocols, breach response mechanisms, and oversight frameworks.[26]

4.3 FAO's Open Access Policy on publications and intellectual property rights

The FAO Open Access Policy mandates that FAO publications be freely accessible online through its Knowledge Repository or Open Access publishers, generally using a CC BY 4.0 license to encourage reuse with proper attribution. While maintaining copyright, FAO considers its intellectual property a public good and establishes clear roles for authors and the Office of Communications in facilitating distribution.[27] The Open Access Policy complements FAO's Open Data Licensing Policy for statistics and its broader Intellectual Property Policy, which treats all FAO-produced or commissioned materials as global public goods. These policies collectively prioritize universal, cost-free access to maximize knowledge sharing and global impact.[28]

5. Findings

5.1 Absence of a human rights-based approach in data governance

FAO's Data Protection Policy outlines five core principles—Fairness, Integrity, Responsibility, Security, and Transparency (FIRST)—which align with Article 5 of the EU's General Data Protection Regulation (GDPR) concerning the processing of personal data. These principles reflect one of the most stringent legal standards for personal data protection. However, as we will discuss, FAO's data governance framework lacks a clear foundation in human rights.

5.1.1 No recognition and protection of data rights frameworks for peasants, women, Indigenous Peoples and workers [29]

No FAO documents explicitly address the protection of Indigenous Peoples', workers', peasants', or women's rights in digitalization, nor how their non-personal data (NPD) related to farming, fishing, gathering, livestock keeping, the use of ecosystems for food production and the managing of territorial food markets[30] should be legally recognized. While FAO's Data Protection Policy applies to non-personal data[31], its definition excludes such information[32], and neither FAO's legal office nor FAO's data protection office clarified this upon request. Regarding Open-Foris, though, FAO confirmed that its tools are open-source, satellite data is public, and user-provided data remains strictly user-owned. Personal data (e.g., emails) is used only for access, and platforms like WHISP and Collect Earth ensure anonymity and local storage. FAO also emphasized user control over data sharing through open formats.[33]

This non-recognition is problematic for the following reasons: on one hand, the line between personal and non-personal data can be very thin. A single data point might be non-personal, but when combined with other datasets, it can be "re-identified" to point back to a specific individual or farm.

This risk is particularly high for small-scale food providers since farming, fishing, livestock keeping are activities integrated in families' and communities' ways of life. Additionally, small-scale food providers' data is closely intertwined with their traditional knowledge and innovation. On the other hand, not protecting the NPD of small-scale food providers means that there is a high risk that agribusiness corporations and digital platform companies can collect vast amounts of their NPD through digital platforms, farm management software, satellite imagery, etc. and unduly appropriate, use and benefit from the data of small-scale food providers to, among others, dictate market prices, develop and sell proprietary inputs, influence policy, practice biopiracy and create digital lock-ins.

Other issue which deserve careful examination is how the right to Free Prior and Informed Consent (FPIC) of Indigenous Peoples and the right to active, free, effective, meaningful and informed participation of peasants should be applied and safeguarded in the context of geospatial information. This is highly relevant when geospatial data involves indigenous ancestral territories and peasant lands; when this data could impact livelihoods and cultural rights, particularly in cases in which governments would make, for instance, land-use regulations or emergency responses based on geospatial data; when traditional knowledge of Indigenous Peoples and peasants would be integrated in geospatial platforms; or when privacy risks would exist for their communities. Here again, nothing in FAO's data governance framework points to this particular issue even though FAO is intensively using geospatial data in its major initiatives.

FAO's reports highlight initiatives to support women in technology and agripreneurship, but fail to adequately assess how digitalization impacts the rights of peasant, indigenous and working women. The organization's data governance framework notably lacks any principle of gender equality, operating instead on the assumption that women will automatically benefit from digital initiatives. This approach ignores structural inequalities and diverse womens' contextual realities.

It is important to note that issues related to labor, the impacts of digitalization on labor and matters pertaining to the data rights of workers throughout food systems are almost entirely invisible in FAO discussions and digital initiatives not to speak of its data governance framework.

In sum, FAO is not contributing to develop data rights frameworks for Indigenous Peoples, peasants, women and workers; is not protecting traditional knowledge of Indigenous Peoples and peasants; is not applying the right to free, prior and informed consent of Indigenous Peoples and the right to active, free, effective, meaningful and informed participation of peasants in the context of geospatial platforms; and is not applying a gender-sensitive approach in its data governance.

5.1.2 Unequal access to benefits of science and technology[34]

A human rights-based approach to data governance must include the right to benefit from one's data, yet this dimension is missing from FAO's current framework. None of the FIRST Principles in FAO's Data Protection Policy address benefit-sharing, and discussions about data benefits remain limited and are regarded sensitive when it comes to issues such as, liability for wrong forecasts in crop yield production.[35] While FAO promotes open data as a global public good, this approach alone cannot ensure equitable benefits, particularly for marginalized groups. It assumes universal benefit will automatically follow from data accessibility, but this ignores that the conditions to benefit are shaped by power imbalances. Critical scholarship warns that open data policies can reinforce inequalities and enable 'data colonialism' when Northern knowledge systems dominate.[36] There is also a tension between an open data policy and protecting the data rights of Indigenous Peoples, small-scale food producers and all the different actors active in food systems, particularly when it comes to using non-personal data of these groups for FAO publications and digital platforms.

Who is using and benefiting from FAO's data and data platforms and who is harmed? This is an important area of further research. In the current context of data assetization by agribusiness and agri-tech companies,[37] it is important to examine whether these companies are incorporating public, open data of institutions like FAO into their data sets and whether this constitutes an undue manner of appropriating public data. An unrestricted open access approach has been criticized precisely for failing to acknowledge and respond adequately to the risks of monopolistic capture of the value of digital innovations by a few powerful actors.[38]

On the other hand, while FAO documents vaguely acknowledge technology risks, they overwhelmingly emphasize potential benefits. The organization lacks targeted educational materials for women, peasants, workers, and Indigenous Peoples on digital rights risks and protections. FAO also fails to monitor emerging threats or to create platforms for risk information exchange.

Further research will tell us who is using and benefiting from FAO's data platforms and who is harmed or discriminated against. Given the fact that peasants, Indigenous Peoples, women, workers are excluded from defining priorities for FAO's digital initiatives and that FAO is not actively raising awareness about potential risks for their rights, it is unlikely that these groups are equally benefiting from FAO activities.

5.1.3 Exclusion from contributing to scientific advancement[39]

Peasants, Indigenous Peoples, workers, and women have minimal input in FAO's digital programs, which prioritize partnerships with tech firms and academia over grassroots engagement. The Family Farming Knowledge Platform[40] is an exception but remains isolated from major initiatives.

In this sense, FAO does not provide equal opportunities to participate in scientific advancement for Indigenous Peoples, women, peasants and workers; does not promote intercultural dialogue for scientific progress; and only marginally takes their knowledge and data into account. This happens despite the fact that the guiding principles of FAO's Strategy for Science and Innovation recognize that traditional and indigenous knowledge have an important role to play in the global scientific dialogue.[41]

5.1.4 Absence of participatory mechanisms[42]

FAO lacks structured participation for marginalized groups in digital decision-making, favoring symbolic engagement over substantive input.[43] Member states also have limited influence beyond collaboration in the field of national statistics. Moreover, overreliance on remote sensing technologies for socio-economic and environmental conflict analysis particularly in emergency situations risks authoritarian tendencies by bypassing democratic deliberation with affected communities.

5.2 Deficits in FAO's digital public goods and digital public infrastructure

FAO's DPGs and DPIs fail to meet key public interest criteria set out in **section 1.1** (also see Annex 1). Their design lacks participatory value-setting. Universal accessibility remains compromised by extremely high reliance on US cloud providers. Moreover, collaboration terms with tech corporations lack transparency.

5.2.1 Purpose and accessibility[44]

FAO's digital initiatives prioritize efficiency and scalability in most of its digital initiatives, sidelining equity in practice as was shown in the previous section. The Geospatial Platform, despite its DPG certification, excludes users in US sanctioned countries due to cloud provider restrictions[45]—a systemic risk for a UN entity.[46] No assessments exist regarding equitable distribution of FAO digital public goods' benefits across countries and constituencies. FAO relies on multistakeholder, voluntary standard-setting approaches on public digital goods and infrastructure as well as on artificial intelligence but they have proven inadequate for rights protection[47], highlighting the need for binding multilateral regulations.

5.2.2 Responsiveness to marginalized groups[48]

As shown in **section 4.1**, FAO's data governance excludes perspectives from marginalized groups. Most FAO digital platforms prioritize efficiency, productivity and scalability, adopting what scholar Donna Haraway terms the "the god trick of seeing everything from nowhere".[49] This approach often proves irrelevant or harmful to small-scale food producers and other actors whose knowledge is rooted in specific territories and contexts. Consequently, FAO's digital tools better serve transnational investors and corporations with global supply chains, reinforcing existing power imbalances.

5.2.3 Transparency and accountability gaps[50]

FAO has developed its digital initiatives through an extensive network of collaborators (see section 3 and Annex 3), though disadvantaged groups have been minimally involved in these co-creation processes. The selection criteria for FAO's digital platforms remain unclear and treated as a mere technical matter.[51] FAO withholds contracts and risk assessments with cloud providers.[52] Its Cloud Adoption Strategy ignores structural risks like vendor lock-in or power concentration, focusing narrowly on safety. The example of the Open Foris-Google Earth Engine partnership shows,[53] how FAO promotes Big Tech cloud services in sensitive areas like ecosystem monitoring. Further research is needed to assess impacts on inclusion and structural vulnerabilities for developing countries, as well as whether Google benefits disproportionately from such data partnerships. FAO's Cloud Adoption Strategy, seemingly undiscussed in governing bodies, falls under the Chief Information Officer's purview.[54] However, given its implications for member states, broader deliberations are warranted. The lack of adequate funding for FAO and the UN plays a major role in their overdependency on Big Tech companies.
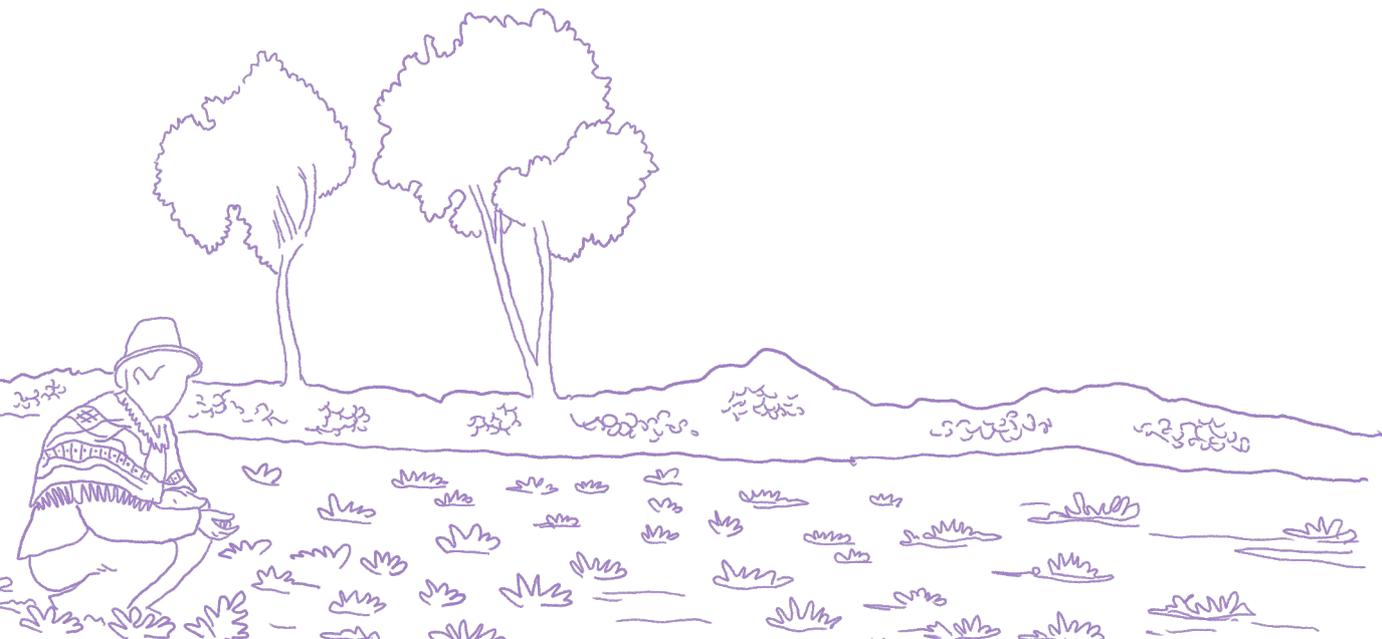
6. Conclusion

This study reveals fundamental shortcomings in FAO's data governance, particularly its failure to incorporate human rights principles and protect marginalized groups. While FAO has established basic data protection measures and developed some digital initiatives for smallholders, these remain insufficient.

The analysis identifies three critical gaps in FAO's approach. First, the organization fails to protect the rights of Indigenous Peoples, peasants, women and workers regarding their traditional knowledge and non-personal data in food systems, while they are practically excluded from contributing to scientific advancement. Second, benefit distribution remains unequal, favoring corporate actors over small-scale food producers. Third, marginalized groups are systematically excluded from decision-making processes that shape digital tools affecting their livelihoods.

These deficiencies seriously compromise the right to science of Indigenous Peoples, women, peasants and workers. This is harmful for food sovereignty and for developing countries' agenda of overcoming high dependency on importing basic food supplies. Small-scale food providers' knowledge is at the core of the territorial food systems that feed people and is an essential source of innovation to continue adapting and transforming food systems to respond to current challenges. Their knowledge is also at the core of the capacity of communities to decide in a self-determined manner how to feed themselves and their future generations. The right to science and data rights are inextricably connected. Data rights, which comprise collective rights to data, include, inter alia, the right to decide how to use and benefit from one's data; the right to participate in governing one's data, and the data systems based on it; and the rights to alternative and collective forms of data stewardship. FAO's current approach endangers the ingenuity of small-scale food providers and risks perpetuating forms of structural inequalities now compounded by new ways of wealth extraction, where the benefits of digitalization accrue disproportionately to powerful actors while marginalized communities and developing countries bear the costs.

The analysis of FAO's DPGs and DPI reveals systemic shortcomings that undermine their public interest mandate. While these platforms aim to support sustainable agri-food systems, their design, governance, and implementation raise serious concerns about universal accessibility, corporate dependency, transparency, and accountability—issues that compromise their legitimacy as truly 'public' goods. FAO's heavy reliance on US based tech corporations (e.g., Amazon, Google, Microsoft) for cloud services creates exclusion risks for countries under US sanctions and exposes FAO to geopolitical vulnerabilities. The lack of publicly disclosed contracts with private providers raises concerns about undue corporate influence and potential data appropriation. Secondly, there is a lack of democratic governance. Indigenous Peoples, peasants, women, workers do not participate meaningfully in shaping DPGs, leading to platforms that prioritize efficiency and scalability over equity and contextual relevance. Critical decisions on digital infrastructure remain technocratic, sidelining member states and civil society in governance processes. FAO's risk assessments focus narrowly on technical safety, ignoring structural risks (e.g., digital colonialism, corporate monopolization of public data). The chronic underfunding of FAO and UN digital infrastructure forces reliance on private actors, undermining public control.

These shortcomings point to the finding that FAO is not substantially contributing to building alternative digital economy models that will benefit developing countries and their populations. FAO's current trajectory risks entrenching digital neo-colonialism, where Big Tech corporations and powerful states dictate the terms of agricultural digitalization. Moreover, accepting notions of DPG and DPI in which Big Tech corporations play a central role, serves the purpose of further entrenching the already excessive power of these companies by legitimizing and naturalizing it. This will undermine the possibilities to pursue self-determination in digital matters and realizing digital rights in most countries; and it is a structural obstacle for human rights approaches to data governance, and to develop technologies under democratic control and for self-determined ways to improve people's lives and the health of the planet.

To realign its digital transformation with human rights and public interest principles, we recommend FAO the measures below. It is important to raise specific demands to FAO and the UN on the role they should play in data governance. The focus tends to be on national governments. This is of course a crucial dimension, but it misses the perspective of international cooperation. More robust guidance for the UN is necessary. Otherwise, decision-making is done by the management of UN agencies which are vulnerable to undue influence by Big Tech and powerful countries. Raising specific demands to FAO will also strengthen its normative work when it comes to developing standards in areas where governments have not regulated yet. So far discussions about data governance in UN Committee on World Food Security (CFS) and FAO's governing bodies have been obstructed by the argument that FAO is not the appropriate forum to regulate data governance internationally.

But there is no single place where such a regulation can be undertaken. Data governance will emerge as a result of the regulation activities of different actors. So far, we basically have a de facto mosaic of regulations by powerful governments and few international agreements. FAO has certainly a role to play in data governance related to food systems.

Recommendations on the data governance framework:

- Adopt gender equality as a core principle of data governance.

- Expand FAO's definition of non-personal data to protect traditional knowledge on farming, fishing, livestock keeping, gathering, using ecosystems for food production and managing territorial food markets, particularly in the context of geospatial data. Revise FAO's data governance accordingly, and collaborate with UN experts (e.g. the UN Special Rapporteur on Indigenous Peoples' Rights, the UN Working Group on UNDROP, ILO and CEDAW experts) to establish legal safeguards. FAO's governing bodies must adopt standards to recognize and protect small-scale food providers' data rights.[55]

- Apply the right to FPIC of Indigenous Peoples and the right to active, free, effective, meaningful and informed participation of peasants and other people working in rural areas when geospatial data is used to inform policy making.[56]

- Pay attention to labor issues and the specific challenges that digitalization poses on workers' rights throughout food systems.

- Develop materials to alert women, peasants, workers and Indigenous Peoples about potential threats to their rights in the context of new technologies, systematically monitor technological risks, and support member states in developing protective regulations in their countries and in FAO's governing bodies.

- Incorporate benefit-sharing principles like those in the CARE Principles into FAO's data governance framework. Develop safeguards against undue appropriation of FAO's data by corporations and develop assessment tools to evaluate who benefits from, or is harmed by, FAO's digital initiatives.

- Establish multi-scalar mechanisms for the active participation of women, workers, peasants and Indigenous Peoples in defining priorities for FAO's digital initiatives, in assessing and monitoring their implementation and their regular review. These mechanisms should ensure interaction with FAO's Data Group, as well as the level of FAO's Technical Committees, Council Committees and Governing Bodies.

- Ensuring effective participation of peasants, Indigenous Peoples, workers, and women in scientific development. This requires protecting traditional knowledge and adopting a pluralistic approach to science— as laid down in FAO's Science and Innovation Strategy.

Recommendations on digital public goods and digital public infrastructure

- Disclose the terms of use of cloud service providers to FAO and the collaboration agreements with tech corporations. The risk assessments of these collaborations should also be presented to and discussed by FAO's Programme Committee.

- Define in a participatory manner the values and objectives of FAO's digital platforms striking a proper balance between efficiency, productivity, scalability vs. equality, fair distribution of public value and sustainability.

- Ensure universal accessibility of FAO DPIs by reducing US cloud dependence through diversified providers and UNICC collaboration.

- Prioritize developing territorial, national and regional digital platforms in partnership with small-scale food providers, local businesses, research institutions, municipalities and regional research institutions.

- Member states should adopt intergovernmental agreements and standards in FAO's governing bodies, for instance, on the protection of non-personal data related to food systems, and equal and fair conditions for sharing and using of Food Security and Nutrition (FSN) data in the public interest, with the aim of developing a human rights-based governance of truly public FSN data systems and digital platforms.

- Member states and FAO management should strengthen UNICC and promote collective agreements of UN agencies, for instance, to negotiate the terms of contracts with Big Tech companies so that UN agencies are in a better position to defend international public interests.

- In line with the CFS policy recommendations to foster truly public data infrastructure, member states should guarantee adequate public funding of FAO and its IT infrastructure so that it does not need to rely on private providers which may exercise undue influence in FAO's work or unduly appropriate public value.

Ultimately, FAO must ensure its digital platforms serve territorial food systems rather than global agribusiness interests. Without these changes, the organization risks entrenching digital neo-colonialism where powerful corporations and states dictate the terms of agricultural digitalization. Aligning FAO's data governance with human rights and food sovereignty principles is not merely a technical adjustment, but a fundamental requirement for achieving equitable and sustainable food systems in the digital age.

7. Annexes

Annex 1. Human rights–based data governance framework and criteria for digital public goods and infrastructure

Human rights-based data governance framework

The table below takes key elements of the right to science as laid down in General Comment 25 (GC 25) of the Committee on Economic, Social and Cultural Rights (CESCR) and aligns them with 1) the CFS Policy Recommendations on Strengthening Collection and Use of Food Security and Nutrition Data, which are the first human rights-based guidance on food data; and 2) the framework of data justice developed by data experts involved in the Global Partnership on Artificial Intelligence's project on Data Justice. Applying a human rights approach to digitalization in the field of food systems is an emergent area of standard setting which is still in the early stages of development. We therefore decided to also draw on this latter framework, which is based on human rights principles, focuses on the critical concept of data justice, and provides detailed guidance on its practical implementation. Based on these three sources, we drafted questions to assess FAO's data governance.

Right to Science as in GC 25	CFS Policy Recommendations on Data	GPAI Data Justice Framework	Questions
Prioritize scientific development that serves peace and human rights.[57]	The aim of FSN data systems is to improve decision-making for the right to food.[58] Human rights principles at the center of FSN data systems.[59] Need for more data and information on the structural determinants of FSN and on the situation of those subject to various forms of discrimination.[60]	Basing data regulation on human and community rights: This requires developing actionable data rights frameworks, which include economic and collective rights to data. A basic framework should include: the right to benefit from one's data, and to not be harmed by data collection and use; the right to access and port one's data; the right to appropriate representation in data, including to remaining invisible; the right to participate in governing one's data, and the data systems based on it; the rights to alternative and collective forms of data stewardship.[61]	**Are human rights part of FAO's data governance and data systems?** **Is FAO contributing to frame data rights frameworks for workers, peasants, Indigenous Peoples and women?**

Right to Science as in GC 25	CFS Policy Recommendations on Data	GPAI Data Justice Framework	Questions
Right to benefit from applications of science; equal access for everyone to the applications of science.[62]	Invest in public data infrastructure and improve policy frameworks on the management of public and private infrastructures underlying the collections, storage, processing, sharing and use of FSN data to promote equitable access to FSN data and to prevent the illegal extraction of data.[63]	Equitable access to resources: Ensure equitable access to skills development and digital infrastructure including connectivity and computing resources, as well as data assets—especially where communities have contributed to the generation of these data assets.[64] Workers' data rights: Alongside the need for the expansion of employment and social protections to platform workers, regulation is needed to elaborate and advance workers' data rights.[65]	**Do peasants, Indigenous Peoples, women, workers have equal access to the benefits of FAO's initiatives?**
Right to participate in scientific advancement; equal opportunity for everyone to participate in it.[66]	Recognize the significance of the variety of methods that Indigenous Peoples, peasants and other small-scale food producers have to generate, collect, store, and use data on FSN.[67] Promote the collection, analysis and use of multiple forms of FSN data, beyond quantitative and machine-readable data, including participatory, qualitative methodologies and mixed-methods approaches that are used by local communities, while safeguarding the rights of data originators.[68]		**Do women, peasants, workers and Indigenous Peoples have equal opportunities in FAO's initiatives to participate in scientific advancement?** **Does FAO take into account their knowledge and data?**
Right to have access to information concerning the risks and benefits of science and technology.[69]			**Does FAO provide information on the risks and benefits of new technologies to women, peasants, workers and Indigenous Peoples?**
Gender-sensitive approach to scientific research and new technologies.[70]			**Does FAO apply a gender-sensitive approach in its data governance and digital initiatives?**

Right to Science as in GC 25	CFS Policy Recommendations on Data	GPAI Data Justice Framework	Questions
Protection of indigenous knowledge, FPIC, participation in intercultural dialogue for scientific progress and right to self-determination.[71]	Support the effective, inclusive and meaningful participation of those who generate and manage these data, information, and knowledge, while respecting their human rights and protecting their traditional knowledge, innovations and practices.[72] Establish effective national multi-sectoral and multistakeholder FSN mechanisms responsible for guiding FSN policy and program for national development planning and for setting local, national, regional and global priorities. Such mechanisms should ensure that Indigenous Peoples, small-scale food producers, consumers' organizations, those in vulnerable situations and those subject to various forms of discrimination have an active and well-defined role in determining priorities.[73] Elaborate national plans, through participatory processes and approaches, to define priorities for FSN data collection and analysis, to be integrated in their national strategies for the development of statistics, and to improve and optimize existing national FSN data systems, taking into account the different types of data from different sources.[74]	Democratic participation of affected communities: Data justice requires policymakers to identify the full set of stakeholders who might be impacted by data collection and use, and data-driven activities. Individual and collective data subjects, as well as primary data generators, are essential stakeholders. Their participation must be built-in democratically to the design, development and deployment of data-intensive systems, including AI.[75]	**Is FAO protecting indigenous knowledge?** **Is FAO applying FPIC?** **Does FAO have a mechanism for Indigenous Peoples to participate in defining priorities for FAO's initiatives?** **Does FAO promote intercultural dialogue for scientific progress?**
Protection of peasant knowledge, right to determine their own food and agriculture systems (right to food sovereignty), right to choose which technologies suit them best.[76]		Enabling alternative forms of data sharing/stewardship: Equitable access to data can be achieved through responsible data sharing models such as access to data, or data commons, in managed safe conditions. Vehicles such as data trusts or data cooperatives can be empowered to manage data in the collective interest.[77]	**Is FAO protecting peasant knowledge?** **Is FAO observing the right to active, free, effective, meaningful and informed participation of peasants in defining priorities for FAO's initiatives and all matters that may affect their rights?** **Does FAO support the right of peasants to choose which technologies suit them best?**
Transparency & Participation: Essential to maintain scientific objectivity, prevent undue influence, and align with human rights and the welfare of society. [78]	Multi-sectoral FSN mechanisms should take into consideration existing power imbalances between different actors.[79]	Transparency in data practices and systems: Those with power in processes of collection use of data and data-driven innovation should be obliged to make information publicly available about what data is collected and how it is used, including information about AI inputs, and algorithms, and to provide this information directly to impacted individuals and communities.[80]	**How is FAO preventing undue influence of powerful actors?** **What safeguards has FAO put in place to address power imbalances and set standards of engagement with the private sector?**

Criteria for digital public goods and infrastructure

For assessing the design of FAO's DPGs and DPIs, we take as reference the notion of 'public' in international human rights law, as well as at the conceptual work of economists David Eaves, Mariana Mazzucato and Beatriz Vasconcellos. We have combined both frameworks to identify the criteria for truly public digital goods and infrastructures.

Human Rights Standards for Public Services[81]	Pillars for Public Digital Infrastructures[82]	Questions
Accessible to all, without discrimination: States must actively remove barriers so the most vulnerable or disadvantaged people can access services.	Purpose and directionality: Setting an ambitious direction towards which policies may be designed, public-private partnerships formed and citizens engaged.	**What is the purpose and directionality of FAO's public goods and digital infrastructure?** **Are FAO's DPGs accessible to all?**
	Access for all and reward-sharing: Ensuring that public value is distributed equitably (inclusive growth).	**Is the public value of FAO's DPGs equitably distributed?** **Does FAO have clauses that prevent the undue appropriation of FAO's data by private actors?**
Responsive to the needs of those they serve and culturally appropriate.	Collective learning and knowledge-sharing: Rethinking institutional practices that support collective learning and build long-term capabilities and capacities.	**Are FAO's DPGs responsive to the needs of disadvantaged groups?** **Does FAO have processes of assessment and feedback that support collective learning about its DPGs?**
Participatory: States must ensure that vulnerable and disadvantaged groups are involved in the provision of public services, including by ensuring that such groups are represented in the design of and decision-making regarding public services.	Co-creation and participation: Defining the rules and mechanisms for co-investment, collaboration and coordination involving a diverse group of societal actors.	**Have FAO's DPGs' rules and mechanisms for co-investment, collaboration and coordination involving member states, private sector, civil society and Indigenous Peoples, research institutions been co-created?** **Have disadvantaged groups been involved in the design of and the decision-making regarding FAO's DPGs?**
Adequate services: States must ensure that public services are of a sufficient quality.		**Are FAO's DPGs adequately supported with public funds?**
Adequately funded: States are required to allocate sufficient funding to ensure the provision of quality public services.		
Transparent: States must ensure access to information regarding the quality and terms of conditions of providing public services.	Transparency and accountability: Winning and retaining citizen's trust in tracking progress through practices that show commitment to transparency and accountability.	**Does FAO disclose the terms of collaboration with digital service providers?** **Does FAO have adequate accountability mechanisms in place regarding the functioning of its DPGs?**
Accountable: States are required to establish regulatory mechanisms or bodies to ensure the respect of human rights in public services.		

Annex 2: Questionnaire for interviews

On IT infrastructure

1. How is the IT infrastructure of a UN agency such as FAO structured? What are the main features of FAO's IT infrastructure?

2. FAO's IT facilities

    -   Does it have its own servers and data centers?
    -   FAO Data Center: Is it still in place? How was it restructured?

3. What storage solutions does FAO use?

4. Does the storage solution depend on the type of data?

5. Why does FAO use .StatSuite as a dissemination platform for statistics?

6. FAO has adopted cloud computing and opted for a multi-cloud ecosystem. Which clouds are part of the FAO ecosystem?

    -   Under what terms of use?
    -   For how long are these agreements?
    -   What is the UN Cloud Alliance? What is FAO's role in it?
    -   Cloud Computing Risk Assessment (CCRA), what is this about?
        -   * Does CCRA take into account structural vulnerabilities and risk to societies?

7. What are the criteria for selecting types of clouds (public, hybrid, private, non cloud)?

    -   Guidelines on the use of Cloud Computing and Risk Assessment Process.

8. What is the nature of collaboration with the UN International Computing Center?

    -   Does FAO use UNIQCloud? If so, what for?

9. How does FAO assess the risks of structural vulnerabilities for LMICs? Lock-ins and dependencies on private companies based in other countries? Do FAO digital platforms run the risk of entrenching the power of Big Tech companies?

10. Does FAO have any plans regarding the WSIS+20?

On Data protection

1. How does FAO protect non-personal data of peasants, Indigenous Peoples, women, workers in food systems?

2. How long are personal and non-personal data retained?

3. Are service providers required to obtain consent from peasants or Indigenous Peoples before sharing and /or transferring personal and non-personal data to third parties?

4. Is the right to data portability ensured in these services?

5. Do FAO and GEE use the data collected through these services and for what purposes?

6. Is there a classification about which non-personal data FAO is collecting?

   - Statistics Division's longstanding functions of producing statistics in the areas of crops, livestock and food statistics (agricultural production, trade and food balance sheets); food security and nutrition statistics; social and economic statistics; and environment statistics.

7. How is this data protected from commercial use and private appropriation of benefits?

8. What are FAO's views on the proper balance between protecting the rights of particular groups, particularly those holding different forms of traditional knowledge, (including Indigenous Peoples, peasants, small-scale fishers and consumers), and promoting open access to data in a global research environment?

9. Does FAO have governance mechanisms that enable Indigenous Peoples, peasants, small-scale fishers and others groups holding traditional knowledge to have control over their data?

10. How to protect farm data considering concerns such as :

    - Growth of big data in farming, the possibility of losing control of own's data when uploading to cloud-based storage, complex legal agreements with digital services/Big Data providers.
    - Concerns about misuse of data by integrators in the supply chains who deanonymize farm-level production data in order to impose price fixing.

On Statistics

1. What are the processes of modernization and innovation of corporate statistics about?

2. How will the use of Big Data and Earth Observation/geospatial data improve statistics work/generation? What are the challenges here?

3. Does FAO have access to data of public interest stored by private companies?

4. How does FAO go about defining priorities and data needs?

5. How does FAO go about ensuring that civil society, academia, Indigenous Peoples, local communities, those in vulnerable situations and those subject to various forms of discrimination, have an active and well-defined role in determining priorities for better production and use of data in FSN decision-making?
   - What are the good practices in this regard?

6. Has FAO established inclusive, participatory multi-stakeholder processes to discuss the development of FSN data principles that support the realization of the right to adequate food?

7. How is the interplay of different forms of knowledge and non-quantitative information with data and statistics for decision-making assessed ?

On Smallholder/Family farmers

1. Provide an overview of digital tools used by FAO for smallholders.

2. How does FAO go about identifying priorities in this field? Which digital tools are developed?

3. How is FAO's work assessed in this area?

Annex 3: Overview of FAO's major digital initiatives

Initiative	Brief Description
1. Hand in Hand Geospatial Platform	Flagship initiative launched in 2020. It integrates geospatial and statistical data. This open-access platform unlocks over 2 million data layers from open-access geographic information integrated with information from external organizations and over 20 FAO units across multiple domains (e.g. food security indicators, agricultural statistics, soil, land, water, forests, climate, fisheries, livestock, animal health, food prices, trade, markets, etc.).
2. Agro-Informatics Platform	Overarching platform developed to integrate geospatial and statistical data, leveraging technologies like AI and ML. This platform serves as a central hub for various digital initiatives and projects within FAO and its member states. Some of those are: • Soil mapping for resilient agrifood systems in Central America and sub-Saharan Africa (SoilFER) - Mobile application for soil data acquisition and extension/farmer advisory services. • Empress Global Animal Disease Information System – EMPRESS-i • Early Warning Systems, region-wise or issue-wise such as the Rift Valley Fever (RVF) early warning decision support tool which integrates near real-time RVF risk maps with geospatial data, RVF historical and current disease events from EMPRES Global Animal Disease Information System (EMPRES-i) and expert knowledge on RVF eco-epidemiology.
3. Open Foris	Set of free and open source software tools and platforms developed to assist countries in measuring, monitoring, and reporting on forestry progress. Key components of Open Foris are: Arena: A cloud-based platform for storing and processing data collected in field inventories or questionnaires. Earth Map: Provides access to various datasets covering climate, vegetation, land degradation, water, forestry, and biodiversity. It enables complex analysis of earth observation and climate data without prior knowledge of remote sensing or GIS. Whisp: An open source solution designed to produce relevant forest monitoring information and support compliance with deforestation-related regulations, built on interoperable open standards with publicly available code on GitHub. System for Earth Observation Data Access, Processing and Analysis for Land Monitoring (SEPAL): Offers users access to satellite data, paving the way for improved climate change mitigation plans and land-use policies using these data.

4. Strata	Geospatial platform that integrates various sources of data to help identify and track where environmental, climate, and security stresses converge with socio-economic vulnerabilities and instability. Developed by FAO and UNEP.
5. Data Lab for Statistical Innovation	Initiative to fill information gaps and enhance statistical work by improving the timeliness and granularity of data collection, increasing the use of methods and technologies to extract data from unstructured sources (such as web scraping, text analytics, data validation and statistical modelling). The Data Lab supports the work of the Hand in Hand Initiative (HiH initiative) producing data using text mining tools in contexts where little data are available, typically in the HiH priority countries and at a sub-national level; using a big data approach to produce vulnerability maps in countries in crisis where up-to-date poverty maps are not available. Some of their projects are:
	Geospatial Data in Agricultural Statistics Over the last 10 years, FAO assisted around 70 countries in producing national land cover databases and crop forecasts by using Earth Observation data, through: • FAOSTAT Land Cover statistics: It contains land cover information organized by the land cover classes of the international standard system for Environmental and Economic Accounting Central Framework. • FAOSTAT statistics on Drained organic soils: These are computed geospatially and provide estimates related to the area drained for agricultural production and the associated greenhouse emissions (drainage produces a large amount of greenhouse gases into the atmosphere). • FAOSTAT statistics on greenhouse gas emissions from fires: Computed geospatially from NASA MODIS information on burned areas and from thematic agro-climatic maps, through cloud computation in the Google Earth Engine platform. • FAO is developing a new tool for estimates on agricultural production linking satellite imagery to agriculture mapping and crop assessment.
	Nowcasting Food Prices and Daily Food Prices Acceleration Monitor The Data Lab is now casting monthly food inflation and monitoring daily price accelerations using daily updated information.
	UN Food Systems Summit Analysis Using text mining tools to extract, summarize, organize, and categorize information the Data Lab highlights current priorities that countries have defined to be the pillars of their food systems transformation and finds commonalities across country programs.
	MetroPolicy and enhancing FAOLEX The Data Lab developed the MetroPolicy indicator that measures how decisions reflected in national planning documents are supported through the use of statistics. Likewise, the Data Lab created a tool based on machine learning methods to automatically classify and qualify new documents in FAO's database containing national policies and bilateral agreements concerning food, agriculture, and natural resources management, drawn from more than 200 countries and originating in over 40 languages.
	Food Loss and Waste (FLW) database It is the largest online collection of data on reports measuring food loss and food waste. The Data Lab scrapes the web to automatically identify openly accessible reports and studies and uses Natural Language Processing (NLP) procedures to identify food products, stages of the value chain, and geographical areas, and quantities.

6. FAOSTAT	FAOSTAT provides free access to food and agriculture data for over 245 countries and territories and covers all FAO regional groupings from 1961 to the most recent year available. AQUASTAT is the FAO global information system on water resources and agricultural water management. It collects, analyses and provides free access to over 180 variables and indicators by country from 1960. FishStat is the leading source of global fishery and aquaculture statistics. The FAODATA explorer is FAO's new dissemination platform to access, filter, explore, download and share FAO statistics. The platform is currently a beta version as it is under development and will gradually be populated with existing FAO statistics. FAODATA explorer includes SDG data of the 21 indicators under FAO custodianship.
7. FAO WaPOR	Portal to monitor Water Productivity through Open access of Remotely sensed derived data (WaPOR). The portal provides open access to near-real time information on key land and water variables and is intended to assist countries in developing their capacity to monitor and improve water and land productivity in agriculture, both rainfed and irrigated.
8. FAO Digital Services Portfolio	Cloud based platform designed to disseminate information in the food and agriculture and related sectors and agricultural services for smallholders and family farmers, fostering digital inclusion and digital agricultural advisories. Some of the projects developed here are: • RECSOIL app is a mechanism for scaling up sustainable soil management (SSM) with a focus on increasing soil organic carbon (SOC) and improving overall soil health. • A series of apps have been developed here such as El Rafidain for agricultural extension in Iraq, SAIDA in Senegal, El Mufeed in Egypt, Muzare in Jordan, Hinga-Worore in Rwanda, among others.
9. Family Farming Knowledge Platform	This platform compiles digitized information on family farming from across the globe, covering national laws and regulations, public policies, best practices, key data and statistics, research studies, articles, and publications. It serves as a centralized hub for international, regional, and national resources on family farming, with active collaboration of its contributors including governments, United Nations agencies, farmers' organizations, research centres and academia with the common goal of promoting a shift towards more equal and balanced development.
10. Identification, Delivery and Empowerment Application (IDEA)	FAO developed a digital ecosystem of applications to deliver assistance in food crisis countries. IDEA facilitates secure beneficiary registration, identity verification at the point of distribution, entitlements delivery and tracking, data reporting and visualization. IDEA builds on more than 10 years of development and implementation in Somalia. FAO is using it in 12 food crisis countries: Afghanistan, Burkina Faso, Central African Republic, Democratic Republic of Congo, Ethiopia, Kenya, Malawi, Mali, Mozambique, the Philippines, Uganda and Ukraine.
11. FAO Artificial Intelligence Initiatives	FAO is the co-chair of the Focus Group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A) together with ITU. This group is part of the Inter-agency Working Group on Artificial Intelligence (IAWG-AI). FAO has already identified several areas of specific interest related to its mandate. In several cases it is already using AI and Machine Learning as for instance in WaPOR, in the application and platform on Fall Armyworm Control, in the detection of agricultural stress and in early warning systems. New initiatives are under development such as an AI assistant for emergencies and resilience based on the LLM GPT-4 to assist users in finding information on the Data in Emergencies Hub. AMIS aims to use AI to identify early-warning indicators of market risk. Furthermore, there is an ongoing pilot of an LLM to create an intelligent search of policy databases, such as FAOLEX.[83] FAO is part of the project AgriLLM together with the Technology Innovation Institute (TII), The World Bank, International Fund for Agricultural Development (IFAD), Food and Agriculture Organization of the United Nations (FAO), CGIAR, and the Bill & Melinda Gates Foundation.
12. FAO Science, Technology and Innovation Portal	New interoperable and open access gateway to information and resources on agri-food systems science, technology and innovation (STI) from within and beyond FAO. The portal is currently under development.

Annex 4: List of FAO's major collaborators

Based on the two FAO reports which provide an overview of FAO's digital initiatives84 as well as additional information from FAO's website collated in the previous section, it is possible to sketch a network of FAO's collaborators as follows:

International organizations and UN agencies:

- For its HiH Geospatial Platform, FAO has signed formal data-sharing agreements with the **World Bank Group, International Labour Organization** (ILO), **International Telecommunication Union** (ITU), **World Trade Organizatio**n (WTO), **World Health Organization** (WHO), **World Food Programme** (WFP), **International Fund for Agricultural Development** (IFAD) and **Inter- American Development Bank** (IDB).

- The **United Nations Environment Programme** (UNEP) jointly developed with FAO Strata, a web-based geospatial data platform that identifies and tracks where environmental, climate, and security stresses converge with socio-economic vulnerabilities and instability.

- **Group on Earth Observations** (GEO) is an intergovernmental body dedicated to co-producing information, ranging from satellite images of forests to oceanic temperature readings for ecosystems monitoring. The Global Forest Observation Initiative is a flagship program of GEO. Its secretariat is hosted at the FAO.

- The **United Nations Committee of Experts on Global Geospatial Information Management** (UN-GGIM) involves FAO in discussions on geospatial information use and policy-making.

- The **United Nations Environment Programme World Conservation Monitoring Centre** (UNEP-WCMC) is a future collaborator with the HiH Platform on administrative boundaries.

- The **United Nations Framework Convention on Climate Change** (UNFCCC) was involved in the development of the Nationally Determined Contributions Agriculture and Transparency Assessment navigator.

- The **World Organisation for Animal Health** (WOAH) is a partner with FAO on the InFARM data platform and developed the Rinderpest mobile application.

- The **United Nations International Computing Centre** (UNICC) - collaboration on cybersecurity, including enhanced incident detection and response, threat intelligence, and participation in the Common Secure network.

- The **International Telecommunications Union** (ITU) co-chairs with FAO the Focus Group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A), which serves as an open platform for exploring the potential of AI and the IoT to support innovative practices for agricultural

production processes, in the Inter-agency Working Group on Artificial Intelligence (IAWG-AI). Moreover, it has partnered with FAO's Regional Office for the NENA region for the FAO-ITU Digital Agriculture Solutions Forum 2023.

- The **International Atomic Energy Agency** (IAEA), through the Joint FAO/IAEA Centre, collaborates with FAO on linking nuclear and digital techniques in food and agriculture. In particular, there is an FAO/IAEA Open Data Platform, with a focus on data analytics and early warning systems in response to large-scale nuclear emergencies affecting food and agriculture and, in particular, soil moisture estimation.

- The **World Health Organization** (WHO) is a partner with FAO on the Global Individual Food consumption data Tool (FAO/WHO GIFT).

- The **United Nations Office on Drugs and Crime** (UNODC) led the UN Open GIS Geo-AI Challenge with FAO; collaborated on the 2023 Geo-AI Challenge on cropland mapping.

- The **UN Capital Development Fund** (UNCDF) partnered with the African Development Bank ADB and FAO to map the digital landscape in the United Republic of Tanzania.

- **UN Open GIS initiative**, where FAO co-chairs Working Group 5 on Geo-AI, involves collaboration to promote AI in geospatial IT.

- **UN Global Pulse** collaborated with FAO, Politecnico Milano, and ITU on the Geo-AI challenge.

- **Consultative Group on International Agricultural Research** (CGIAR) - Technical collaboration with FAO and ITU for the FAO-ITU Digital Agriculture Solutions Forum 2023

- The **European Space Agency** collaborates with FAO, particularly on forest monitoring.

Alliances and initiatives:

- The **Digital Public Goods Alliance** (DPGA): FAO joined this alliance and collaborates on topics such as climate services and digital financial inclusion, and will co-chair a new community of practice on food security.

- **AWS UN Cloud Alliance**: In collaboration with AWS, FAO launched a UN Cloud Alliance on 27 June 2023 in Rome. The event brought together seven United Nations agencies under the FAO umbrella, including the World Food Programme, World Intellectual Property Organization, International Telecommunications Union, the United Nations International Computing Centre , the United Nations Joint Staff Pension Fund and the United Nations High Commissioner for Refugees with the aim to collaborate and share knowledge to shape the common future of technology implementation within the United Nations ecosystem.

- **AI for Good**: Managed by the ITU in partnership with 40 other United Nations System organizations, including FAO, is a digital platform where AI innovators collaborate to identify and develop practical AI applications to advance the SDGs and scale up those solutions for global impact.
- **UN OpenGIS initiative**: FAO is a member of this initiative, co-chairing the UN OpenGIS Working Group 5 on Geo-AI to promote artificial intelligence innovation and applications in geospatial IT.

Universities and research institutions:

- **Catholic University of Louvain** (UCLouvain) collaborates with FAOSTAT Land Cover statistics.

- **Mississippi State University** (United States of America) renewed their Memorandum of Understanding with FAO to enhance informatics and technologies for sustainable agri-food systems through knowledge transfer in areas like GIS, remote sensing, AI, precision agriculture, and UAVs.

- **European Union Joint Research Centre's** representative participated in the 'Digitalization for Resilience' event; participated in the 'AI and digital tools for climate resilient agri-food systems'event at the Science and Innovation Forum.

- **ETH Zürich and Wageningen University & Research** collaborate in the context of developing forest monitoring applications and platforms.

- The **US National Aeronautics and Space Administration** (NASA) collaborates with FAO providing information to be able to produce FAO statistics on greenhouse gas emissions from fires

- The **University of Southampton** collaborates with FAO through HiH to extend multi-hazard and vulnerability datasets for Small Island Developing States (SIDS).

- The **Technical University of Denmark** partnered with FAO on a graduate-level thesis related to machine learning for extracting insights from project documents.

- **Politecnico Milano** collaborated with FAO, UN Geospatial Unit, UN Global Pulse, and ITU on the Geo-AI challenge.

- The Mediterranean Agronomic Institute of Bari (CIHEAM Bari) introduced in collaboration with FAO the **XylApp** and **XylDatabase** digital tools in NENA countries with the aim of enhancing capacities to prevent the introduction and spread of xylella fastidiosa – olive quick decline syndrome in NENA countries.

Private sector and companies:

- **Gates Foundation** (formerly Bill & Melinda Gates Foundation) provides support for several initiatives, including improvements of the Geospatial Platform, the Food and Agriculture Microdata (FAM) Catalogue.

- **Google**

  * Partnership with Google Earth Engine. Free access for FAO to GEE and its geospatial data catalogue, compute power and data storage. Collaboration to develop a series of apps of the platform Open Foris.

  * Google Cloud Platform, one of the main clouds that FAO uses for its IT infrastructure.

- **Amazon Web Services** is one of the main clouds that FAO uses for its IT infrastructure.

- **Microsoft**

  * Azure, one of the main clouds that FAO uses for its IT infrastructure

  * Signatory of the Rome Call for AI Ethics with FAO, IBM, and the Pontifical Academy.

- **Oracle** is one of the main clouds that FAO uses for its IT infrastructure.

- **AI71** is a company using open source LLM models such as Falcon to develop AI-powered enterprise solutions. This company was launched by the Advanced Technology Research Council of Abu Dhabi. Together with FAO, IFAD, CGIAR, the World Bank, the Gates Foundation and the Technology Innovation Institute, they are developing AgriLLM which is an AI-based initiative for agriculture launched at UNFCCC COP 29.

- **Syngenta** provided access to its datasets for the Food and Agriculture Microdata (FAM) Catalogue.

- **Afrikinnovations** is an African company working with ANCAR in Senegal on rural development.

- **Tolbi** is an African company working on the digitalization of agriculture in Senegal and partnered with ANCAR.

- **Collins Bartholomew's GSMA Mobile Coverage Explorer database** was used to derive the World Mobile Broadband coverage data.

- The **GSMA** is the source of data for mobile broadband coverage.

- **ESRI** and **QGIS** are mentioned as Desktop GIS software used in HiH GIS analysis training.

- **Forest Data Partnership** is a multistakeholder collaboration on global monitoring of commodity-driven deforestation, forest degradation and restoration efforts across the globe. Partners: EU, GIZ, FAO, World Resources Initiative, Unilever, Servir, NASA, Google, Spatial Informatics Group.

- **Livestock industry associations** in Kazakhstan partnered with FAO and EBRD to create a dedicated app for advisory services.

- **Association of Producers (Kazakhstan)** partnered with FAO and EBRD on the development of the advisory app.

Financial Institutions and development partners:

- The **Asian Development Bank**, IHE Delft Institute and the International Water Management Institute (IWMI) have worked together to integrate spatially disaggregated data and trends in water availability, consumption and productivity in key selected areas in the world.
FAO is responsible for the further integration and publication of the data online, through the AQUAMAPS Water Accounting portal.

- In another partnership with **ADB** and FAO's resilience team for East Africa, a unified framework is being designed for building national farmer registries for Burundi, Comoros, Somalia and South Sudan, potentially building on the Identification and Delivery for Empowerment Applications (IDEA) platform, which is already present in Somalia and South Sudan.

- The **African Development Bank** supported the Zimbabwean Emergency Food Production Project, under which the EOSTAT project was included. AFD also supported the mapping of the digital landscape in the United Republic of Tanzania with the goal of selecting a suitable national farmer registry for upscaling nationally.

- The **European Bank for Reconstruction and Development** (EBRD) partnered with FAO and livestock industry associations in Kazakhstan to create a dedicated app for advisory services in milk and meat production; collaboration on a COVID-19 responsiveness package for agribusinesses in EBRD's countries of operation.

- The **Swedish International Development Cooperation Agency** funded the project integrating Water Productivity Open-access Portal data into the Irrigation Reference for Enhanced Yield app.

- The **World Bank** collaborated on several initiatives, for instance, on the Agri LLM project, on the initiative 50x2030 which is about improving agricultural country data

- The **United Kingdom of Great Britain and Northern Ireland** launched with FAO AIM4Forests, a five-year programme aimed at forest monitoring using modern monitoring technologies such as space data and remote sensing.

- **Norway's International Climate and Forest Initiative** as part of the NICFI Satellite Data Program, Norway supported financially the SEPAL project of FAO.

- The **United States of America** collaborated through the **Silva Carbon program**, an interagency technical cooperation program for building capacities on forest monitoring. The US Department of State funds the SoliFer project.

- Japan International Cooperation Agency, Kreditanstalt Für Wiederaufbau, German Ministry of development Cooperation, Ministry of Foreign Affairs Finland in the context of the SEPAL project.

Governmental and national agencies:

- **Kenya:** The Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MoALF&C) and the Agricultural Transformation Office (ATO) collaborated with FAO on the development and piloting of the Kenya Integrated Agriculture Management Information System (KIAMIS). County ICT and agricultural officers in Kenya were also involved.

- **Tanzania:** The Ministry of Livestock and Fisheries, the Tanzania Food and Nutrition Centre (TFNC), and the Tanzania Meteorological Authority (TMA) collaborated with FAO on the Digital Services Portfolio (DSP) in the United Republic of Tanzania.

- **Rwanda:** The Ministry of Agriculture and Animal Resources requested regular FAO support to develop strategies of ICT in agriculture. It was one of the first pilot countries to launch the Digital Services Portfolio. Comprehensive training with Rwanda Water Resources Board and other agencies on the use of Earth observation for land-cover mapping.

- **Zambia:** The Smart Zambia Institute for Government runs one version of the Integrated Agriculture Management Information System (FSMS).

- The departments of **veterinary services in Kenya, Uganda, and the United Republic of Tanzania** collaborated with FAO on the development of the Rift Valley Fever-Decision Support Tool (RVF-DST).

- **Senegal:** FAO support to the National Consulting Agency Agricultural and Rural (ANCAR) which has launched the e-advisory services of Agricultural Services and Digital Inclusion in Africa (SAIDA) initiative and the GIS-driven e-Tolbi platform.

- **Zimbabwe:** The EOSTAT project seeks to improve the collection and use of crop and climatic data to monitor the status of agricultural production in real time, to forecast climate-driven disasters and to assess their impacts. These datasets will be integrated into initiatives led by the Government of Zimbabwe, including the farmer registry and disaster risk reduction.

- **Egypt:** The FAO digital app El-Mufeed in Food and Agriculture was launched in 2019.

- **Jordan:** The Ministry of Agriculture (MoA) collaborated with FAO on the creation of the JIAMIS farmer registry and voucher system and the implementation of the Digital Service Portfolio. The National Agricultural Research Centre (NARC) is a close collaborator in the implementation of the Digital Service Portfolio (DSP) and the development of the NARC Data Repository System (DRS) and e-LAB. Moreover, two acoustic detection devices (Palmprotect and Palmear) of the RPW larvae have been trialed in Jordan.

- **Tunisia:** The Ministry of Agriculture was involved in preparatory steps for the introduction of the DSP. The National Institute of Field Crops developed the IREY smart irrigation app and integrated reference evapotranspiration data from the FAO WaPOR platform.

- **The Government of Azerbaijan:** Joint initiative with FAO for the International Conference on Digital Agriculture.

- **Georgia:** The National Food Agency collaborated with FAO on the pilot implementation of the Locust Pesticide Management System (Locust-PMS). The same project was developed in Morocco and Yemen.

- **Iraq:** El Rafidain for Agriculture Extension app was developed and introduced with three themes: AgriMarketPlace, plant production, livestock and the farmer's forum.

- **Bangladesh** has been using the DSP framework to develop an app for fresh markets, adding new capabilities, replicating the behaviour of Google Maps.

- **Sri Lanka:** The Ministry of Agriculture - FAO developed a comprehensive e-extension platform – the Smart Extension and Efficient Decision-making (S.E.E.D.) Hub – to support advisory services for rice production.

- **Ecuador:** The EOSTAT project was implemented in collaboration with the country's Ministry of Agriculture (MINAGRI). The innovation sparked by the project consisted of integrating EO data into a physical-based crop growth model, the System Approach to Land Use Sustainability (SALUS). SALUS was calibrated for maize and rice using 10 years of historical crop yield data. As a result, high-resolution crop yield maps (10m) were produced for Ecuador for 2018-2023.

- Training events on the Hand in Hand Initiative – Geospatial Platform with ministries from a series of countries such as Cabo Verde, Ecuador, Nicaragua, Rwanda, Sao Tome and Principe, Tanzania.

Regional organizations

- **The Southern African Development Community** (SADC) and FAO have unveiled together the first SADC Agricultural Information Management System (AIMS), a platform to generate agricultural data for the region's evidence-based decision-making. FAO was involved throughout the year in reviewing and contributing to the SADC technical road map, including the linking of the project to HiH resources.

- **European Union**

  * funded the MADAD Fund, which supported the creation of JIAMIS, and is a partner in a project to Digitalize Land Records in Kenya.

  * Cooperation between FAO and the Copernicus Climate Change Service (C3S), which combines observations of the climate system with the latest science to develop authoritative, quality-assured information about the past, current and future states of the climate in Europe and worldwide. The European Centre for Medium-Range Weather Forecasts (ECMWF) operates C3S on behalf of the European Union.

  * Co-funding of Strata, the joint web-based geospatial platform to track environmental, climate, security and socio-economic vulnerabilities.

- **United Nations Global Platform Regional Hub in Hangzhou**- The platform allows statisticians, data scientists and other researchers from different countries and locations to work together on projects, for example, the use of satellite data to estimate crop production and the use of mobile phone data for tourism statistics and migration.

Endnotes

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3. Food and Agriculture Organization of the United Nations. (2022). FAO science and innovation strategy. Rome. https://openknowledge.fao.org/server/api/core/bitstreams/e9d1ee6c-c0f1-4312-9a1a-c09ba0a4fbdc/content

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5. High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. (2022). Data collection and analysis tools for food security and nutrition: Towards enhancing effective, inclusive, evidence-informed decision making. https://openknowledge.fao.org/server/api/core/bitstreams/ab8bba96-365d-4a7f-ae9f-557e9c778f2f/content; Jouanjean, M., et al. (2020, October 23). Issues around data governance in the digital transformation of agriculture: The farmers' perspective (OECD Food, Agriculture and Fisheries Papers No. 146). OECD Publishing. http://dx.doi.org/10.1787/53ecf2ab-en; Chichaibelu, B. B., Baumüller, H., & Matschuck, M. A. (2023). Protecting the data of African agricultural producers: A review of national laws, compliance and perceptions. Law, Innovation and Technology, 15(2), 617–661. https://doi.org/10.1080/17579961.2023.2245673 ; Fairbairn, M., & Kish, Z. (2023). Setting data free: The politics of open data for food and agriculture. New Media & Society, 25(8), 1935–1959. https://doi.org/10.1177/14614448231174520; Ruder, S. L., & Wittman, H. (2025). Agricultural data governance from the ground up: Exploring data justice with agri-food movements. Big Data & Society, 12(1). https://doi.org/10.1177/20539517251330182

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9. UN Committee on World Food Security .(2023). Policy recommendations on strengthening collection and use of food security and nutrition data. https://www.fao.org/fileadmin/templates/cfs/policy-products/Policy_Products_2024/Strengthening-Collection-2024_En.pdf

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11. United Nations. (1966). International Covenant on Economic, Social and Cultural Rights. https://www.ohchr.org/en/instruments-mechanisms/instruments/international-covenant-economic-social-and-cultural-rights

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13. In the realm of international law, a public good is traditionally defined as a good that is non-excludable, which means that no one can be effectively excluded from its use; and non-rivalrous, which means that one party's use does not diminish another's. Framing the concept of 'public' in DPGs in international human rights law implies that these goods, beyond being open to the public, shall neither in law nor de facto exclude, discriminate or harm any group or individual, particularly any marginalized or disadvantaged group. Furthermore, the way in which DPGs are regulated should not allow one party (e.g. digital service providers) to take advantage of, or harm any other less powerful group in the present or in future generations. The regulations of public goods shall be oriented by the principle of public interest in international law (rooted in political philosophy, constitutional and human rights law), which implies that any actions, principles or regulations shall benefit the general welfare of society vis á vis individual interest. In this line, they shall give priority to human rights, in line with articles 103, 55 and the preamble of the UN Charter.

To ensure that DPGs comply with the conditions of international public goods, the principle of public interest and states' international human rights obligations in the context of power imbalance, inequalities and digital divide, any use or regulation of DPGs may require measures that allow correcting discrimination or substantial inequality, protecting human dignity and caring for the environment. It may also require the availability and protection of public/community digital infrastructure networks and services. The UN Human Rights System has developed a normative framework on state's human rights obligation regarding public services. See Annex 1 and Global Initiative for Economic, Social and Cultural Rights. (2020, October 19). States' human rights obligations regarding public services: The United Nations normative framework (Policy brief). https://gi-escr.org/images/documents/ONU_DOC_3.pdf.

14. Eaves, Mazzucato and Vasconcellos contend that defining 'public' in Digital Public Infrastructure involves inherent values and assumptions about impact. They present two analytical frames: the attributes perspective, which emphasizes technical benefits like interoperability and open standards, prioritizing efficiency and scalability while remaining neutral about outcomes; and the functional perspective, which focuses on concrete societal benefits like economic activity and human rights fulfillment. While combining these perspectives enhances public value potential, the authors argue both neglect governance and the state's active role in maximizing public benefit. They propose a 'common good' framework that stresses both the process and outcomes of value creation, advocating for states to act as market shapers and co-investors rather than mere regulators. This approach aims to preserve public sovereignty, maintain essential capabilities, and prevent corporate capture of critical public functions. See Annex 1 for the five pillars of this framework that public institutions must guarantee for shaping truly public digital infrastructures. Eaves, D., Mazzucato, M., & Vasconcellos, B. (2024). Digital public infrastructure and public value: What is "public" about DPI? UCL Institute for Innovation and Public Purpose. https://www.ucl.ac.uk/bartlett/sites/bartlett/files/iipp_wp_2024_05.pdf

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19. Food and Agriculture Organization of the United Nations. (2022). Governance of FAO's statistical and other data activities and their alignment with the cross-cutting FAO policies on protection of data and intellectual property rights: Proposal for improved internal coordination and alignment with corporate policies on data protection and intellectual property rights (FAO Council, 170th session, 13–17 June 2022, CL 170/18, para. 24).

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22. Food and Agriculture Organization of the United Nations. (2020). Evaluation of FAO's statistical work (Program Committee, PC 128/5; Rome, 18–22 May 2020); Interview with FAO officials, Rome, March 3, 2025.

23. This group includes five Assistant Directors-Generals, the Chief Scientist, the Chief Statistician, the Director of Digitalization and Informatics Division, and two rotating Directors. It oversees data policies, prioritizes use cases, allocates resources, resolves issues, and represents FAO in UN data governance. Food and Agriculture Organization of the United Nations. (2021). Proposal for improved governance of FAO statistical activities (Programme Committee, 132nd session, PC 132/5, paras. 10–11; Rome, 8–21 November 2021). https://openknowledge.fao.org/server/api/core/bitstreams/0b86013a-1325-46e6-b8bb-a164910a089d/content

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26. Food and Agriculture Organization of the United Nations. (2022, 8 July). Administrative circular No. 2022/06: Data protection policy.

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28. Food and Agriculture Organization of the United Nations. (2023, March 31). Administrative circular No. 2023/07: FAO policy on intellectual property rights. https://www.fao.org/fileadmin/user_upload/legal/docs/AC2023.07_.pdf

29. In this section, we address the following questions developed in the analytical framework of this study (Annex 1): Is FAO contributing to develop data rights frameworks for Indigenous Peoples, peasants, women and workers? Is FAO protecting traditional knowledge of Indigenous Peoples and peasants? Is FAO applying the right to free, prior and informed consent of Indigenous Peoples and the right to active, free, effective, meaningful and informed participation of peasants in this context? Does FAO apply a gender-sensitive approach in its data governance?

30. Non-personal data include inter alia data related to production (crops, yields, breeds, etc), ecosystems and environment (land, soil, water, forest, fisheries, etc), climate, agronomic practices, machine and equipment, supply chains.

31. Food and Agriculture Organization of the United Nations. (2022, July 8). Administrative circular No. 2022/06: Data protection policy (para. 9). https://www.fao.org/fileadmin/user_upload/legal/docs/AC2023.07_.pdf

32. "Non-Personal Data means any information of a financial, technical, or operational nature that does not relate to an identified or identifiable individual. Non-personal data includes, for example, financial reports, commercially sensitive data of a vendor, or data containing security sensitive information disclosed by Members." Food and Agriculture Organization of the United Nations. (2022, July 8). Administrative circular No. 2022/06: Data protection policy (para. 9). https://www.fao.org/fileadmin/user_upload/legal/docs/AC2023.07_.pdf; Annex 1.

33. Email from Julian Fox, Team Leader Forest Monitoring and Data Platforms at FAO. May 28, 2025.

34. In this section, we address the following questions developed in the analytical framework of this study (Annex 1): Do peasants, Indigenous Peoples, women, workers have equal access to the benefits of FAO initiatives?

35. Interview with an FAO official, Rome, March 4, 2025.

36. Fairbairn, M., & Kish, Z. (2023). Setting data free: The politics of open data for food and agriculture. New Media & Society, 25(8), 1935–1959. https://doi.org/10.1177/14614448231174520

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39. In this section, we address the following questions developed in the analytical framework of this study (Annex 1): Do women, peasants, workers and Indigenous Peoples have equal opportunities in FAO initiatives to participate in scientific advancement? Does FAO take into account their knowledge and data? Does FAO promote intercultural dialogue for scientific progress?

40. Food and Agriculture Organization of the United Nations. (n.d.). Family Farming Knowledge Platform. FAO. https://www.fao.org/family-farming/background/en/

41. Food and Agriculture Organization of the United Nations. (2022). FAO science and innovation strategy. Rome. https://openknowledge.fao.org/server/api/core/bitstreams/e9d1ee6c-c0f1-4312-9a1a-c09ba0a4fbdc/content

42. In this section, we address the following question developed in the analytical framework of this study (Annex 1): Does FAO have mechanisms for Indigenous Peoples, workers, peasants and women to participate in defining priorities for FAO's digital initiatives?

43. See the letter sent to member states of FAO by members of the International Planning Committee for Food Sovereignty demanding substantive participation in FAO governing bodies https://www.foodsovereignty.org/wp-content/uploads/2024/06/IPC-Letter-to-the-FAO-Council.pdf

44. In this section, we address the following questions developed in the analytical framework of this study (Annex 1): What is the purpose and directionality of FAO's digital public goods and digital infrastructure? Are FAO's DPGs accessible to all? Is the public value of FAO's DPGs equitably distributed?

45. "Today the United States has expanded the list of restrictions on the trade of software to 'technology, and software relating to materials processing, electronics, telecommunications, information security, sensors and lasers, and propulsion, including traditional encryption and geospatial software'. It thus causes the companies developing software under US jurisdiction to be concerned about complying with sanctions regimes regarding trade in software provided through public offer, used for private purposes and sometimes even at no cost, to a number of countries, including (as of 2017) the Balkan countries, Belarus, Burma, Cote d'Ivoire (Ivory Coast), Cuba, the Democratic Republic of the Congo, Iran, Iraq, Lebanon, Libya, North Korea, Somalia, Sudan, Syria, and Zimbabwe; and also to become extremely concerned about the growing level of software piracy. As a result of the imposed prohibition on the export of technology, Syria appears to have been unable to buy software for CT scanners and ventilators that is produced only by US companies and is vital in the course of the COVID-19 pandemic. Because of the fear of secondary sanctions, companies under US jurisdiction have to comply with limitations concerning the software traditionally used for regular administration, public and private purposes, in particular for commercial Internet services or connectivity and even for non-commercial activity. This has become especially dangerous in the course of COVID-19.

In particular, the terms of service for Zoom as of 20 August 2020 precluded the use of the platform by those living in the DRPK, Iran, Syria and Crimea, or through legislation of the United States, even for contacts and coordination among doctors to exchange their experiences on symptoms, diagnostics and means of treatment. Limitations on the use of Zoom for official purposes appeared to be even greater. Because of the above reasons, it was not possible to use Zoom for UN communications as initially planned. Cuba, in particular, was unable to participate in a virtual summit meeting on Zoom of leaders of the Organization of African, Caribbean and the Pacific States on 3 June 2020 to discuss the COVID-19 pandemic. Some countries (in particular, Belarus) have negotiated access permission on a bilateral basis. As a result, the UN Secretariat has had to invest in the development of a special UN platform. It has been reported that Iranian citizens cannot get access to information on COVID-19 and its symptoms, even from the Iranian government, due to Google's censoring of AC19, an Iran-developed App." Douhan, A. (2022). The changing nature of sanctions in the digital age. In G. Angelo Jr., M. C. Kettemann, & R. Kunz (Eds.), Digital transformations in public international law (pp. 122–123). Nomos. https://www.nomos-elibrary.de/de/10.5771/9783748931638-99/the-changing-nature-of-sanctions-in-the-digital-age?page=1

46. Quell, M. (2025, May 15). US sanctions also target international organizations as in the case of the International Criminal Court (ICC). Associated Press. https://apnews.com/article/icc-trump-sanctions-karim-khan-court-a4b4c02751ab84c09718b1b95cbd5db3?ref=thedissident.news#:~:text=Microsoft%2C%20for%20example%2C%20cancelled%20Khan%E2%80%99s,have%20been%20blocked

47. Gleckman, H. (2023). Multistakeholderism: Is it good for developing countries? Research Paper 182. The South Centre. https://www.southcentre.int/wp-content/uploads/2023/10/RP182_Multistakeholderism-Is-it-good-for-developing-countries_EN.pdf; For a comprehensive critique of the approach of the Digital Public Goods Alliance, see Gurumurthy, A., Chami, N., & Mahindru, T. (2022, May). Digital public goods for an inclusive digital future: A roadmap towards 2030 [Science-policy brief for the Multistakeholder Forum on Science, Technology and Innovation for the SDGs]. IT for Change. https://sdgs.un.org/sites/default/files/2022-05/2.1.1-45-Gurumurthy%20-Digital%20Public%20Goods.pdf

48. In this section, we address the following questions developed in the analytical framework of this study (Annex 1): Are FAO's DPGs responsive to the needs of disadvantaged groups? Does FAO have processes of assessment and feedback that support collective learning about its DPGs?

49. Haraway, D. J. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. Feminist Studies, 14(3), 575–599. https://doi.org/10.2307/3178066.

50. In this section, we address the following questions developed in the analytical framework of this study (Annex 1): Have been FAO's DPGs' rules and mechanisms for collaboration and coordination involving member states, private sector, civil society and Indigenous Peoples and research institutions been co-created?
Have disadvantaged groups been involved in the design of and the decision-making regarding FAO's DPGs? Are FAO's DPGs adequately supported with public funds? Does FAO disclose the terms of collaboration with digital service providers? Does FAO have adequate accountability mechanisms in place regarding the functioning of its DPGs? Does FAO have clauses preventing undue appropriation of FAO's data by private actors?

51. It is noteworthy that in 2019, 74 ministers of agriculture requested FAO to develop a concept note for the establishment of an 'International Digital Council for Food and Agriculture'. The issue was discussed in FAO governing bodies over 2-3 years but was finally closed without outcome. Food and Agriculture Organization of the United Nations. (2020, July 6–10). Item 9: International Platform for Digital Food and Agriculture (164th session of the FAO Council, Rome, Italy). https://openknowledge.fao.org/server/api/core/bitstreams/fa902571-a9ed-43d5-94e3-faa8af2b2853/content. Inferring from the views that agro-exporting countries have uphold in the CFS negotiations on FSN Data Collection and Use, it seems that these countries are not interested in setting international standards in a field that is not properly regulated domestically yet.

52. FAO's Committee on Constitutional and Legal Matters has recently decided to adopt a mandatory dissemination clause in all MoUs that FAO will sign with intergovernmental organizations (IGOs), academia and research institutions, civil society organizations (CSOs) and private sector entities (PSEs). Food and Agriculture Organization of the United Nations. (2025, March 3–5). Update on the dissemination of memoranda of understanding signed by FAO (122nd session, CCLM 122/2, Rome, Italy). https://openknowledge.fao.org/server/api/core/bitstreams/26adb37c-5923-4540-97b8-3c4602872d7a/content. As of April 1, 2025, MoUs with the private sector are not accessible to the public but to member states and FAO staff. https://www.fao.org/connect-private-sector/search/detail/en/c/1381675/

53. Launched in 2011 as an open-source project with Google Earth Engine (GEE), then a nonprofit, FAO and GEE signed their first MoU in 2015—the first between a UN agency and Google. Google staff contributed through their 20% nonprofit project time. By 2022, GEE had expanded into commercial activities, likely leveraging its FAO collaboration. The renewed MoU, under FAO's new Framework for Risk Assessment/Management of Engagements with the private sector (FRAME), ensures continued access to GEE's resources for FAO-supported countries. Open Foris has enabled 91% of participating countries to independently use FAO's tools for UNFCCC forest data submissions. This information was presented by Julian Fox, FAO's Forestry Division, during the following event: Partnership Google LLM. Private Sector - Brown Bag Lunches - Digitalization for Development with Google. Date and Time: 14 February 2025, 13:00–14:00 CET Location: Sheikh Zayed Room and Online.

54. The UN Joint Inspection Unit (JIU) report on managing cloud services advocated a balanced approach, weighing benefits against risks and highlighting potential UN system-wide synergies through UNICC—a dedicated entity for shared IT services. The report recommended safeguards to improve cloud computing knowledge, inter-agency cooperation, and UN negotiating power with providers.
United Nations Joint Inspection Unit. (2019). Managing cloud computing services in the United Nations system (JIU/REP/2019/5, p. iii). Geneva. Although FAO collaborates with UNICC on cloud and security matters, its Cloud Adoption Strategy ignored the JIU report. There is no evidence of FAO pursuing inter-agency efforts to negotiate stronger contracts or safeguards with Big Tech. Instead, initiatives like the AWS UN Cloud Alliance risk further entrenching corporate interests within the UN system.

55. The HLPE report on Data Collection and Analysis Tools for Food Security and Nutrition recommended creating governance mechanisms that enable Indigenous Peoples to have control over their data and refers to the CARE Principles for Indigenous Data Governance. High Level Panel of Experts on Food Security and Nutrition (HLPE). (2022). Data collection and analysis tools for food security and nutrition: Towards enhancing effective, inclusive, evidence-informed decision-making (p. 76).

FAO. https://openknowledge.fao.org/server/api/core/bitstreams/ab8bba96-365d-4a7f-ae9f-557e9c778f2f/content. Likewise, the Civil Society and Indigenous Peoples Mechanism of the CFS elaborated its own vision about data governance for FSN which highlights individual privacy, community sovereignty, and human rights as the foundation of data justice. Among various elements it calls for a sui generis framework for the societal commons of FSN data that can uphold data as a collective resource to be managed through appropriate stewardship mechanisms where benefits are distributed and accrued to source communities. See for their proposals https://www.csm4cfs.org/wp-content/uploads/2023/10/EN_CSIPM-Data-Vision-Statement_091023.pdf. The European Coordination of Via Campesina asserts the ownership rights of farmers over their data; as the originators of agricultural data, they must have full control over how their data is collected, stored, and utilized. Moreover, they demand that algorithms used in the context of agricultural digitalization must be freely and openly accessible to the public and must not be covered by intellectual property rights (IPR). European Coordination of Via Campesina (ECVC). (2025, April 25). The challenges digitalisation brings to peasant agroecology: An ECVC perspective. https://www.eurovia.org/wp-content/uploads/2025/04/EN-ECVC-Digitalisation-2025-04-25.pdf

56. The UN Integrated Geospatial Information Framework (UN-IGIF) adopted an implementation guide to enhance national geospatial information management within and across Member States. In the Strategic Pathway 4 on Data of this implementation guide, respecting rights is mentioned as a guiding principle and there is an explicit reference to FPIC when it comes to sharing indigenous knowledge. UN Integrated Geospatial Information Framework (HLG-IGIF). (2025). Strategic pathway 4: Data. https://ggim.un.org/UN-IGIF/documents/SP4-Data-Refined.pdf

57. Committee on Economic, Social and Cultural Rights (CESCR). (2020). General comment No. 25 on science and economic, social and cultural rights (article 15 (1) (b), (2), (3), and (4) of the International Covenant on Economic, Social and Cultural Rights) (para. 6). United Nations. https://www.ohchr.org/en/documents/general-comments-and-recommendations/general-comment-no-25-2020-article-15-science-and.

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