Data Policy Guidance on Farm Data

Strengthening Collection, Analysis and Use of Agriculture and Food System Data for SDG Attainment
In today’s outcomes driven world, data are used to shape and influence most decisions that farmers, ranchers, aquaculturists and forest landowners make on a daily basis. What to grow; where and when; which inputs should be used; and how will outputs be quantified are all informed and shaped by the way data are collected, analyzed and used across the value chain.

As observed by FAO, data are often fragmented across different international agencies, government sectors, and public and private institutions; and they may be collected or managed using different protocols, making them difficult to use.

In addition, a myriad of stakeholders are working to influence the way data are collected and used further complicating the ability to forge cross boundary agreement on basic guiding principles.

In this paper, the leaders of Solutions the Land (SfL)* offer “producer perspectives” on policy guidance on how data should be collected, analyzed and used in support of investments, markets and programs that enable and scale agricultural solutions to Sustainable Development Goal (SDG) attainment. These recommendations are addressed to national, state and local governments; non-governmental organizations; financial and research institutions; private sector entities; and all other stakeholders working to secure a better world.

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The phrase, “farmers, ranchers and foresters” encompasses farmers, ranchers, foresters, orchardists, graziers, aquaculturalists, and all those who are stewards of working landscapes. Working landscapes are agricultural croplands, grasslands, orchards and forests, vineyards, fisheries, and other lands and waters that are managed for livelihoods and the production of food, fiber, energy, and ecosystem services.

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Satellites orbit the Earth and can observe large portions of its surface at a time. Satellites are used for communication and navigation, monitoring weather, data gathering, mapping oceans, land uses and other types of Earth observations.
Data underlie capacities to innovate and solve the problems of agriculture and food systems, help achieve food security and nutrition goals, enable improved soil and water outcomes, and reveal market demand for agricultural and forestry products. Data and their analytics are critical decision making resources for farmers at all scales—smallholders, mid-sized farmers, and large scale commodity producers—providing useful and essential feedback loops for adjusting and adapting cropping systems and management practices as environmental, climate and market conditions change. In aggregate, at the macro level, data organized in the context of information needs to enable industries to innovate and national policies to be created that advance country level goals of food security, abundant nutritious food, reduced poverty and improved rural livelihoods, and healthy and safe environments.

Data can be experiential, numerical, visual, digital, sensory, created from other data, model generated, and/or artificially intelligence (AI) refined/redefined/recreated representing dynamic and static phenomenon along micro to macro continuums as nature and culture intersect. Data and the robustness of its infrastructure influence local and global agriculture, ecological and agrifood systems, and the capacity of countries to support daily activities that drive innovation and technologies that offer solutions to food and nutrition insecurity, rural livelihoods, environmental diversity, and well-being.

An abundance of satellite data (figure 1) and a decade of data analytics have led to a proliferation of data tools and specialized software for crops (especially commodity crops wheat, cotton, corn, soybean) that enable precision agriculture, GPS and sensor technologies, autonomous and AI-enabled equipment and other innovations designed to help farmers make data-informed management decisions (Lin 2023).

“Soil characteristics are collected and analyzed in a Vietnam Mekong Delta rice paddy-shrimp rotation using Infrared Reflectance Spectroscopy.”
The entire Earth is observed at least once daily with most of these data available in near-real time. Public and private investments in Earth observations, shifts in data policy to free and open access to global data (e.g. NASA/USGS-Landsat, NASA-MODIS, European Commission-Copernicus) and expanded computation infrastructure and analytics (e.g. cellular data, the Cloud, Internet-of-Things) are transforming the quantity and quality of spectral, spatial and temporal agricultural and land use data available and their derived products. Key agricultural data products include maps of land uses, crop types and areas planted, crop and rangeland conditions, crop yield forecasts, water use and productivity, crop biophysical variables (e.g. biomass, leaf area index, photosynthetically active radiation, fractional cover and height) and environmental variables (e.g. evapotranspiration, land surface temperature, soil moisture). Some products can be downloaded today; others are still in demonstration stages or not yet invented. When combined with social and economic data, satellite-based information can enable community leaders, agricultural industries, and policy makers to monitor agricultural, forest and food system variables that predict/are associated with early crop failure, drought potential, wildfire conditions, environmental degradation, food price shifts, increased market volatility and uncertainties, famine and need for food aid.

Remotely sensed earth observation data and the geospatial information they create are helping governments to develop strategic priorities, make decisions, and measure and monitor outcomes. In 2011, 130 national and international agencies including space agencies, ministries of agriculture, research organizations, universities and private industry created an international organization for agricultural monitoring. The GEO Global Agricultural Monitoring (GEOGLAM) initiative uses satellite earth observations (EO) to gather data on diverse crop and rangeland management systems and works with other agencies and organizations to enable the utilization of these observations in support of the attainment of many of the UN Sustainable Development Goals (SDGs) via development of fundamental indicators (Essential Agricultural Variables EAV Home | AgVariables) of conditions and change, monitoring and assessment, coordination, and communication in the transitioning of data into operational uses. GEOGLAM’s “Data to Decision” cycle begins with articulation of decision support needs, which in turn drive the information and data required and how the data are processed and converted into knowledge that can support sustained decisions (Whitcraft et al. 2019).

Figure 1. Earth observation data and derived products. Whitcraft et al. 2019
Agricultural data generated on-farm by farmers, non-operating farmland owners, and agricultural communities (see figure 2 for definition of agricultural data) encompass data related to agricultural and forestry production including all types of data associated with farming and forestry processes (Digital Agriculture Association 2021a). Agricultural farm, forest and field level production, sales and market data are increasingly valuable to farmers as they monitor, track past, present, and model future livestock and cropping systems, short and longer-term weather patterns, their natural resource base, and assess market opportunities so as to improve management decisions for concurrently delivering 1) an abundance of nutritious food; 2) healthy soils, safe and abundant water supplies and robust ecosystem resources; and 3) profitability that ensure livelihoods and life quality for farm families. New technologies and innovations are driving rapid change in the kinds and quantities of data being collected, used, and shared. The effectiveness of Artificial Intelligence (AI), machine learning algorithms, artificial neural networks, and deep learning are wholly dependent on huge volumes of data. Cloud computing data can be used to aggregate data from weather stations, satellite images and tools such as soil and water sensors to assist on-farm and agricultural value chain decision-making (Digital Agriculture Association 2021b). The capture of farm data from multiple sources is already occurring via product sales, private and public program enrollments, satellite monitoring systems, government and private surveys, internet and cell phone usage. Product quality and food safety increasingly require data that provide transparency and supply chain traceability to follow a product from farm production to the consumer (Farm Foundation 2021).

The lack of structural and semantic interoperability and data integration currently limit the ability to move data between devices and systems, to share and exchange data, and to experiment with and evaluate the adoption value of innovative digital solutions (Farm Foundation 2021). Public and private efforts to increase data interoperability and the seamless sharing of data across many platforms is accelerating an urgent need for privacy and security principles and policies that set standards for farm data collection.

**AGRICULTURAL DATA DEFINITIONS**

- **Farm Data** – Data referring to farms, farm operations and management including ranches, forests, orchards, fish-shellfish-aquatic plant systems, vineyards and other operations used to produce agricultural products under controlled conditions:
  - Agronomic Data – Related to plant production (e.g., yield planning, soil data, input data);
  - Compliance Data – Data required for control and enforcement in relation to competent authorities;
  - Livestock/Aquatic Organisms Data – Related to the herd/flock (e.g., age, sex, performance indicators such as meat and milk yield and live weight, animal welfare and health indicators, input data); fish, shellfish and aquatic organisms indicators and input data
- **Machine Data** – Used for machine operations (e.g., data flowing between system controllers and machine sensors), often encrypted and not made available to prevent “reverse engineering” or modifications on the on-board system communication which result in the malfunctioning of controls in place to protect the operator and the machine.
- **Service Data** – Data used for vehicle maintenance and repair.
- **Agri-Supply Data (input)** – Related to the nature, composition and use of inputs such as fertilizers, feedstuffs, plant/animal/aquatic protection products, etc.
- **Agri-Service Provider Data** – Data originating from an agricultural service provider operating to benefit a client (e.g., farmers), of sole interest to the management of the service-providing company (e.g., working time of an employee, machine performance) and not related to the farm or farm operations.

*Figure 2. Agricultural data defined. Digital Agriculture Association 2021. Data Ownership, Use and Privacy; USDA farm production definitions, aquaculture is agriculture.*
“The risks of farm data misuse and unauthorized aggregation by those who did not generate the data, loss of personal farm data ownership and privacy are of great concern”

Photo below. Equipment monitor screens report real time data on terrain adjustments, outside temperature, GPS location and capture harvest data, grain moisture, wet yield, dry yield, field totals, load totals, and other data related to crop production.

access, ownership and control as well as transparency and consistency guidance to protect agricultural data generators and the relationship with end users.

Farm data are actively sought by private industries, not-for-profit organizations and government agencies to support specific business models, investor expectations, and organizational, institutional, national, global and ideological goals, public policy and missions. Because values, goals, and targeted outcomes for obtaining and using data diverge and are often contested across industries, nations and international organizations, there is a need for national and international policies to guide farm data transparency, ownership, use and privacy.

The risks of farm data misuse and unauthorized aggregation by those who did not generate the data, loss of personal farm data ownership and privacy are of great concern to farmers, ranchers, foresters and aquaculturists. There is a need to reduce data fragmentation throughout the collection, storage, analysis, and management stages while ensuring transparency, data owner control, and fairness in end user agreements so that farmers benefit when others use their data (Digital Agriculture Association 2021a). There is also a need to further increase transparency among original equipment manufacturers (OEMs), service providers and farmers in the products/services they deliver to farmers. Standardization and requirements for data exchange can benefit the farmer and still give OEMs and service providers the necessary space they need to innovate. Farmers and private sector industries have much in common in working together as they innovate and seek solutions that strengthen and help agricultural and forestry enterprises thrive, protect and enhance the environment and provide multiple benefits in support of sustainability and the UN Sustainable Development Goals (SDGs).
DATA FOR ATTAINING SUSTAINABLE DEVELOPMENT GOALS (SDGs)

“Farmers are the beginning of the food system”

The United Nations (UN) seek data that can guide global and country-level policies that enable assessment and promotion of individual, community and national food and nutrition security in support of achieving the 2030 Agenda for Sustainable Development and Sustainable Development Goals (SDGs) (UN CFS 2023). Farmers are the beginning of the food system and play essential roles in achieving household and community level food security and nutritious foods. According to the World Bank 80% of the world’s poor live in rural places and farm as part of their livelihood strategy. The occupation of farming in many countries is intimately connected to inadequate incomes, poverty, household food insecurity and lack of access to foods that provide necessary nutrition for good health. Many of the crops they produce and consume daily have not been improved through comprehensive modern breeding programs.

Agriculture directly influences and underpins more than half of the UN Sustainable Development Goals (SDGs) (figure 3). New technologies and data driven innovations offer new approaches and tools for farmers at all scales, including small holders to collect their own farm data and use as feedback to guide on-farm management decisions, select profitable cropping systems, increase production, and find or create new markets that increase household income through local, regional and peri-urban and urban market sales. Farm data privacy and security policies must protect large, mid-size and small holders’ data ownership and uses as they partner with government agencies and agriculture technology providers and adopt data driven approaches that increase their productivity and household incomes. These partnerships must also ensure farmers have easy access to their own data when it is shared with other stakeholders by mutual agreement.

Agriculture directly influences/underpins more than half of the UN Sustainable Development Goals (SDGs)

Figure 3. Solutions from the Land UN Sustainable Development Goals directly influenced by agriculture and forestry production systems

Visit solutionsfromtheland.org to learn more.
“High-quality, timely and relevant Food Security and Nutrition (FSN) data are key to inform local, national and global actions that promote food security and better nutrition.”

The UN Committee on Food Security (CFS) High Level Panel of Experts (HLPE) final draft July 20, 2023 recommendations on strengthening FSN data collection and analysis tools for food security and nutrition begin with their rationale for country-level and global data policies that enhance effective, inclusive, evidence-informed decision making:

High-quality, timely and relevant Food Security and Nutrition (FSN) data is one key tool to inform local, national and global actions, as well as public policies, that promote and improve food security and nutrition. Capacities to produce, interpret and use FSN data, and institutional arrangements that promote the use of data to guide FSN policy, are essential to understand the impacts of policies and determine which policies are successful and which policies should be changed.

Historically much of the household food insecurity and nutrition data collected and analyzed focuses on individual indicators of food insecurity, hunger and nutritional status from which policies are developed to address individual food problems. These are important metrics, however, individual data yield an incomplete assessment of the food security situation. These data must be integrated with data on the social, economic, environmental, ecological, cultural and political organization of communities and countries to assess the structure of the environment that influences capacity of at-risk households to obtain healthy, affordable foods to meet food sufficiency needs (Morton et al. 2005).

The 2020 COVID pandemic starkly revealed that food resources-production, processing, and distribution systems are not evenly located across communities and countries. Many solutions to limited supplies of affordable, healthy foods are community rather than individual based. The US Department of Agriculture (USDA) defines community food insecurity as a function of inadequate resources from which people can produce and/or purchase foods in sufficient quality and variety at affordable prices (Morton et al. 2005).

While data to assess individual household food and nutrition security and community strategies such as emergency food aid, food pantries, senior and youth meal programs are important, there is also a need for community and regional food system and agro-ecosystem resource data that are indicators of the efficiency and effectiveness of food value chains beginning with the local farmer and the agriculture and food products produced. Thus, data and appropriate metrics representing investments in food production facilities, access to wholesale and direct agriculture and food markets, transportation networks to access affordable production inputs, product processing and transportation to deliver products to markets, as well as accessible affordable digital innovations and technical support are necessary domains to monitor and analyze. This is the place where farm data reported in aggregate and anonymously can be integrated with social, economic, and environmental data to measure baseline, gaps and progress toward regional and country-level SDGs such as poverty, food security, health and well-being, sustainable water and land resources and robust livelihoods and communities.

Photo above. On-farm weather monitoring systems give extremely accurate data on when to initiate and terminate irrigation cycles especially when used in conjunction with soil moisture sensors.
“Farm data are sources of information that can guide on-farm decision making to help individual farmers and agricultural communities meet their goals.”

Guidance on ensuring farmer data value, privacy and security

There are many reasons to collect and analyze agricultural and farm data. Farm data are sources of information that can guide on-farm decision making to help individual farmers and agricultural communities meet their goals. High level goals of food security and nutrition, farm profitability, and healthy ecosystems in pursuit of abundant food, fiber, sustainable and resilient farms and thriving communities require a standardized framework for defining data, collecting, organizing, aggregating, and sharing across the supply chain beginning with farmers at all scales of production from countries around the world (Farm Foundation 2021). This means carefully selecting data domains associated with agriculture and food systems, food and nutrition security, and ecosystem services and the parsimonious identification of indicators that measure within individual domains and across larger system level outcomes when these domains intersect.

While some data domains have global universality, other domains are country and culture specific based in the unique context of farm scale, commodities produced, and current and evolving data infrastructure. Many farmers, indigenous peoples and marginalized groups in developing and underdeveloped countries lack secure land and property rights (World Bank 2023), access to data generated information, and/or education and training for using data and data derived information technologies that can improve their production systems. Small holders and mid-size farmers in low and middle

Figure 4. Farmers in Africa use cell phones, a variety of apps, and information to monitor crops and livestock to improve how they manage their farm systems. Farmers in Kenya and Zambia can order products from Apollo Agriculture’s digital store and pick them up at an agrodealer near their village. Photo used by permission, Apollo Agriculture.
“Anyone who has a cell phone with internet or satellite service can download a variety of applications and information to improve how cropping systems are monitored and managed, can set up bank and savings accounts and be paid via cell phone.”

income countries frequently find collecting and analyzing field and farm level data costly and often do not have skills or training in interpreting and applying data information to their farm/forest decisions. The UN FAO State of Food and Agriculture 2022 The State of Food and Agriculture (fao.org) identifies several barriers preventing inclusive adoption of technologies, especially by small-scale producers. Key barriers are low digital literacy and lack of an enabling infrastructure, such as connectivity and access to electricity, in addition to financial constraints.

Data exchange for mutual value can increase farmer access to knowledge, technologies and capital. Despite the extreme unevenness among countries, data infrastructure, satellite and information technologies are transforming agriculture and food systems across the world and increasingly available to farmers in Africa, Latin South America, India, Eurasia and developing Asian countries (figure 4).

expanding farmer resources to improve quality, yield, and profitability of their crops (figure 5), improving access to data for on-farm decision and leveraging their data for access to capital (figure 6).

Anyone who has a cell phone with internet or satellite service can download a variety of applications and information to improve how cropping systems are monitored and managed, can set up bank and savings accounts and be paid via cell phone. Regional spectroscopy labs around the world now offer reliable cost-efficient and rapid analysis of soil, plants and agriculture inputs such as manure and fertilizers and offer landscape-scale assessments of soil and ecosystem health enabling countries to monitor agriculture and environmental restoration efforts.

Data help farmers in emerging markets increase farm profitability. Agronomic machine learning, remote sensing, and mobile technology provide farmers’ access to credit, quality farm inputs and customized advice. Apollo is a technology com-

Figure 5. A smart device camera, LiDAR enabled sensor and GPS data can record images, depth and location of trees and plants; and use these plant measurements to create 3D models and verify tree and plant carbon measurements.
company based in Nairobi serving farmers in Kenya and Zambia by providing everything they need to become successful commercial farmers. Farmers can purchase farm inputs on credit. Instant credit decisions are made by Apollo using machine learning credit models. Farmers use Apollo’s digital store to order seeds, fertilizers, implements, and other inputs and pick up their order at an agrodealer near their village. Farmers receive agricultural training and crop insurance to protect their investment from unexpected events (Apollo Agriculture). This kind of model can expand opportunities for farmers to increase access to capital by leveraging the value of their data to verify (and be paid for) farm/forest carbon retention/sequstration, protection of water and soil resources and/or production of other valued ecosystem services.

LiDAR enabled smart devices can create 3D models of crops and trees anywhere in the world enabling accurate plant measurements. The device camera, LiDAR sensor and GPS data record images, depth and location. This tool enables farmers and foresters to verify on-the-ground carbon measurements and give detail to satellite data. Precise above ground plant measurements combined with geospatial data verify how much carbon trees are retaining, predict yields, and provide guidance for reforestation, afforestation and agroforestry decisions. (Agerpoint Know Your Carbon™). Remote sensing technologies and machine learning (ML) can extrapolate data points between field soil samples reducing time and costs of extensive in-field soil sampling and probe data. The resulting soil map and precision data on each hectare/acre gives farmers and their advisors quality data to make crop and management decisions. (Earth Optics Soil Mapper™ Platform)

Data value. Farmer data are valuable. They enable farmers to monitor and assess changes in conditions on their land and crops over time, can improve management and market decisions, and increase farm income and the capacity to feed one’s household. As data driven technologies proliferate, farm data on equipment, fertilizer and seed inputs and a myriad of other farm generated data change hands between private industries, often without farmer knowledge or receiving monetary and/or informational value in return. Farmer concerns about public and private collection and use of their data revolve around privacy and ownership issues, access to their own data once it is shared with others, cost of gathering data as added cost of production and transparency in other’s use of farm data.

Key indicators in the selection of data domains are grounded in the value of data and to whom the value accrues. In many instances markets demand data from farmers to verify product safety, quality, growing conditions, and sustainability impacts. The higher the value of the crop, the more data markets require and the greater the opportunity for farmers to benefit from the value of their data.

“Farmer concerns about public and private collection and use of their data revolve around privacy and ownership issues, access to their own data once it is shared with others, cost of gathering data as added cost of production and transparency in other’s use of farm data.”
Smart government like climate smart farms need data policies that are inclusive, transparent, ethical and equitable ensuring the rights of the people to whom the data ultimately belong and protecting against power imbalances related to the generation, access and use of data.

Addom (2023) proposes global and national approaches to managing agricultural, forestry and food system data ecosystems and development of public data infrastructure involve four components: 1) social/cultural principles that encourage data standards across many data sources; ensure data privacy and protection for owners and contributors; enable data sharing, use and reuse; and reflect data ethics and values, 2) technological/digital data systems that support interoperability across industries and countries, data registries and networks that reduce data fragmentation, 3) neutral governance entities that administer public data infrastructure and ensure benefit and representation for all stakeholders including farmers and rural communities, and 4) business/trade component that encourages private finance and investments to maintain and sustain the infrastructure.

In this document, Solutions from the Land, a farmer-led NFP proposes basic social/cultural principles to guide public country-level and private industry policies associated with the collection, analysis and use of agriculture and food systems data generated by farmers, non-operating farmland owners, and agricultural communities.

**DATA ASSUMPTIONS**

1. Farmers, ranchers, foresters and aquaculturists are the beginning of the food system, central to ensuring food and nutrition security locally, nationally and globally and stewards of their environments;

2. More than half of the UN Sustainable Development Goals directly intersect/connect/are supported by agriculture and food system sectors (figure 3);

3. Agricultural, forestry and food systems and their data ecosystems are complex. Complexity and value are uneven and vary by geography; within and across country economies, cultures and policies; by farm and production commodity and scale; and local-national-global market relationships (see figure 7 for USA example);

4. Multiple data domains (e.g. agriculture, food systems, ecosystem services, food security, nutrition, health and longevity, rural community/regional economies, infrastructure and problem solving capacities, transportation networks, political stability) and indicators within and across domains are critical in measuring current agriculture and food system conditions and projecting short and longer term outcomes for food and nutrition security, environmental well-being and farmer livelihoods at regional, national, and global levels;

5. Data information mechanisms, education and training are essential in enabling farmers and agricultural communities in decision making that guide adjustments.

“Farmers need education and training in data technologies to make full use of their potential”
and adaptations to changing conditions and utilization of technologies for general and precision management applications and product market development;

6. Farmers obtain value and benefit from sharing data. Shared data accelerates innovation and technology experimentation and applications and lowers the cost of data;

7. Farm and agricultural enterprise data are personal information associated with an identifiable person/entity applicable to Privacy Laws (Digital Agriculture Association 2021a);

8. Agricultural farm/forestry data (figure 2) refer to any set of codified symbols representing units of information regarding specific aspects of the world that can be captured or generated, recorded, stored, and transmitted in analogue or digital form (FSN 2023, Digital Agriculture Association 2021a);

9. Data guiding policies of public institutions and private industries associated with collection, analysis, dissemination and use of agricultural farm/forestry data must address areas of scope, metrics, intellectual property rights and ownership, and transparency;

10. Food and agricultural data policies must benefit farmers/foresters at all scales inclusive of large, mid-sized and small holders.

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**Figure 7. United States (US) Farm Resource Regions. 2000. USDA Economic Research Service. Bulletin # 760.**

This map of US regions utilizes a mix of climate, soil, water, and topography data in localized geographic areas to depict geographic specialization in the production of US farm commodities and farm sizes. These factors have been found to constrain the types of crops and livestock that will thrive there. Geographic representation is not constrained by political boundaries and is one way to integrate different types of data to show national diversity in agriculture based on differences in financial performance of farms and the economic well-being of farm households, land resource areas, farm production regions and crop reporting districts. (USDA ERS home page)
FARM DATA POLICY GUIDANCE IN SUPPORT OF ATTAINING SDGs

Data ownership, public and private stakeholder access and use of farm data

1. Data infrastructure must ensure farmers and agricultural/forestry communities have reliable and easy access to information generated from their own data and as well as aggregated public data and the information it generates.

2. Farmers/foresters and agricultural communities own their personal farm records and data generated by their farming processes. These data are intellectual property and propriety.

3. The value assigned to agriculture and food system data must be shared fairly across the entire value chain, starting first with farmers of all scales (large, mid-size and small holders) who generate the data that others want.

4. Farmer/forester and agricultural community personal information and agricultural data should not be traded (business models profiting off the sale of others’ data to external actors) without the explicit and transparent agreement of those who generated and own the data.

5. Farmers/foresters and agricultural communities must benefit from sharing their data, and if they choose to share have the right to specify and limit its use. They may voluntarily consent and enter agreements on data use and sharing with stakeholders with economic and/or social interests. Stakeholders include but are not limited to tenants, landowners, cooperatives, owners of precision agriculture system hardware, agriculture technology providers, government agencies and/or university researchers.

6. Stakeholder-farmer data agreements/contracts regarding data collection, access, confidentiality and use of agricultural data must disclose type of agricultural data collected and purposes, limitations on use and conditions of sharing/resale with others, clear opt out/discontinuance of the data exchange relationship, and time period and data retention/disposal procedures.

7. Farmer use of their own data within the context of the stakeholder-farmer agreement and retention conditions should easily allow the farmer to retrieve their own non-anonymized and non-aggregated data for storage and/or use in other systems.

Public production and use of agricultural data

8. Country-level agricultural data infrastructure should a) provide fundamental services and systems that enable agricultural/forestry economies, b) ensure access and flows of data and data derived information and communication among government, farmers, agricultural communities and their value chains, c) facilitate creation and growth of agricultural and food systems to ensure food and nutrition security and d) support activities of daily living (Addom 2023; SfL Ag Renaissance paper 2021).

9. Food and Nutrition Security. Policies intended to define and promote national and global FSN data and metadata standards and metrics that can be used to integrate food and nutrition security outcomes with robust resilient...
food and agricultural systems must engage farmers representing multiple scales, production systems, geographies, and climatic conditions in the identification of appropriate domains and measurements associated with specific desired targets and outcomes and the development of metrics and standards.

10. Climate Smart and Ecosystem Services. Farmers/foresters and agricultural communities representing different types of production systems, geographic and climatic conditions should be involved in the development/setting of industry standards and public policy standard metrics that are associated with the monetizing of data needed to track livestock and crop specific practices and outcomes associated with Climate Smart and environmental priorities/goals.

11. National and global data policies must balance government needs for data access and sharing to achieve SDGs with farmer/forester and agricultural community data ownership protections and control of use. (see UN FAO 2022 State of Food and Agriculture 2022 The State of Food and Agriculture (fao.org) Leveraging agricultural automation for transforming agrifood systems)

12. Care must be taken to avoid government program prescriptions using national aggregate farm data to extrapolate identical requirements for all farmers without regard for unique differences in region, farm size, crops, resources, and cultures. Farm resource regions have distinctly different natural resource bases and climates as well as farm sizes, livestock systems, perennial and annual cropping systems, soil types, water availability/access, topographical and cultural variations. See Figure 7, US Farm Resource Regions as an example of the integration of different types of data that can be used to represent unique agricultural characteristics of different regions.

13. Government required farm level data must be reported in aggregate and anonymously.

14. Government data is fragmented by agency. Requirements for farm level data should be coordinated so duplication of collection of the same data are avoided and paperwork is reduced.

“National aggregated farm data should not be used to create prescription rules for all farmers without regard for unique differences.”
References


UN FAO (United Nations Food and Agriculture Organization 2022. The State of Food and Agriculture (fao.org) Leveraging agricultural automation for transforming agrifood systems)


