GSDR 2015 Brief

Monitoring the Performance of Agriculture and Food Systems

*By the Thematic Group on Sustainable Agriculture and Food Systems**

The Sustainable Development Goals (SDGs), targets, and indicators will define global, national, and local aspirations for improving human well-being. Without clear metrics to measure progress and accurate, consistent, and continuous data collection across both time and space, sustainable development will remain an amorphous goal. Metrics are needed to set baselines against which to measure progress; track and predict socioeconomic, nutritional, and ecological change; understand constraints to sustainable development; work successfully with public, private, and NGO partners; and identify appropriate policy measures.

Principles for good metrics for agriculture

There are several key considerations in choosing metrics. Metrics must be well defined, meaningful, measurable, motivational, and easy to understand and communicate to all stakeholders, including farmers, policymakers, business executives, and consumers.

A concise set of universal indicators will provide broad, general information, and should be supplemented by metrics tailored to national and local challenges. Because a central objective of sustainable development is to ensure social inclusion, metrics should be disaggregated by gender, geography, socioeconomic status, disability, ethnicity, age, and other dimensions wherever possible.

There are infinite ways to measure progress; therefore, there must be a conscious limiting of the number of metrics. Indicators associated with well-tested methodologies and guidelines should be chosen; proxies can be used that cover several areas of interest simultaneously. Moreover, there will be trade-offs between metrics in terms of precision, scale, and cost that will require a clear vision of measurement objectives at the start.[1]

Countries must be empowered to collect and interpret their own data; engaging data end-users from the beginning will increase the chance of success. Metrics can and should change over time as the relevant questions and challenges evolve.2 At the same time, metrics should make use of international and national data that is already available, where appropriate.

Major data and data access gaps

Many information gaps hamper the assessment of progress on sustainable agricultural development, including insufficient data, inconsistent guidelines for measuring metrics, weaknesses in predictive models, and a lack of investment in new technologies for monitoring systems. One issue is the frequency and scale of data collection: aggregate national data from several years back does not aid policy decisions. Another issue is that while more and more actors – governments, international and regional organizations, agricultural research centers, private companies, etc. – are collecting data, there is often little coordination of activities or data sharing.

Many current metrics are inadequate or contradictory; this lessens their utility for policymakers and practitioners. There are differences in methodologies and definitions for even basic measurements of crop yields, prevalence of poverty and hunger, and the environmental impact of agriculture; therefore, misrepresentations and distortions of the current state of affairs in agriculture and food systems are common.[3] For example, aggregate national data on agricultural production, land use, food supplies, and poverty rates typically fail to include income

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distribution, agricultural waste, seasonal changes in production and consumption, exogenous shocks from weather or conflict, and market and climate uncertainties. Statistical capacities in many African countries are particularly dire.[4]

Moreover, there are large uncertainties around societal characteristics that impact agricultural systems. These include population growth, urbanization and the availability of agricultural land, the numbers and locations of net producers and net consumers, and changes in diet. For example, we do not know whether the world's population will be nine or ten billion by 2050, but an extra one billion people has huge implications for food needs.

On the demand side, policymakers need cross-sectional information that includes comparisons between different social groups, regions, and net producers vs. net consumers; information on long-term trends, seasonal patterns, and the impact of production shocks on incomes and food consumption; and data on nutritional intake that include macro- and micronutrients across time (seasonal and year-to-year) and space (within- and between-countries).

On the supply side, to improve market forecasts, early warning systems, and other solutions-oriented decisions, policymakers need accurate, high-resolution, transparent, and updated information on crop and livestock production, adoption of new technologies, land degradation, fertilizer and pesticide use, availability of credit and machinery, water use and efficiency, labor, agrochemicals, diversity of crop and animal breeds, trade, end stocks, non-food uses of crops, food prices, and postharvest food losses and waste. Such data is currently not available for many countries due to lack of human resources, technology, and funding.

Information is needed on the potential and actual trajectories for agricultural land development and exploitable productivity gaps. There has been some recent progress in gathering disaggregated data for the Global Yield Gap Atlas (www.yieldgap.org), but more needs to be done to refine the data at local levels.[5]

Long-term weather and soil data at high spatial resolution are among the most important for promoting Sustainable Intensification of Agricultural (SIA) and should a priority to those concerned with food security, yet big gaps remain. High quality and high-resolution data on soils and nutrients affect fertilizer usage, crop choice and management, and land development and rehabilitation strategies. New systems filling data gaps, like the Africa Soil Information Service (www.africasoils.net), need support, business models for self-sustained operation, and greater reach to other regions of the world. There is also a need for a global nutrient monitoring system to tailor nutrient management programs for greater productivity and efficiency and to progress toward sustainability. Meanwhile, long-term and real-time climate data and modeling, at high spatial resolution, is required in all major crop-producing regions for appropriate and feasible local recommendations.[6]

New data initiatives and "digital agriculture"

A new, global information system built on the principle of open data sharing and real-time learning would drive agricultural innovation and support achievement of the SDGs. Many data gaps (real or perceived) could be filled if existing information and methodologies were better aligned and available to all.

The systematic, reliable collection of data to track progress will require significant investments in local, national, and global data collection and processing, in all sectors. International agencies and official development assistance (ODA) should support these investments. Governments should embrace digitally-enabled exchange of information and learning to accelerate the pace of development, democratize information, and empower farmers, consumers, and investors to make informed choices. Our ultimate ambition should be to monitor nearly every hectare of existing farmland by 2030.

Countries and regions should prioritize, customize, and commit to implementing "digital agriculture" technologies, based on local relevance and feasibility, to collect new data that is highly disaggregated, easily sharable, and transparent. Available technologies include geographic information systems (GIS), remote sensing, global positioning systems (GPS), and numerous Internet and smartphone tools. Strong public-private partnerships can help realize their full potential.

Countries must maintain a regularly updated central register using baseline population and agricultural census data. Where applicable, governments should improve their capacity to collect data at farm and village levels. National household surveys are essential, but they should be simplified for easier, more reliable data collection on issues not captured by census and administrative records. Surveys also need to include more detail on key aspects of market and consumer behavior. Moreover, with the right technology, age census data can be linked to a country's administrative records so that each individual record is automatically updated without the need for extra surveys.

Other useful tools include composite indices that integrate and score multiple functions of agriculture and food systems; while these cannot replace the specific indicators needed to measure progress towards achieving targets and SDGs, they can be additional sources of valuable information and analysis for policymakers and education.

The vast amounts of data collected would feed into a well-designed and well-directed global monitoring network to track, anticipate, and manage changes in the biophysical, economic, and social components of agriculture and food systems around the world.[7] This system would allow scientists, farmers, and policymakers to find solutions to pressing problems; direct public and private investments in agriculture; allow for aspects of agriculture and food systems to be quantified and compared across time and space; and track progress toward meeting the SDGs.

Universities and research centers should play a major role as they have thousands of experts and partners already on the ground collecting and utilizing data; there would also have to be a high level of coordination with national statistical agencies, UN agencies, and others who collect and analyze data. An interdisciplinary monitoring network would also provide unique, exciting opportunities for students and others to learn about the science and practice of sustainable agricultural development.

Ultimately, all SDGs should be supported by online, real-time, place-based, and highly disaggregated data. A transformation in monitoring progress toward the goals and targets related to agriculture and food systems will provide a model for all other areas of sustainable development. Agriculture-led growth is essential for ending poverty and hunger. GDP growth from agriculture is at least twice as effective at reducing poverty as growth from non-agricultural sectors.

Additional examples of applications of digital agriculture may be found in the Annex.

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Annex: Examples of the applications of digital agriculture

- National and sub-national scorecards that track key indicators related to food and nutrition security and the environmental sustainability of food systems
- High-resolution satellite imagery to support land tenure processes so farmers can confidently invest to improve their land
- Digital data, maps, and spatial application services to create customized products, such as the Global Yield Gap Atlas (www.yieldgap.org) or the Africa Soil Information Service (http://www.africasoils.net)
- Data platforms to support simple but large-scale experiments by farmer research networks
- Smartphone platforms to share location-specific crop status information, forecasts, and damage assessments, based on high-resolution, real-time satellite, cloud-based processing, weather data, and crop simulation models
- Smartphones used for plant disease diagnosis or better nutrient management (e.g. Crop Manager for Rice, http://cropmanager.irri.org)
- Video technology and monitoring platforms for farmer-to-farmer extension (e.g. Digital Green, www.digitalgreen.org)
- Mobile phone access to commodity exchanges and markets so farmers can secure higher prices; processors benefit from high quality raw material based on transparent standards and from easier aggregation of primary products
- Mobile phone access to portals and services for extension professionals, farmers, and agribusinesses, including credit, inputs, weather-indexed insurance, location-specific extension alerts and technical support, market prices, and short-term weather forecasts
- Tracking of government performance in providing an enabling environment for SAI, including seed delivery, extension services, local businesses, and service providers for activities such as land preparation, planting, and application of pesticides
- Local value chain tracking and analysis to share information with businesses, governments, and consumers, increase value chain efficiencies, and track food safety and losses
- Bioinformatics platforms to speed up gene discovery and breeding in both crops and livestock species
- Knowledge repositories and exchange platforms that enable information-sharing with partners to increase the effectiveness and reach of sustainable development efforts
- Mobile platforms that provide integrated agriculture, health, financial and education services to rural families (e.g. MOTECH, http://www.grameenfoundation.org/what-we-do/health/motech-suite-and-platform)