SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

SDSN TG7 Issue Brief: Monitoring the Performance of Agriculture and Food Systems

Prepared by the Thematic Group 7
Sustainable Agriculture and Food Systems

Over the course of the next two years, countries will define the Sustainable Development Goals (SDGs), targets, and indicators that will set global, national, and local aspirations for improving human well-being.

> An indicator is a quantitative metric to track progress towards achieving an SDG target. Often, multiple indicators are used for each target. The purpose of SDG indicators is twofold. Most importantly, an indicator should be a management tool, to help countries to stay on track to achieve the SDGs. Second, an indicator is a report card, to measure progress and ensure the accountability of governments to their citizens.

Without clear metrics through which to measure progress against the goals, and without accurate, consistent, and continuous data 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 to monitor progress toward sustainable agricultural development. Primarily, 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 minimum set of universal indicators will provide broad, general information, to be supplemented with metrics that are tailored to national and local challenges. Because a central objective of sustainable development is to ensure social inclusion, metrics should also be disaggregated according to gender, geography, socioeconomic status, disability, ethnicity, age, and other dimensions wherever possible.

There are infinite ways to measure progress toward sustainable development; therefore, there must be a conscious limiting of the number of metrics. Indicators should be chosen that are associated with well-tested methodologies and guidelines; 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 and enabled to develop their own metrics and to collect and interpret their own data; moreover, engaging those who will ultimately use this data from the beginning will increase the chance of success. Metrics and the ways they are monitored and modeled 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 ability to assess the progress of 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 major issue is how often data is collected and at what scale: average or aggregate national data that are 10 years old do not improve targeting of policy decisions and

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investments in the areas where they are most needed. 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 currently used metrics and indicators are inadequate or conflict with each other; this obscures the ability of these metrics to inform clear paths of action for policymakers and practitioners. There are inherent uncertainties in estimating (and sometimes different definitions of) even basic measurements and models of crop yields, prevalence and patterns of extreme poverty and food and nutrition insecurity, 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 distribution, agricultural waste, seasonal changes in production and consumption, exogenous shocks from weather or conflict, and market and climate uncertainties. Statistical capacities in many Sub-Saharan Africa countries are particularly dire.[4]

Moreover, there are large uncertainties around societal characteristics that impact agricultural systems. These include future population growth, massive urbanization that reduces the availability of agricultural land, the numbers and locations of net producers and net consumers, and changes in diet preferences as social structures shift. 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 additional 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 over 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 constraints such as lack of human resources, technology, and funding.

Information is also needed on the potential and actual trajectories for agricultural land development and exploitable productivity gaps. Fortunately, there has been some recent progress in gathering disaggregated data for a new Global Yield Gap Atlas (www.yieldgap.org), but more needs to be done to further 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 Agricultural Intensification (SAI) and should be of the highest 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), still need more R&D support, appropriate business models for a more self-sustained operation, and greater reach to other regions of the world. There is also a need for a global nutrient monitoring system to help tailor nutrient management programs for greater productivity and efficiency and to more easily make progress toward sustainable development targets. Meanwhile, long-term and real-time climate data and modeling, at high spatial resolution, is required in all major crop-producing regions in order to define more appropriate and feasible recommendations for local agriculture systems.[6]

New data initiatives and applications of "digital agriculture"

We need to create a whole new global information system that is built on the principle of open data sharing and real-time learning to drive agricultural innovation. In fact, many of the real or perceived data gaps could likely be filled if existing information and methodologies were better aligned and more readily available to all.

The systematic, reliable collection of data with which to track progress on sustainable development of agriculture and food systems will require significant investments to improve local, national, and global data collection and processing, including in related sectors like health, economics, and the environment. This investment should be supported by international agencies and official development assistance (ODA). Our ultimate ambition should be to monitor nearly every hectare of existing farmland within the next ten years.

For this to happen, governments must embrace the era of 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.

To accomplish this, countries and regions should prioritize, customize, and commit to implementing different "digital agriculture" technologies, based on local relevance and feasibility, to collect new data that is highly disaggregated, easily sharable, and more transparent to foster accountability. Available technologies include geographic information systems (GIS), remote sensing, global positioning systems (GPS), and numerous internet and smartphone tools, such as mobile phone applications, social media, and crowdsourcing. Strong public-private partnerships will be necessarily to realize their full potential.

As a fundamental priority, every country 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. As such, national household surveys remain essential sources of information, 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

Examples of the applications of digital agriculture include;

- 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 or the Africa Soil Information Service
- 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. NM Rice)
- Video technology and monitoring platforms for farmer-to-farmer extension (e.g. Digital Green)
- 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)

that account for the large cultural and economic differences within countries. 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 valuable additional sources of information and analysis for policymakers and for education.

The vast amounts of data that would ideally be 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 the most pressing problems facing food security; help 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 Sustainable Development Goals.

Universities and international agricultural research centers are well placed to play a major role in such an effort as they have thousands of experts and thousands of partners already on the ground to collect and utilize new data; there would also have to be a high level of coordination with national statistical agencies, UN agencies, and others who collect and analyze similar 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 the 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.

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Related SDSN Reports:

Solutions for sustainable agriculture and food systems. Technical report for the post-2015 development agenda. 2013.

An action agenda for sustainable development. Report for the UN Secretary General. 2013.

These reports and more at unsdsn.org/resources.

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