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Agricultural Science and Technology Indicators: New approaches for long-term sustainability of R&D data collection

Hernan Daniel Muñoz (FAO-ESS)

Executive summary

The Agricultural Science and Technology Indicators (ASTI) program has been a global leader in compiling and analyzing agricultural research data for over two decades. It focuses on institutional developments, investments, human resource capacity, and research outputs in low- and middle-income countries (LMICs), and functions through a vast network of national research agencies and international partner institutions. Major international and donor organizations, as well as decision-makers at regional and national levels, have relied extensively on ASTI data to assess the performance and impact of agricultural research in LMICs, and to set policies and investment priorities for increased agricultural growth and productivity. The program, formerly managed by the International Food Policy Research Institute (IFPRI), is now transitioning into FAO. This transition poses challenges and opportunities for ASTI, requiring improved operational mechanisms, such as a redesign of the data collection process. In this context, the role of national statistical offices will be crucial to enhance the quality, timeliness, and completeness of ASTI data. The institutionalization of ASTI and the adoption of a new data collection approach include national validation, aiming to integrate ASTI into both global and national statistical mechanisms while fostering increased country ownership.

Suggested actions

- Recognize the importance of data on science, technology and innovation for guiding policies that aim to enhance agricultural productivity and, therefore, poverty reduction and hunger eradication;
- Recognize the scarcity of these data and the need to improve its collection and to systematize the dissemination of quality, official and country owned indicators;
- Acknowledge the ongoing transition towards a more institutionalized and sustainable Agricultural Science and Technology Indicators (ASTI) program in FAO;

• Support ASTI activities in the region. FAO will conduct pilot projects and specialized capacity building activities with the national institutions that produce agricultural statistics; • Integrate the National Agriculture Research Institutes (NARIs) into the National Statistical Systems and undertake data quality assessments. • Initiate national dialogues to establish fit-for-purpose data collection models and enhance country ownership.
Queries on the substantive content of this document may be addressed to: APCAS Secretariat; Email: APCAS-Secretary@fao.org

1. THE IMPORTANCE OF SCIENCE, TECHNOLOGY, AND INNOVATION FOR AGRICULTURE

As the UN specialized agency for food and agriculture, FAO is called upon to be a driving force for facilitating solutions to agrifood system challenges through science, technology, and innovation (STI). The Organization is taking major steps to rise to the challenge of harnessing the transformative potential of science and innovation. In 2020, the first-ever position of Chief Scientist was established to join the core leadership team of the Director-General. A new Office of Innovation was also created to ensure that FAO leverages the use of innovation, technology, and new approaches across the Organization. The FAO Science and Innovation Strategy aims to bolster recent organizational developments by providing Organization-wide guidance, coherence and alignment on science and innovation to better serve countries by strengthening FAO's capacities.

There is considerable evidence that investing in agricultural research is a highly effective pathway both for reducing poverty and hunger and for addressing the climate change impacts on food systems. Regardless of the mode of investments, timeframe, and specific targets for adaptation chosen, studies have consistently shown that spending on agricultural research has had a greater impact on agricultural productivity than other types of public expenditures. In LMICs, agricultural R&D often represents one of the most significant areas for public investment in STI and thus has considerable prominence in national STI policies. It has also been demonstrated to yield beneficial impacts on the environment and natural resources management. The imperative nature of investments in agricultural R&D becomes evident when considering the formidable challenges that small-scale producers across the globe are currently grappling with and are poised to encounter in the foreseeable future. Consequently, strategic and sustained investments in agricultural R&D are indispensable for empowering these producers to surmount the considerable obstacles they face.

Quantitative data are essential to any informed decision-making process. Agricultural research stakeholders require quantitative data to analyze investment and capacity trends, identify key gaps, set future priorities, promote efficient resource use, and ensure effective coordination and coherence of agricultural research initiatives. Research indicators are also vital in assessing the contribution of agricultural research to broader development goals, such as agricultural and economic growth, food security, poverty reduction, and climate change mitigation. In addition, they are an indispensable tool when assessing the contribution of agricultural STI to agricultural growth and economic growth more generally. They assist research managers and policymakers in formulating policy and navigating decisions related to strategic planning, priority setting, monitoring, and evaluation. They also provide information to governments and others involved in the public debate on the state of agricultural R&D at national, regional, and global levels.

However, the collection of agricultural R&D data is not straightforward because agricultural R&D is carried out by a very large number of diverse institutions (including government, higher education, non-

profit, and private for-profit agencies) and funded through multiple sources (government budgets, donor grants, private sector, producer levies, product sales). While national statistical agencies in OECD countries have generally developed the means for gathering and reporting STI information, many LMICs have not. The Agricultural Science and Technology Indicators (ASTI) program has attempted to fill this gap by compiling, analyzing, and publishing agricultural research data relating to institutional developments, investments, human resource capacity, research focus and research outputs of agricultural R&D agencies in more than 90 LMICs. ASTI analysis includes the status and direction of agricultural R&D at national, regional, and global levels, as well as analytics on the efficiency and performance of research systems and the impact of R&D on productivity and social goals.

The findings and outputs of ASTI's work have had important policy relevance at the national, regional, and international levels. At the country level, ASTI evidence has been an important input into medium- to long-term agricultural sector plans or development strategies in numerous countries. It is also used extensively by in-country stakeholders to advocate for increased R&D funding, to highlight capacity gaps, and to mobilize resources for neglected research areas. A large number of international organizations, donor organizations, as well as regional- and national-level decision makers around the world, have extensively used ASTI data and analyses to assess the performance and impact of agricultural research in LMICs, and to influence policy for increased agricultural growth and productivity.

2. ASTI'S CURRENT CALLENGES AND OPPORTUNITIES

While ASTI has successfully updated its datasets for Africa, Asia-Pacific, Latin America, and the Middle East at regular intervals in the past, funding constraints have significantly diminished the geographic coverage, data quality, and frequency of data collection rounds. To overcome these challenges, integrating ASTI into FAO presents a compelling and timely opportunity to breathe new life into the program, expand its scope, and propel it to unprecedented levels of success. ASTI stands to leverage FAO's strengths and strong mandate on data. Article I of the FAO Constitution mandates the Organization to "collect, analyze, interpret, and disseminate information relating to nutrition, food and agriculture". With this aim, FAO statistics division (ESS) works directly with countries to develop national statistical strategies, strengthen institutional and technical capacities, and improve statistical systems. Further, FAOSTAT dissemination platform is the most suitable data processing and dissemination platform to collect and disseminate ASTI data. FAOSTAT counts approximately 200,000 users per month and disseminates more than a million statistics covering five decades and 245 countries and territories. However, the main hurdle in integrating ASTI into FAOSTAT lies in the imperative to strengthen data collection, analysis, and dissemination processes, harmonizing them with FAO statistical standards grounded in the core principles of the National Statistical Quality Assurance Frameworks.

Under IFPRI, ASTI survey rounds were primarily conducted by country focal points from national agricultural research institutes (NARIs) or similar institutions. Moreover, they received financial compensation to carry out this work. At the start of each national survey round a complete list was compiled of all agencies involved in agricultural R&D and each agency was approached to complete a questionnaire. Time-series data were collected for three main indicators: "research investments," "research funding sources," and "research staff totals". The remaining indicators were collected for particular benchmark years for use in cross-country comparisons. Additional qualitative information was gathered during country visits through in-depth meetings with various agencies.

The process outlined above encountered persistent challenges necessitating a more refined vision and improved operational mechanisms. These challenges included: a) in-country data collection being led

by agencies lacking a clear mandate for such responsibilities; b) limited scope and insufficient incentive for individual host institutions to spearhead a coordinated global effort; c) incomplete datasets and a lack of timeliness; d) limited access to comprehensive investment data, especially from the private sector; e) reliance on project-based funding from donors, among other issues.

Thanks to a three-year grant from the Bill and Melinda Gates Foundation (BMGF) supporting the transition of ASTI into FAO, there is now an opportunity to strengthen the program, establishing a permanent institutional home for it. This presents a chance to transform ASTI into a more sustainable statistical operation as part of a new vision, making it more responsive to national policy needs and institutionalizing the data collection process within national statistical systems. This transition includes the uninterrupted continuation of ongoing activities, effective transfer of knowledge, new in-country institutional arrangements, enhancements to program quality and credibility, and leveraging opportunities to maximize the long-term utilization and demand-responsiveness of ASTI.

In light of this transformative change and to test the new data collection approach, FAO is conducting pilot projects in 11 countries. Insights gained from these pilots will help build a solid foundation for the long-term institutionalization of ASTI through the adoption of fit-for-purpose data collection models and the integration into official mechanisms at the country level. The primary goal of the pilot projects is to explore pathways for the long-term institutionalization of ASTI, setting the stage for dialogues between NSOs and NARIs, aiming to foster enhanced cooperation within countries and develop tailored solutions that address each country's specific circumstances and needs. Additionally, during ASTI team missions to the pilot countries, meetings with national relevant stakeholders are being organized to secure commitments on the required new institutional arrangements and raise awareness about the policy relevance of ASTI data. Drawing from the insights gained from the data collection, the ASTI team will compile a report detailing key findings and lessons learned from the pilots, along with recommendations for the global rollout to be conducted in all FAO member countries in 2025. These lessons learned and recommendations will be presented at regional workshops to be organized during the second half of 2024.

3. THE TRANSITION TOWARDS A MORE INSTITUZIONALIZED AND SUSTAINABLE PROCESS

In order to chart a clear roadmap for enhancing ASTI's institutionalization and sustainability, a comprehensive assessment and review of the program's existing framework has been conducted. As part of this process, a technical advisory group has been formed, comprised of global experts knowledgeable about agricultural R&D systems and statistical systems in LMICs. The advisory group offered input, expertise, and recommendations to guide the transition of ASTI to FAO, offering advice on key decision points throughout the process, and defining the focus, frequency, and scope of data and outputs that ASTI aims to collect and report. The assessment did identify several positive aspects, indicating the potential for aligning ASTI's procedures more closely with official statistical processes and quality standards. Main recommendations refer to:

- Increase country coverage of ASTI data by conducting survey rounds in all FAO Members, including high-income countries, and incorporating information from other sources,
- Increase the frequency of data collection to gather more timely and complete information,
- Split data collection into Tier I and Tier II variables, with core data collected annually,
- Restructure the data collection approach, integrating ASTI into national statistical system mechanisms,
- Foster national dialogues, with NARIs and NSOs as main actors, to establish country-specific models for data collection and enhance country ownership,

- Streamline the process of validating the list of respondent agencies and maintain regular updates,
- Improve the collection of data from the private sector by linking it to compulsory response statistical operations or engaging with national statistical offices,

Efforts will be made to retain current data providers within the ASTI network, and opportunities to engage with additional counterparts will be carefully assessed. A key focus of the project is to facilitate capacity development, aiming to establish technical capacity among current and potential data providers. Unlike IFPRI, which used to compensate countries for ASTI data collection, FAO member countries provide data to the FAOSTAT system without any economic incentive or contractual obligation. The objective is therefore to transition from a network of compensated collaborators to an institutionalized network of national counterparts that respond to FAO-led questionnaires, providing essential data within their institutional mandate. This shift emphasizes the commitment of member countries to share agricultural data with FAO and transitioning gradually to the network commonly employed by FAO for data collection, which primarily relies on National Statistical Offices (NSOs) and line Ministries, and functions through FAO country, sub-regional, and regional offices.

The overarching goal is to standardize, harmonize, and improve the overall quality, timeliness, and completeness of the dataset, while making it more sustainable and country owned. Harmonization and standardization, as well as country ownership and awareness will also be fostered and institutionalized through UN mechanisms, including regional and global statistical commissions.

The new data collection approach incorporates national validation of the data and aims to integrate ASTI into National Statistical System mechanisms, seeking official recognition to enhance country ownership. With the goal of reducing the burden on respondents and improving timeliness and completeness, the annual data collection process will focus on a reduced number of core variables on agricultural R&D investments and human resource capacity that will be collected through FAO questionnaires, administered to the designated national focal points in coordination with the NSOs. The four variables that will be included in FAOSTAT are:

- Total agriculture research spending in constant prices.
- Agriculture research spending as a share of agriculture, forestry and fishing value added.
- Total of Full Time Equivalent (FTE) agricultural researchers
- FTE agricultural researchers per 100 000 farmers

The data will be structured in accordance with FAOSTAT standards and detailed with standardized metadata. The processed data will be securely stored in the FAOSTAT archives and subject to annual updates. Ongoing efforts will ensure that these lists of in-country R&D players are kept current and reflective of any changes with each new data collection cycle.

Other more nuanced variables related to the institutional setup of agricultural R&D, research capacity, investment, funding sources, commodity and thematic focus, research outputs, and other specific demands will be collected less frequently according to national needs and funding availability. Efforts will be made to secure support from regional R&D partner organizations to enhance and support data collection endeavors.

4. CONCLUSIONS

The ASTI program, which has been a global leader in compiling and analyzing agricultural research data for over two decades, is now transitioning into FAO. This transition poses challenges and opportunities for ASTI, including the need for new institutional arrangements and the redesign of the current operational mechanism.

The new data collection approach aims to integrate ASTI into NSS mechanisms, enhancing national validation of the data as well as country ownership. This approach emphasizes the importance of building on ASTI's existing Network of National and Regional partners.

The participation of the NSS and NSOs plays a crucial role in establishing a well-defined mandate for data collection, guaranteeing compliance with quality standards, and capitalizing on their expertise in delivering timely data to FAO. Concurrently, FAO, with its inherent mandate for country data collection and its engagement in both global and national initiatives, fosters an ideal setting for the development and institutionalization of ASTI. The proposed changes aim to establish a more sustainable and reliable data collection process, representing a substantial improvement compared to the past resource-dependent and intermittent ASTI approach.

FAO is also proactively seeking opportunities to enhance the availability, accessibility, appropriateness, and ownership of ASTI data and evidence. This includes efforts to make ASTI more responsive to in-country, regional, and global data demands.

The institutionalization of ASTI in this process will require the support from APCAS member countries, with a particular focus on collaboration with national statistical authorities. FAO will conduct specialized capacity strengthening activities, aiming to generate more accurate data on the status and direction of agricultural R&D at national, regional, and global levels, thereby enhancing its utility for well-informed policy-making. These data contribute directly to the United Nations' Sustainable Development Goal 2 on achieving food security and improved nutrition.