

II. GENERAL DEFINITIONS AND PROCEDURES

WHAT IS RESEARCH AND DEVELOPMENT?

The *Frascati Manual* (2002) <[web link](#)> defines R&D as “creative work undertaken on a systematic basis in order to increase the stock of knowledge..... and the use of this stock of knowledge to devise new applications.” It goes on to categorize R&D as basic research, applied research, and experimental development. ASTI currently does not divide R&D into these more specific areas. The manual also lists a number of areas that are not considered to fall under the definition of R&D. The most important of these categories in relation to agricultural R&D are the following four:

- **Education and training.** However, research conducted by PhD students at universities, is included, if possible.
- **Science and technology information services.** Specialized activities to collect, code, record, classify, disseminate, translate, analyze, and evaluate data are considered R&D only when they are conducted primarily for the purpose of R&D support.
- **General purpose data collection.** In relation to the agricultural sector, this means that topographical mapping and geological, oceanographic, and meteorological surveying are not defined as R&D, though such activities are often conducted within fisheries, forestry, and natural resource management agencies.
- **Administration and other support activities.** Activities related to the financing of R&D and indirect support are not included. However, administration and clerical activities that are exclusively for R&D are included. For example, administration of an agricultural research institute is considered to be part of R&D.

CHALLENGE: What activities do and do not support R&D?

It is sometimes difficult to identify which activities should be included and which should be omitted from agricultural R&D statistics. No all-encompassing definition exists. For example, ASTI includes agricultural extension and training in its R&D statistics only when it is done by an agency that is focused entirely on R&D.

WHAT IS A RESEARCH PERFORMER?

ASTI measures the human and financial resources invested by “performers” of agricultural R&D. The “performer” is the entity that carries out the research, not the funder of the research. Public-sector agricultural R&D agencies often derive funding from multiple sources, including the private sector. In such cases, the government R&D agency is considered the performer, not the private-sector enterprise funding the research.

WHAT CONSTITUTES NATIONAL RESEARCH?

Up until now ASTI has focused on national agricultural research systems. The concept of “national” refers to domestically targeted research activities that are funded or executed by the public or private sector within a particular country. Therefore, research activities done by international and bilateral research agencies are excluded unless they are executed by national institutes. Also excluded are research activities undertaken by short-term development projects.

CHALLENGE: Including R&D beyond the national level

Research conducted by international entities and foreign-owned organizations plays an important role in developing countries. To incorporate these contributions, the *Frascati Manual* recommends creation of a “foreign institution” sector. This category is particularly relevant for the agricultural R&D sector, which includes the 15 centers of the Consultative Group on International Agricultural Research (CGIAR), various other international organizations, and a number of foreign governmental and nonprofit agencies that have research units in developing countries. ASTI has maintained data on CGIAR research spending, but not on CGIAR human resources (the latter are collected through the CGIAR Gender and Diversity Program). The “foreign institution” category is expected to become increasingly relevant for the ASTI data with the ongoing enhancement of regional agricultural research. In Africa, in particular, plans are being made to create agricultural R&D “centers of excellence.”

WHAT IS INCLUDED UNDER AGRICULTURE?

ASTI defines agricultural research to include research on crops, livestock, forestry, fisheries, natural resources, and the socioeconomic aspects of primary agricultural production. Also included is research concerning the **on-farm** storage and processing of agricultural products, commonly referred to as postharvest or food-processing research. R&D in the agrochemical industry, agricultural machinery, and the food processing industry **off farm** is not included in the current ASTI data (these are better reported under those industries). Also not included are the more discipline-oriented basic research activities undertaken by departments such as microbiology and zoology, except when this work has a clear focus on agriculture. Strict delineations, however, cannot always be made.

CHALLENGE: Food-processing R&D in advanced developing countries

A large number of agricultural R&D agencies, especially those in the more advanced developing countries, conduct research related to food processing and agribusiness concerns. Strictly speaking, these R&D activities should be reported under the manufacturing sector instead of under agriculture.

WHAT CONSTITUTES PUBLIC AND PRIVATE RESEARCH?

ASTI groups “performers” of agricultural R&D into two sector categories (public sector and private sector) and five institutional categories (Table 2). Thus, “public sector” agricultural research is considered to include government agencies, institutions of higher education, and nonprofit institutions. The “private sector” includes businesses and public (for-profit) enterprises. Public enterprises exist in only a handful of countries, most of which are in Asia (for example, China and India).

Table 2. Sector and institutional classifications for measuring resources invested in agricultural R&D

Sector categories	Institutional categories	Definitions
Public sector	1. Government	Research organizations directly administered by the national government, typically as a department or arm of a ministry
	2. Higher education	Academic agencies that combine university-level education with research; they include agricultural faculties, as well as specialized R&D institutes administered by universities
	3. Nonprofit	Agencies not directly controlled by the national government and without an explicit profit-making objective; in the agricultural sector these agencies are often linked to producer organizations or commodity boards
Private sector	4. Business	Entities with the primary aim of producing goods and services for profit; some of these companies have a R&D unit dedicated to agricultural research, though R&D is generally not their main activity
	5. Public enterprises	Enterprises that are owned by government units; their primary activity is typically the marketing and sale for profit of goods and services, which are often produced by private enterprises

Source: Compiled by authors from the *Frascati Manual* 2002<[web link](#)>.

CHALLENGE: Blurring institutional boundaries

Increasing diversity in the structure of agricultural research agencies has made it more difficult to classify an R&D unit as “government,” “higher education,” or “nonprofit.” In addition, the boundaries between public and private research are becoming increasingly blurred. The *Frascati Manual* developed a decision tree to assist statisticians in assigning the proper institutional classification. Nonetheless, some ambiguous situations remain. In some of these cases ASTI follows the *Frascati Manual*’s institutional classification; but in other cases it has developed its own classification scheme:

- A number of government research agencies have a semi-public or a semi-autonomous status. Their administrative control is nongovernmental, but they continue to depend on government for funding. Examples include the Colombian Corporation for Agricultural Research (CORPOICA) and the National Institute for Agricultural Research (INIA) in Uruguay. ASTI follows the *Frascati Manual* in classifying these institutions as government agencies. The National Agricultural Research Center (CNRA) in Côte d’Ivoire, on the other hand, is largely funded by the private sector. Although ostensibly a private company, CNRA still falls under the supervision of the Ministry of Higher Education and Scientific Research, from which it derives the public share of its funding, and is mandated to undertake public research. Following the *Frascati Manual*, ASTI also classifies CNRA as a government agency.
- ASTI classifies all nonprofit institutions as public-sector agencies. However, the latest edition of the *Frascati Manual* fine-tunes the definition of private-sector agencies to include R&D units linked to producer organizations or commodity boards. This is unlike earlier editions, which classified such agencies as public sector. ASTI argues that most research done under the auspices of producer organizations or commodity boards is funded by a tax on production or exports. Government legislation is usually needed to establish such a tax scheme and to make the tax compulsory for all farmers. Revenues from such taxes can also be seen as public-sector resources (like regular income taxes) and not as private-sector revenues. Therefore, ASTI continues to classify R&D units of producer organizations and commodity boards as nonprofit organizations and part of public-sector agricultural R&D.
- ASTI counts nongovernmental organizations (NGOs) as nonprofit, public-sector agencies.

CHALLENGE: Private-sector coverage

Obtaining complete and accurate agricultural R&D investment data for private enterprises is very difficult. Many private companies are reluctant to share information on their agricultural R&D resources and investments due to confidentiality concerns. In addition, private research activities in low-income and middle-income countries tend to be small in scale and ad hoc, making it difficult for surveyors to capture full information. Obtaining private-sector data requires an approach that is very different from ASTI’s usual survey work.