GUIDELINES FOR RESPONDING TO THE FAO QUESTIONNAIRE ON AGRICULTURAL SCIENCE AND TECHNOLOGY INDICATORS

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1. PURPOSE AND CONTENT OF THE FAO QUESTIONNAIRE

This document provides instructions for completing the **Annual Questionnaire on Agricultural Science and Technology Indicators** of the Food and Agriculture Organization of the United Nations (FAO).

The questionnaire aims to support FAO efforts to maintain a comprehensive global database that provides cross-country comparable data on agricultural science and technology indicators (ASTI), including expenditures and total researchers. These data will be published on FAOSTAT.

The indicators to be published will be the following:

1. Total agricultural research expenditure.

2. Agricultural research expenditure as a proportion of the value added in agriculture, forestry and fisheries.

3. Total agricultural researchers in full-time equivalents (FTE).

4. Agricultural researchers (FTE) per 100 000 farmers.

These indicators will be constructed based on the responses to this questionnaire and additional external indicators from secondary sources.

2. HOW TO COMPLETE THE FAO QUESTIONNAIRE

2.1. Relevant aspects to consider before completing the questionnaire

- This questionnaire requests data at the **aggregated national level**.
- Only the cells highlighted in **orange** should be completed.
- Rows or columns should not be added or removed. Do not enter information in any cell that is not explicitly marked with the corresponding colour.
- Please note that both researchers and expenditures must be reported in **full-time equivalent (FTE)**. If you are unsure how to do this, refer to Annex 1, section A.5 and A.6.
- Information is required for the most recent year for which data are available in the country, as well as the two previous years.

2.2. Questionnaire structure

The questionnaire is an **Excel** document consisting of **seven tabs**:

A. Cover: Includes the contact details of the institutional representative serving as the country focal point.

B. Instructions: Provides basic guidance to consider while completing the questionnaire.

C. Definitions: Summarises the key definitions to consider before entering any data.

D. Human Resources – Researchers FTE: This form should be completed with the number of FTE agricultural researchers in each institutional sector, disaggregated by educational level and gender.

E. Financial Resources FTE: Form to report expenditures associated with agricultural research activities in each institutional sector, disaggregated by cost category.

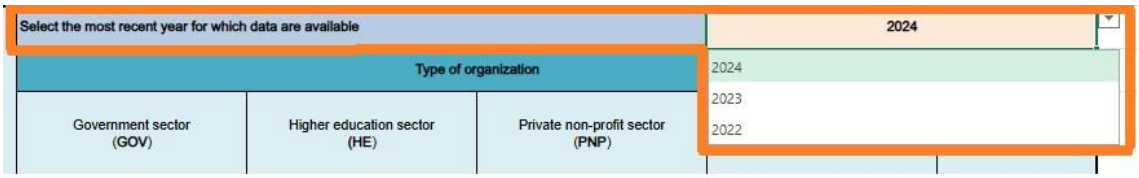
F. Metadata: Collects information on the availability of the data and the dissemination methods used for the previously reported data.

G. Feedback: Collects feedback on the questionnaire design, clarity of guidelines, etc. to improve future data collection.

2.3. How to complete the Human Resources Section

First, select the most recent year with available data from the dropdown menu. Once the year is chosen, all remaining time references will update automatically based on the selection.

Figure 1. Dropdown menu for selecting the most recent year with available data



Then, complete the orange cells with the total number of full-time equivalent (FTE) agricultural researchers in each institutional sector (as defined in Section A.4) disaggregated by gender, and educational level (Figure 2). The totals are calculated automatically as data is entered.

Box 1. Educational level categories

ASTI collects time-series data on university qualifications of professional research by degree (Ph.D., M.Sc., and B.Sc.). If the degree-level equivalent is unclear, the following scale is applied:

- **Research doctoral degrees (e.g., Ph.D., D.Sc.)**. Equivalent to more than six years of full-time university education, including a doctoral thesis.
- **Master's degrees (e.g, M.Sc., M.Econ., M.Phil.)**. Equivalent to five to six years of full-time university education.
- **Bachelor's degrees (e.g., B.Sc., BVM, B.Phil.)**. Equivalent to at least three (but usually four) years of full-time university education. This category also includes staff with honors degrees.

Figure 2. FTE researcher questionnaire section (for the most recent year with available data)

Researchers according to the highest educational level attained and gender (expressed in FTE)	Type of organization								Total
	Government sector (GOV)		Higher education sector (HE)		Private non-profit sector (PNP)		Business enterprise sector (BE)		
	Female	Male	Female	Male	Female	Male	Female	Male	
Doctoral degree (Ph.D.)									0
Master's degree (M.Sc.)									0
Bachelor's degree (B.Sc.)									0
Sub-total	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
2024	0		0		0		0		0

After completing the disaggregated information for the most recent year with available data, enter the data for the two previous years. The corresponding years appear automatically based on the year previously selected. For these years, only the total number of FTE agricultural researchers by institutional sector is required (Figure 3).

Figure 3. FTE researcher questionnaire section (preceding years)

Researchers according to the highest educational level attained and gender (expressed in FTE)	Type of organization								Total
	Government sector (GOV)		Higher education sector (HE)		Private non-profit sector (PNP)		Business enterprise sector (BE)		
	Female	Male	Female	Male	Female	Male	Female	Male	
Doctoral degree (Ph.D.)									0
Master's degree (M.Sc.)									0
Bachelor's degree (B.Sc.)									0
Sub-total	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
2024	0		0		0		0		0
2023									0
2022									0

2.4. How to complete the Financial Section

Actual expenditures should be reported; not budgeted or projected amounts. All spending data should be recorded in the **current local currency** for the reporting calendar year.

If the financial year does not match the calendar year, expenditures are reported in the calendar year that covers most of the financial year. For example, if the 2023/2024 financial year starts on April 1, all costs incurred in 2023 are to be reported under 2023. If the 2023/2024 financial year starts on July 1, all costs incurred in 2023 are to be reported under 2024.

Before starting this section, three questions must be answered (Figure 4):

- **Currency used for data reporting:** Please specify the name of the local currency you will use to answer this question.
- **Units of monetary measure:** Indicate the unit of measurement you will use to report financial data.
- **Date ending the financial year:** Indicate the date on which the fiscal year ends in your country. For example: 31 December.

Figure 4. Initial information

Currency used for data reporting:	
Units of monetary measure:	
Date ending the financial year:	

Then, select the most recent year with available data from the dropdown menu. Once the year is chosen, all remaining time references will update automatically based on the selection (Figure 1).

Next, complete the orange cells with the total FTE expenditure on agricultural R&D for each institutional sector (as defined in Section A.4), broken down by cost category. Totals will be calculated automatically as you enter the data (see Figure 5).

Box 2: Cost categories

ASTI collects three categories of detailed cost data, following Frascati Manual (OECD, 2015) definitions:

- **Labour costs of R&D personnel.** All employed R&D personnel (called "internal R&D personnel" in the OECD Frascati manual) remuneration expenditures are reported here including, pension plan contributions, insurance premiums, child education and housing allowances. It is important to include only labour costs for employed persons when they make a direct contribution to intramural R&D, especially if such persons do not work full-time on R&D activities. This category also includes the labour cost of temporary staff like day labourers and long-term consultants, which is often mistakenly included under operating expenditures.
- **Other current R&D cost**s. These costs comprise non-capital purchases of materials, supplies, equipment and services to support R&D performed by the statistical unit in the reference year. Items such as gasoline, electricity, stationery, books, agricultural inputs, staff training, travel, and per diem expenses are included here. Royalties or licences for the use of patents and other intellectual property rights, the lease of capital goods, and running costs and maintenance of buildings, cars and equipment are reported here as well. The costs associated with engaging persons who are not employed in the research unit but provide direct services that are integrated into the unit's R&D activities should be included in other current costs (defined as "external R&D personnel" in the Frascati manual, including on-site consultants and researchers from external organisations, research institutes, enterprises, etc., and the self-employed).
- **Capital R&D expenditures.** All expenditures related to the purchase or rental of items that last longer than a year are reported in this category. Examples are research equipment, furniture, computers, cars and vehicles, land and buildings. Depreciation costs (and interest charges) for past capital investments are also included here.

Figure 5. FTE expenditure questionnaire section (for the most recent year with available data)

Total expenditure by cost category (expressed in FTE)	Select the most recent year for which data are available			2024	
	Types of organization				Total
	Government sector (GOV)	Higher education sector (HE)	Private non-profit sector (PNP)	Business enterprise sector (BE)	
Labour costs of R&D personnel					0
Other current R&D costs					0
Capital R&D expenditures					0
2024	0	0	0	0	0

After completing the disaggregated data for the most recent available year, please enter the data for the two preceding years. The corresponding years will be displayed automatically based on the selected most recent year. For these previous years, only aggregate totals by institutional sector are required (see Figure 6).

Figure 6. FTE expenditure questionnaire section (preceding years)

Total expenditure by cost category (expressed in FTE)	Select the most recent year for which data are available			2024	
	Types of organization				Total
	Government sector (GOV)	Higher education sector (HE)	Private non-profit sector (PNP)	Business enterprise sector (BE)	
Labour costs of R&D personnel					0
Other current R&D costs					0
Capital R&D expenditures					0
2024	0	0	0	0	0
2023					0
2022					0

2.5. How to complete the metadata Section

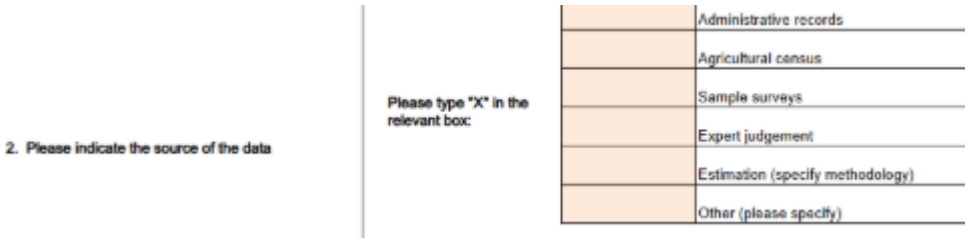
This section collects valuable information on data completeness, source of data, frequency of data collection and dissemination media, with the aim of improving FAO's data collection process.

The section consists of four questions related to the following topics:

1. Data coverage
2. Data sources
3. Data frequency
4. Data dissemination

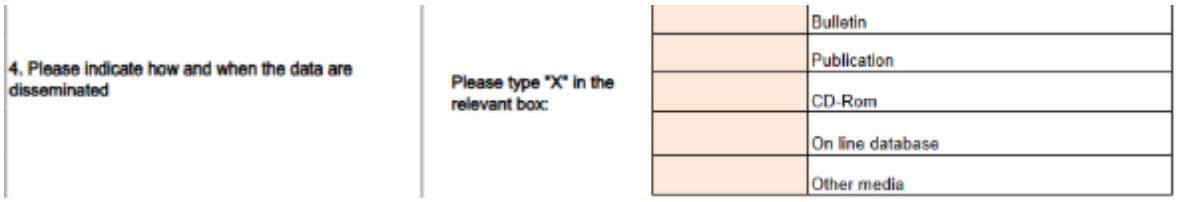
For each question, the appropriate option should be selected by marking an "X", and further details should be provided regarding the specific aspects related to the question.

Figure 7. Metadata section example – data sources



2. Please indicate the source of the data	Please type "X" in the relevant box:	
		Administrative records
		Agricultural census
		Sample surveys
		Expert judgement
		Estimation (specify methodology)
		Other (please specify)

Figure 8. Metadata section example – data dissemination

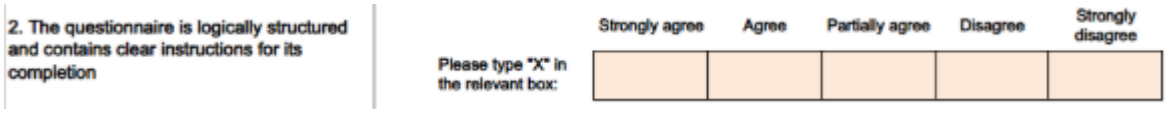


4. Please indicate how and when the data are disseminated	Please type "X" in the relevant box:	
		Bulletin
		Publication
		CD-Rom
		On line database
		Other media

2.6. How to complete the Feedback Section

This section contains a short survey that will help FAO to assess the quality of the questionnaire and identify areas for improvement. It consists of 10 questions for which the appropriate option should be selected, or a written response should be provided, as applicable.

Figure 9. Feedback section example (select relevant box)



2. The questionnaire is logically structured and contains clear instructions for its completion	Strongly agree	Agree	Partially agree	Disagree	Strongly disagree
Please type "X" in the relevant box:					

Figure 10. Feedback section example (written response

10. Please indicate any section or part that you found difficult to complete and why	

ANNEX 1 – BASIC DEFINITIONS

A.1. Agriculture

ASTI adopts the definition of agriculture, which includes crops, livestock, forestry, fisheries, natural resources, and the socioeconomic aspects of primary agricultural production[1]. This covers all types of on-farm activities—including storage and processing of agricultural products when conducted on the farm—but excludes off-farm activities such as postharvest handling and food processing.

R&D in agrochemical, agricultural machinery, and food processing should not be included in ASTI, as these are better reported under those industries.

Discipline-oriented basic research activities undertaken by departments such as microbiology and zoology should not be included, except when this work has a clear focus on agriculture.

A.2. National

The concept of "national" refers to domestically targeted research activities funded or executed by research agencies within a particular country. Therefore, research activities undertaken by international and bilateral research agencies are excluded unless they are executed by national institutes. Research activities undertaken by short-term development projects are also excluded.

A.3. Research and Development (R&D)

ASTI uses the definition for "research and experimental development" as in the Frascati Manual (OECD, 2015), which comprises ...*creative and systematic work undertaken in order to increase the stock of knowledge […] and to devise new applications of available knowledge. Research is considered the creative work and the original investigation undertaken on a systematic basis to gain knowledge and development […] is the application of research findings or other scientific knowledge for the creation of new or significantly improved products, applications, or processes. Overall, R&D is always aimed at new findings, based on original concepts (and their interpretation) or hypotheses. It is largely uncertain about its final outcome (or at least about the quantity of time and resources needed to achieve it), it is planned for and budgeted (even when carried out by individuals), and it is aimed at producing results that could be either freely transferred or traded in a marketplace.*"

For an activity to qualify as R&D, it must meet five core criteria: it must be **novel, creative, uncertain, systematic, transferable and/or reproducible**.

The term R&D covers three types of activity: basic research, applied research and experimental development. FAO will not seek to distinguish between these types of research, but defining them is useful because, put together, they define the full scope of R&D.

[1] Refers to ISIC, rev.4, Section A, Agriculture, Forestry and Fishing (United Nations. (2008). *International Standard Industrial Classification of All Economic Activities (ISIC), Rev.4*. New York: United Nations, Department of Economic and Social Affairs, Statistics Division).

A.4. Research performers, institutional units and institutional sectors

The ASTI methodology measures the human and financial resources invested by "performers" of agricultural R&D, following the performer-based approach recommended by the Frascati Manual. The "performer" is the entity that carries out the research, not the funder of the research.

The **institutional units** involved in the performing of R&D activity are defined as "an economic entity that is capable, in its own right, of owning assets, incurring liabilities, and engaging in economic activities and transactions with other entities"[2]. In the R&D case, institutional units have to be capable of decision-making regarding the conduct of R&D, from allocating financial resources for internal or external use to managing R&D projects.

The **reporting unit** on the other hand is the entity from which the required statistics are collected. It may consist of multiple reporting units in one institution.

Research performers expected to contribute ASTI data belong to different institutional sectors, and the data collected changes slightly for each sector. The Frascati Manual draws upon the approach of the System of National Accounts (SNA) to identify four mutually exclusive institutional sectors to characterize and classify R&D performing institutions: (i) Government (ii) Higher Education, (iii) Private non-profit and (iv) Business enterprise (**Table 1**).

Table 1. Institutional sectors used in the Frascati Manual

Institutional sectors for measuring resources invested in agricultural R&D	
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. Private 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.
4 Business enterprise	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.

A.5. Full-time equivalent (FTE)

The **full-time equivalent (FTE)** of R&D personnel is defined by the Frascati Manual as the ratio of working hours actually spent on R&D during a specific reference period (usually a calendar year) divided by the total number of hours conventionally worked in the same period by an individual or by a group.

To be included in the R&D personnel totals, an individual should make an appreciable contribution to the R&D performed. Therefore, for both internal personnel and external personnel, it is recommended to express FTEs in decimals and to check for the significance of the contribution to a unit's R&D

[2] IMF, OECD, UN & World Bank, 2009. System of National Accounts, United Nations, New York.

performance by individuals spending less than 0.1 FTE on R&D on an annual basis (i.e. 10 per cent of the total working time, which is about 20 working days per year).

Total R&D personnel in FTE terms includes the annual R&D performance of all individuals—internal and external R&D personnel, including volunteers—who contributed to the intramural R&D of a statistical unit, an institutional sector, or a country.

A.6. Adjusting researchers and expenditure using the FTE coefficient

In the questionnaire, the values should be provided at an aggregated level, previously adjusted by FTE coefficient at the agency level. Once the FTE coefficient is calculated at the agency level, it should be multiplied by the total number of researchers and the total research expenditure. For example, if agency A has 10 researchers and an FTE coefficient of 0.5, the adjusted number of researchers will be 5 FTE researchers. In the FAO questionnaire, the sum of the researchers and expenditures adjusted by FTE coefficient for each agency should be provided.

Researchers:

FTE-adjusted researchers per agency

$$Researchers_{FTE}^{(i)} = Researchers^{(i)} x\ FTE\ Coefficient^{(i)}$$

FTE-adjusted researchers at the national level

$$Total\ Researchers_{FTE} = \sum_{i=1}^{n} (Researchers^{i}\ x\ FTE\ Coefficient^{i})$$

Expenditures:

FTE-adjusted expenditure per agency

$$\text{Expenditure}_{\text{FTE}}^{(\text{i})} = \text{Expenditure}^{(\text{i})} \text{x FTE Coefficient}^{(\text{i})}$$

FTE-adjusted researchers at the national level

$$\text{Total Expenditure}_{\text{FTE}} = \sum_{\text{i}=1}^{\text{n}} (\text{Expenditure}^{\text{i}}\ \text{x FTE Coefficient}^{\text{i}})$$

Where:

- (i): refers to each agency (from 1 to n agencies).
- Researchers$^{(i)}$: total number of researchers reported by agency i.
- Expenditure$^{(i)}$: total research expenditure reported by agency i.
- FTE Coefficient$^{(i)}$: FTE coefficient calculated for agency i, as explained in Section A.5.