

GEMS/Food Programme

INSTRUCTIONS FOR ELECTRONIC SUBMISSION OF DATA ON
CHEMICALS IN FOOD AND THE DIET

Updated December 2021



DEPARTMENT OF NUTRITION AND FOOD SAFETY

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1. Introduction

Established in 1976, the Global Environment Monitoring System / Food Contamination Monitoring and Assessment Programme, commonly known as GEMS/Food, began as a joint project between the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP) and the World Health Organization (WHO) with WHO serving as the implementing agency. Although the project came to an end in 1994, WHO has continued to implement GEMS/Food for the benefit of its contributing institutions. In 2011, WHO launched a web-based system for data submission which has been upgraded in 2021.

The purpose of GEMS/Food is to compile and to make accessible data on food contamination from different countries for global synthesis, evaluation, and presentation. GEMS/Food informs governments, international and intergovernmental institutions, such as the Codex Alimentarius Commission, and its scientific advisory bodies, such as the Joint FAO/WHO Meeting on Pesticide Residues (JMPR) and the Joint FAO/WHO Expert Committee on Food Additives (JECFA) on the levels and trends of chemicals in food, their contribution to the total human exposure and their significance regarding public health and trade.

This manual presents protocols for submitting analytical results on chemical levels in foods.

2. Registration and login to the GEMS/Food database

Data provider should first register and create a WHO login (e-mail address) and password. The institution owning the data should provide the GEMS/Food administrator with contact details to have it listed as a collaborating institution. The Institution should propose user(s), authorized to upload the data and request the administrator to create institution account(s). An institution can have as many accounts as needed and each user can access, modify, or withdraw data submitted by his/her institution. When a user is leaving the institution, his account is inactivated but data submitted remain available for other users of the same institution.

WHO is using the Azure AD authentication system.

- To create an account, an e-mail should be sent to gems_food@who.int to request an access to GEMS/Food. The e-mail should provide information about the institution as well as the user contact details.
- An invitation should be sent from WHO to the proposed user through Microsoft Azure[®]. Kindly check your mailbox, including spam folder.
- Once the invitation is accepted, the user should go to <https://extranet.who.int/gemsfood/> and login by clicking the Login link in the top right of the home page.
- Once logged in to the database (see below), the user will have access to the Excel templates for contributing data.
 - a. The “Regular template” allows data provider to enter the national food classification and to map it with both the WHO and the FoodEx2 classifications.
 - b. The “Bulk template” allows data provider having already mapped the national classification with either the WHO or the FoodEx2 classification to enter data directly using one of the 2 coding system.



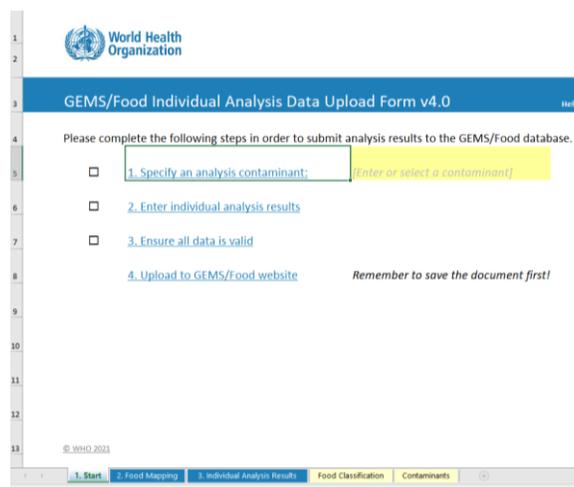
- The home page of the GEMS/Food website also provides useful information about the Programme.

3. Filling the templates

3.1. The “Regular template”

That template should be used by data provider to map the national classification with both the WHO and the FoodEx2 classification. The template is an excel file containing 5 worksheets:

- The worksheet 1 (Start) contains a check list for Institution preparing a data submission. When all the data submitted are for a single chemical you should select it in worksheet 1.



- The worksheet 2 (Food Mapping) contains the tool to be used for mapping: the local food identifier (column A) and the 2 levels of classification in drop-down menus i.e., Level 1 called Food Group (Column B) and level 2 called WHO Food Identifier (Column C). The WHO Food Code as well as the FoodEx2 code and the FoodEx2 name are generated automatically respectively in column E, F and G. This mapping should be done once if the national classification is stable. When new food items are added at national level they should be linked with the corresponding GEMS/Food and FoodEx2 codes.

A	B	C	E	F	G
Local food identifier	WHO Food Group	WHO Food Identifier	WHO Food Code	Foodex2_code	Foodex2_Name

Select the closest WHO food group from the list corresponding to the local food identifier.
This is not mandatory but will narrow down the list of WHO food identifiers.

Note: Food classification

The GEMS/Food code is based on a hierarchical classification with 2 levels: The first level (WHO Food Group) corresponds to 23 broad categories usually reported in food consumption surveys plus one category for feed. These categories are expected to be valid for all types of diets around the world and should allow for an international dietary exposure assessment. The second level (WHO Food Identifier) corresponds to the detailed food descriptors used in the Codex Alimentarius Committees and to foods, processed or not, and analyzed as purchased or as consumed.

The FoodEx2 code developed by EFSA and recommended for dietary exposure assessment is already mapped with the WHO code. The relative rigidity of having only 2 levels of classification is balanced by the possibility to add easily detailed food descriptor at level 2 and to remain able to assess the dietary exposure internationally in a consistent way at level 1.

- The worksheet 3 (Individual Analysis Results) should be filled with individual data to be submitted. When entering a local food identifier (column E) previously mapped, the column B, C and D will be filled automatically with the WHO Food identifier and WHO code. The other columns should be filled following the instructions below. The columns with **blue** heading are mandatory, the columns with **white** heading can be left blank if the information is not available. The column A should be filled automatically when an error is detected.

A	B	C	D	E	F	G	H	I	J
Error	WHO Food Code	FoodEx2 Code	WHO Food identifier	Local food identifier	Serial no of the record	Country/Region	Contaminant	Food origin	Sampling date

- The worksheet 4 contains the WHO and the FoodEx2 classifications used by the system.
- The worksheet 5 contains the list of chemicals considered for submission. **If there is a need to submit chemicals which are NOT in the list, you can insert additional lines before filling the worksheet 3. In the excel file go to the worksheet 5, select a row, then select “insert” then “insert sheet rows”. The added row should be filled with Contaminant name, CAS number and possibly an explanatory note.**

Contaminant	CAS	Notes
RYLONITRILE		Other pesticides
Aflatoxinol		Mycotoxin-Analysed in TDS-SSA
Aflatoxin (total)	1402-68-2	Mycotoxin
Aflatoxin B1	1162-65-8	Mycotoxin
Aflatoxin B1 and B2		Mycotoxin
Aflatoxin B2	7220-81-7	Mycotoxin
Aflatoxin B3		Mycotoxin
Aflatoxin G1	1165-39-5	Mycotoxin

3.2. The “Bulk template”

That template should be used by data provider when the national classification is already mapped with either the WHO or the FoodEx2 classification. The template is an excel file containing only 3 worksheets namely “individual analysis results”, “food classification” and “contaminants”.

Error	WHO Food Code	FoodEx2 Code	WHO Food Identifier	Local food identifier	Serial no of the record	Country/Region	Contaminant	Food origin	Sampling date

Data provider should enter either the WHO Food Code or the FoodEx2 code respectively in column B or C. The process to fill the rest of the bulk template is the same as described above for the worksheet 3, 4 and 5 of the “Regular template”.

Note : Template management:

Institutions are usually reporting data for a single country. In case an institution wants to report data for one or several additional countries, the GEMS/Food administrator should be informed to modify the institution account.

*When using the “copy & paste” function to fill your data in worksheet 2 and 3 the user should go to the “edit” menu and choose “paste special” then select “values only”. **The normal Ctrl V function should not be used.***

When all results are entered, the column A should be check for errors. Errors should be fixed before the template is saved and uploaded.

The following sections describe each of the data fields in the GEMS/Food templates and the way in which the data must be reported.

Description of the fields in worksheet 2 (Food Mapping)

The column A (Local food identifier) consists in the name given to the food in the national database. It could be written preferably in the original language or translated precisely in English.

Each local food identifier should firstly be linked with a WHO food group in column B corresponding to a broad food category or level 1 of the classification. These 24 broad categories appear in a drop-down menu. After the identification of the food group, the local food identifier should be mapped with the closer WHO food identifier, or level 2 of the classification, listed in column C. The WHO food identifiers appear in a drop-down menu. If the precise food name is not listed, the more generic sub-group listed in CAPITALS should be chosen. The generic food names (e.g. CITRUS FRUIT) appear after the corresponding list of detailed names. IMPORTANT: If you do not have the information on the detailed food category (e.g., "fruit") you should select a WHO Food Identifier similar to the WHO Food Group (e.g., Fruit and fruit product NES).

NES means "Not Elsewhere Specified" and is listed in alphabetic order in the dropdown menu of WHO Food Identifier.

The level 2 of the classification is mainly based on the commodity categories developed by the Codex Committee on Pesticide Residues with the addition of some categories from the General Standard for Food Additives (GSFA) developed by the Codex Committee on Food Additives for processed food.

Description of the fields in worksheet 3 (Individual Analysis Results)

Field E: Local food identifier

Field characteristic: Mandatory

Field size: Free text (alphanumeric characters)

Field contents: The local food identifier consists of the name given to the food in the national database. It could be written preferably in the original language or translated precisely in English. When a local food identifier is entered for the first time into GEMS/Food it should be mapped with the WHO food grouping system using the "food mapping" sheet of the template (worksheet 2). When a local food identifier has been mapped, the fields B, C and D are filled automatically when pressing enter after typing field E.

Field F: Serial number of the record

Field characteristic: Mandatory

Field size: Free text (alphanumeric characters)

Field contents: The serial number of the record consists of the code given to the record in the national database.

Note: Duplicate records

It is critical to help avoiding the submission of duplicated records when the code is unique for a considered sample. In case of submission of data for more than 1 chemical or for several congeners, the serial number is essential to identify the different analysis done on the same samples.

Field G: Country/Region

Field characteristic: Optional

Field size: drop-down menu

Field contents: National institutions can submit data from a single country and this field is therefore optional. However international agencies and multi-national institutions can submit data on behalf of several individual countries (e.g. *European Cocoa Association* can submit data from each Member Country belonging to the trade union) or on behalf of a group of countries (e.g. African Union can submit data on behalf of its 55 Member States). In that case the data provider should select the country/region in the drop-down list. If the region is NOT in the drop-down menu you should contact the GEMS/Food administrator and have it added.

Field H: Contaminant

Field characteristic: Optional if the template is for a single chemical and that its name is mentioned in worksheet 1 (start).

Field size: Drop-down menu.

Field contents: This is the name of the chemical analyzed. Several chemicals can be submitted in the same template.

Note: If the chemical is NOT in the list, additional lines should be inserted (with Contaminant name, CAS number and possibly a note) in the tab "contaminant" before filling the worksheet 3. After adding a new contaminant in the template, the GEMS/Food administrator should be informed to update the list for all institutions (see also below chapter 4. "uploading the templates").

Field I: Food Origin

Field characteristic: Optional

Field size: Drop-down menu

Field contents: This is identifying if the Country of Origin of Food is the same as Country Providing Record. Four options are possible: domestic, imported, mixed origin or unknown.

Field J: Sampling Date

Field characteristic: Mandatory

Field size: Date/Year of sampling

Field contents: The date when the sample was collected, expressed in the form of year (YYYY).

Field K: Sample representativeness/reliability

Field characteristic: Mandatory

Field size: Drop-down menu

Field contents: This field may contain only one of the following statistical descriptors: Random sampling, Targeted sampling or unknown.

Note: It is unlikely that sample results reported to GEMS/Food would be based on a statistical sampling method, but the data could still be the result of random rather than targeted sampling.

Field L: Laboratory Identification

Field characteristic: Optional

Field size: Free text (alphanumeric characters)

Field contents: This indicates the laboratory submitting results in this set of records.

Field M: Analytical Quality Assurance

Field characteristic: Optional

Field size: Drop-down menu

Field contents: This field may contain only one of the following options to indicate the level of laboratory proficiency for the laboratory (or the majority of the contributing laboratories):

- Internal quality assurance and reference standards only.
- Successful participation in relevant proficiency tests during the sampling and analysis period.
- Official accreditation for the relevant methods during the sampling and analysis period.
- Unknown quality insurance of the lab.

Note: Relevant means similar or identical food matrices and identical contaminants. In general, official accreditation is considered a higher criterion than successful participation in proficiency testing, followed by internal quality assurance and control only.

Field N: Measurement units for Contaminant Levels

Field characteristic: Mandatory

Field size: Drop-down menu

Field contents: This field should contain one of the following options to indicate the unit of reporting for the contaminant concentration: mg/kg (milligram per kilogram or parts per million), µg/kg (microgram per kilogram or parts per billion), ng/kg (nanogram per kilogram or parts per trillion), pg/kg (picogram per kilogram or parts per quadrillion), Bq/kg (Becquerels per kilogram).

Note: make sure that the reporting unit is the same for results, LOD and LOQ.

Fields O: Limit of detection (LOD)

Field characteristic: Mandatory for results not quantified if LOQ is not provided

Field size: Number

Field contents: The limit of detection (LOD) is the minimum concentration of a contaminant that can be qualitatively measured in the specific food. This field contains the limit of detection reported by the laboratory or a value calculated from the LOQ.

Field P: Limit of quantification (LOQ)

Field characteristic: Mandatory for results not quantified if LOD is not provided

Field size: Number

Field contents: The limit of quantification (LOQ) is the minimum concentration of a contaminant that can be quantitatively measured in the specific food with an acceptable level of accuracy and precision. This field contains the limit of quantification reported by a laboratory or a value calculated from the LOQ.

Note: Regarding the LODs and LOQs for individual data and described above, automatic rules have been implemented into the system to ensure the consistency of data submitted. If these rules are not fulfilled the dataset will be automatically rejected:

** 'LOD' must be greater than 0*

** 'LOQ' must be greater than 0*

** 'LOD' must be less 'LOQ'*

Field Q: Basis for the Analytical Results

Field characteristic: Mandatory

Field size: Drop-down menu

Field contents: This field may contain only one of the following options to indicate the basis upon which the analytical values were determined: Fat content, Dry weight, As is (raw, fresh) or As consumed

Field R: Portion analyzed

Field characteristic: Mandatory

Field size: Drop-down menu

Field contents: This field may contain only one of the following options to indicate which portion has been analyzed: edible only, or total food i.e., edible + inedible portion of food.

Field S: State of food analyzed

Field characteristic: Optional

Field size: Rolling menu

Field contents: This field may contain only one of the following options to indicate if the analytical values were determined on: cooked food, raw food or if the information is unknown.

Field T: Results

Field characteristic: Mandatory

Field size: Number

Field contents: This is the result of an individual measurement for the contaminant in question.

Note: Results below the LOD or for which quantified results are not reported should be entered as 0 (zero). When integrated in the database they will be converted in "Non detected". In that case reporting LOD or LOQ in columns M and N is mandatory.

Field U: Individual vs aggregated data

Field characteristic: Optional

Field size: Drop-down menu

Field contents: this field allows to flag that the reported result is based on pooled sample. Additional comment/information about the number of individual samples in the pool may be reported in column W (see below).

Field V: Confidentiality of Data

Field characteristic: Optional

Field size: Drop-down menu

Field contents: By default, data are not confidential and may be used for the purposes of the GEMS/Food Programme. This field could be filled by "Yes" only if submitted data are confidential and should be used only by FAO, WHO and related technical bodies.

Field W: Remarks/References

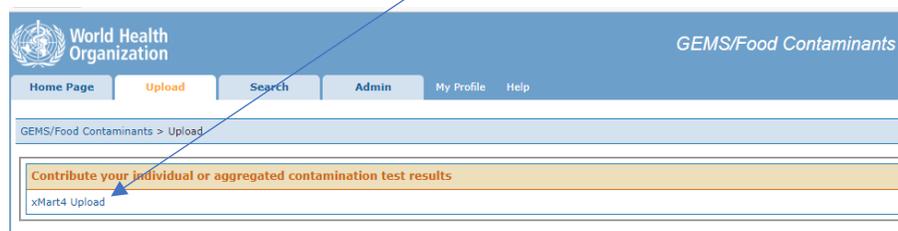
Field characteristic: Optional

Field size: Free text (alphanumeric characters)

Field contents: This field is used for noting remarks and/or references relevant to the data represented.

4. Uploading the templates

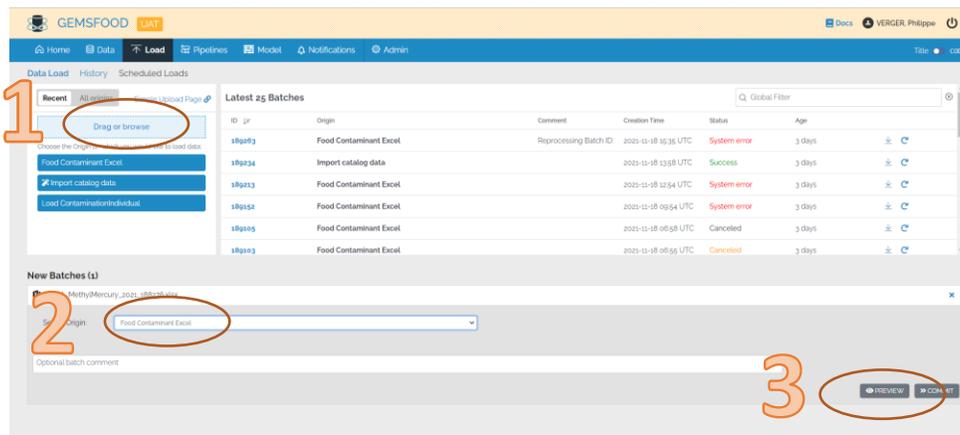
When a template has been filled it should be saved before uploading. Then go to the upload tab to access to the Xmart tool by clicking on [Xmart4 Upload](#).



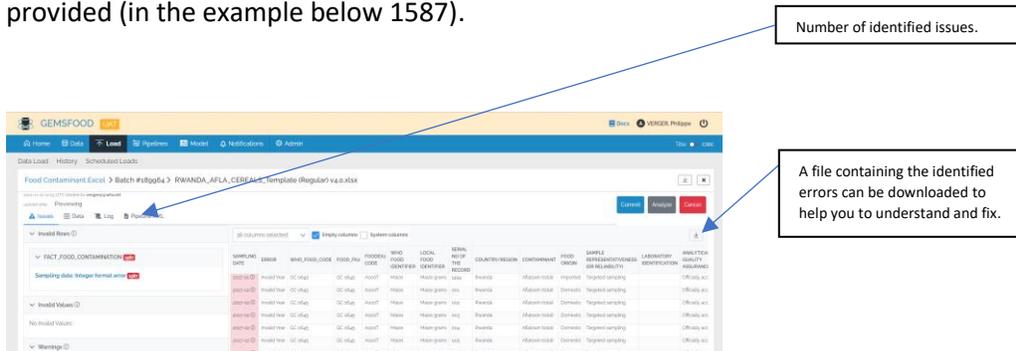
This function allows you to upload templates containing approximately up to 1,080,000 lines (Excel file limit).

Note: Be aware that the time for upload may vary as a function of the number of results in the template, the stability/strength of your internet connection and other users accessing the database at the same time.

1. Select “browse” in the load tab and select the template that you have filled:
2. Select the origin of the batch as “food contaminant Excel”
3. Then click on “preview”. This step can take few minutes.



This step allows identifying the issues before writing data into the database. In the example below the date has been entered with a wrong format. Errors are highlighted in red and the number of errors is provided (in the example below 1587).



If an error is reported as above, click on



fix the error in your template and re-upload the

Note: Duplicates are identified as lines having the same sample ID/serial number, for the same chemical in the same food and on the same year and by the same country. If duplicate lines are detected by Xmart in a batch, they will not be uploaded twice.

2021-11-22 12:54 UTC started by vergerphilippe@gmail.com
result: Canceled

Issues Data Log Pipeline XML

Invalid Rows 38 columns selected Empty columns System columns

FOOD_FK	LOCAL FOOD IDENTIFIER	SERIAL NO OF THE RECORD	SAMPLING DATE	COUNTRY_FK
2538F3A7-A21F-4E0A-B81F-EDD1D8CEE61	Beer	6124A0BCDC55CF38C8E0A82F46	2009	4C90B594-A217-4607-A13C-5EF14F8E6729
2538F3A7-A21F-4E0A-B81F-EDD1D8CEE61	Beer	6124A0BCDC55CF38C8E0A82F46	2009	4C90B594-A217-4607-A13C-5EF14F8E6729
2538F3A7-A21F-4E0A-B81F-EDD1D8CEE61	Beer	82F70390FCAD00B3870F86AC2F4	2010	4C90B594-A217-4607-A13C-5EF14F8E6729
2538F3A7-A21F-4E0A-B81F-EDD1D8CEE61	Beer	82F70390FCAD00B3870F86AC2F4	2010	4C90B594-A217-4607-A13C-5EF14F8E6729

Invalid Values
No Invalid Values

When no error is reported click on  to complete the process.

If you have more than one template to upload, go again to “Load” and restart the process.

Special case: Unknown chemicals, chemicals not listed in the template.

If reported data is related to a chemical not listed in the template, the system will not upload and report an error.

Tab “issues”

Number of identified issues.

Data Load History Scheduled Loads

Food Contaminant Excel > Batch #192126 > Aggregated_data_WHO2012_batch133to215_TEMPLATE_3.xlsx

Batch comment: Harmonizing batch ID: 192126
2021-11-22 12:54 UTC started by vergerphilippe@gmail.com committed by vergerphilippe@gmail.com
result: SUCCESS

Issues Data Log Pipeline XML

Invalid Rows
No Invalid Rows

Invalid Values

CONTAMINANT	ERROR	WHO_FOOD_CODE	FOOD_Fk	FOODKZ CODE	WHO FOOD IDENTIFIER
hch_beta		012	012	Ac0Zg	FERMENTED MILK PRODUCTS
hch_beta		ML_0106	ML_0106	Ac0LT	MILKS
hch_beta		ML_0106	ML_0106	Ac0LT	MILKS
hch_beta		ML_0122	ML_0122	Ac04G	Cattle milk
hch_beta		MM_0122	MM_0122	Ac0XZ	Cattle meat

Failed lookups for FACT_FOOD_CONTAMINATION

In the example above (batch 192126), 687 lines are reported with issue. Go to the tab “data”

Tab “data”

Total number of data submitted

Number of rows NOT uploaded

Number of rows uploaded

Data Load History Scheduled Loads

Food Contaminant Excel > Batch #192126 > Aggregated_data_WHO2012_batch133to215_TEMPLATE_3.xlsx

Batch comment: Harmonizing batch ID: 192126
2021-11-22 12:54 UTC started by vergerphilippe@gmail.com committed by vergerphilippe@gmail.com
result: SUCCESS

Issues Data Log Pipeline XML

Merged 461 source rows into Food Contamination

Contaminant	Status	Country Code	Serial Number	Sampling Year	Local Food Name	Food Code
Food Contamination	461					
Total	461					
Not Loaded	687					
Rows in Error	0					
Unchanged	687					
Loaded	0					
Updated	0					

December 7, 2021

Of the 1148 data submitted, 461 have been uploaded and 687 not uploaded because they relate to unknown chemicals.

Contact the GEMS/Food administrator with the list of “unknown chemicals” so that the chemical list should be updated. When done you should re-process the batch and the missing lines will be uploaded. YOU DON'T NEED TO UPLOAD THE TEMPLATE AGAIN.