

Dataset Information:

Domain: Fertilizers by Nutrient**Abstract**

The **FAOSTAT Fertilizers by Nutrient** domain contains information on *agricultural use, production and trade* of chemical and mineral fertilizers, in tonnes of nutrient, for the three main plant nutrients: nitrogen (N), phosphorus (expressed as P₂O₅) and potassium (expressed as K₂O). The domain also provides information on agri-environmental indicators such as: the ratio between the totals by nutrient of agricultural use of chemical or mineral fertilizers, reported in the FAOSTAT domain “Inputs/Fertilizers by Nutrient” for nitrogen (N), phosphorus (expressed as P₂O₅) and potassium (expressed as K₂O), the area of cropland reported in the FAOSTAT domain “Inputs/Land Use”, the value of agricultural production reported in the FAOSTAT domain “Production/Value of Agricultural Production”, and population reported in the FAOSTAT domain “Population and Employment/Population”. This ratio is provided at country level, as well as for regional and global aggregations.

This domain covers the period from 1961 to the most recent year available. Data are disseminated by country and year.

Statistics on individual products are disseminated, if available, in the *Fertilizers Archive* domain for 1961-2001 (<http://www.fao.org/faostat/en/#data/RA>) and in the *Fertilizers by Product* domain for the period from 2002 to the most recent year available (<http://www.fao.org/faostat/en/#data/RFB>).

Supplemental

FAOSTAT Agri-environmental indicators are calculated by FAO and may not coincide with data reported by member countries to relevant international processes. They are intended primarily as a useful international reference.

International Standards

This **FAOSTAT Fertilizers by Nutrient** domain is compliant with the **System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries**, SEEA AFF. It provides data on inorganic fertilizers, in terms of nutrient content, for the three nutrients included in SEEA AFF: nitrogen, phosphorus and potassium. Data from this domain can be used in the compilation, regarding inorganic fertilizers, of the total supply and total use columns of SEEA AFF Table 4.5 “*Physical flow account for fertilizers*” (FAO & UNSD, 2017).

The **FAOSTAT Fertilizers by Nutrient** domain also aligns with the **Framework for the Development of Environmental Statistics**, FDES 2013. Statistics on the amount of chemical fertilizers used for crop production are part of the core set of environmental statistics of FDES (item 2.5.3.b.2). Additionally, statistics on chemical fertilizers used in forestry activities are part of FDES topic 2.5.1, ‘timber resources’, and the total amount of chemical fertilizers used to enrich soils are part of FDES topic 3.4.1, ‘release of chemical substances’. Statistics on production, imports and exports of chemical fertilizers are included in FDES under ‘mineral resources’, in topic 2.1.2 (UNSD 2017).

Creation Date 2002**Last Update** 2023

FAOSTAT Domain [Fertilizers by Nutrient](#). Methodological note, release July 2023

Data Type	Agricultural input statistics
Category	Environment
Time Period	1961-2022
Periodicity	Annual
Geographical Coverage	World
Spatial Unit	Country
Language	Multilingual (EN, FR, ES)

Methodology and Quality Information:

Data Collection The main data source for production and agricultural use is the [FAOSTAT Fertilizers questionnaire](#), complemented with national publications when available.

Agricultural use of fertilizers refers to the use for crops, livestock, forestry, fisheries and aquaculture, excluding use for animal feed.

Other plant nutrition uses (such as application to ponds, turf and ornamentals) would be excluded, but limited data availability currently prevents the discrimination of these uses. Therefore, it is assumed that those plant nutrition uses may also be included in the values for agriculture provided in this domain.

Industrial uses, also known as technical uses, are excluded, to the extent allowed by data availability.

Changes in stocks are not considered either, due to lack of information. The impact of stocks in the overall trend of the time series is assumed to be negligible.

Production data represent the tonnes of nutrients manufactured into fertilizer products in a country. Production of certain fertilizers may derive from the transformation of other fertilizers, which can be defined as secondary production. A note on avoiding double counting of nutrients from secondary production is included in the 'limitations' section, below.

Trade data (import and export) for the period 1961-2001 were obtained via questionnaire, same as agricultural use and production, but for the period 2002 to present are obtained from UN Comtrade (see disclaimer about the coverage and limitations of UN Comtrade data at: <http://comtrade.un.org/db/help/uReadMeFirst.aspx>). The correspondence between Harmonized System (HS) codes and FAOSTAT fertilizers products categories are indicated in the documentation of the *Fertilizers by Product* domain. Product quantities are then converted to nutrients (N, P₂O₅ and K₂O) by applying the nutrient concentrations indicated in the "default conversion factors" section below.

Gap filling The goal of this statistical domain is to disseminate official data provided by countries (flagged "A", depending if the data were provided via questionnaire, or national publication). However, when official data are not available or inconsistency issues are detected for some values in the time series, those missing values are imputed. Imputation aims at reducing any bias in the output, particularly in the regional aggregates.

In the case of trade data, values reported by each country to UN Comtrade are considered official (flagged "A"). Missing data may be gap filled using **trade partners' data** ("mirror" data), considered non-official (the resulting total, when including non-official data, is flagged "E"). Data imputed with a different method and data from the questionnaire period (1961-2001) receive different flags (e.g. interpolation is flagged "I", expert judgement "E", and data obtained from other international sources "X").

Regarding agricultural use and production data, one method often used for imputing missing data is the calculation of the total in nutrients by adding up the information available in the **Fertilizers by Product** domain. If the resulting total is

the sum of official data that are complete, the result is flagged as official (“A”). Otherwise, the result is flagged as aggregate (“I”).

Missing data may also be imputed using the following **balance equation**: production + imports = exports + agricultural use + other uses. If no data are available for other uses (i.e. uses different from agricultural use), the “other uses” term is assumed to be zero. The resulting imputed value that is derived from the other terms is flagged as balance, “I” (or “E” if the result is zero).

Finally, imputations may also be based on data from associations, research publications, etc. Non-official data are flagged “E”.

Additionally, in the process of quality control and imputation, data are discussed with industry experts. This is part of an ongoing collaboration with the International Fertilizer Association (IFA), which provides fertilizer statistics through IFASTAT (<https://www.ifastat.org>) within the scope allowed by its confidentiality obligations.

Default conversion factors

The default concentrations provided in the table below are used for the conversion into nutrients of data in tonnes of product. In the case of production and agricultural use, these default concentrations are substituted with country specific values if provided in the questionnaires.

COMMODITY	NUTRIENT CONTENT
STRAIGHT NITROGENOUS FERTILIZERS	
Urea	46% N
Ammonium sulphate	21% N
Ammonium nitrate	33.5% N
Calcium ammonium nitrate and other mixtures with calcium carbonate	26% N
Sodium nitrate	16% N
Urea and ammonium nitrate solutions	32% N
Ammonia, anhydrous	82% N
Other nitrogenous fertilizers, n.e.c.	20% N
STRAIGHT PHOSPHATIC FERTILIZERS	
Phosphate rock	30% P ₂ O ₅
Superphosphates above 35%	46% P ₂ O ₅
Superphosphates, other	20% P ₂ O ₅
Other phosphatic fertilizers, n.e.c.	20% P ₂ O ₅
STRAIGHT POTASSIC FERTILIZERS	
Potassium chloride (muriate of potash)	60% K ₂ O
Potassium sulphate (sulphate of potash)	50% K ₂ O
Other potassic fertilizers, n.e.c.	20% K ₂ O
COMPOUND FERTILIZERS	
NPK fertilizers	15% N, 15% P ₂ O ₅ and 15% K ₂ O
Diammonium phosphate	18% N and 46% P ₂ O ₅
Monoammonium phosphate	11% N and 52% P ₂ O ₅
Other NP compounds	20% N and 20% P ₂ O ₅
Potassium nitrate	13% N and 46% K ₂ O
Other NK compounds	20% N and 20% K ₂ O
PK compounds	20% P ₂ O ₅ and 20% K ₂ O

Revisions and limitations Data in this FAOSTAT domain refer to calendar years. However, in some cases the data available correspond to fertilizer years. These cases are indicated in country notes in the “related documents” section in FAOSTAT.

Production of certain fertilizers may derive from the transformation of other fertilizer products. This can be considered ‘secondary production’. Nutrients from secondary production are not included in this *Fertilizers by Nutrient* domain, to avoid double-counting. Production data that represent secondary production are however allowed in the *Fertilizers by Product* domain, to provide more complete data by product. Some risk of double-counting remains as long as there may be cases of secondary production that have not been identified yet as such.

A particular case is that of anhydrous ammonia and phosphate rock. In this *Fertilizers by Nutrient* domain, anhydrous ammonia and phosphate rock are included only if used for direct application in agriculture; otherwise, they are considered raw materials or intermediate products and excluded from the totals by nutrient. The available data on production and trade of anhydrous ammonia and phosphate rock are still provided in the ‘Fertilizers by Product’ domain.

The sum of the data from the *Fertilizers by Product* domain, converted to nutrients, may therefore differ from the totals provided in this *Fertilizers by Nutrient* domain. This may be because: i) data available by nutrient are often more complete than data available by product, ii) data available by nutrient may have been gap-filled, ii) data for anhydrous ammonia and phosphate rock are generally excluded from the totals by nutrient, and iii) in the case of production data, some data by product may be considered secondary production.

Data Collection Method The main data source of the **FAOSTAT Fertilizers by Nutrient** domain is, for production and agricultural use, the FAO Fertilizers Questionnaire (<http://www.fao.org/statistics/data-collection/en/>).

The trade data source is the COMTRADE database of the United Nations Statistics Division (<http://comtrade.un.org>). A disclaimer about the coverage and limitations of UN Comtrade data is available at: <http://comtrade.un.org/db/help/uReadMeFirst.aspx>.

Additional data sources may include: national publications, national websites, publications and yearbooks related to groups of countries, country project reports, studies available in other FAO Divisions, and data discussed with industry experts.

Methods The indicator *Use per area of cropland* is calculated as:

$$U_{(i,c,y)} = \frac{F_{(i,c,y)}}{Area_{(c,y)}}$$

Where:

$U_{(i,c,y)}$ Use per area of cropland of fertilizer nutrient i in country c and year y (in kg/ha)

$F_{(i,c,y)}$ Total agricultural use of fertilizer nutrient i in country c and year y (in tonnes)

$Area_{(c,y)}$ Cropland area (corresponding to the sum of arable land and permanent crops) in country c and year y (in 1 000 ha)

$i =$ Nutrient: nitrogen (N), phosphorus (expressed as P_2O_5) or potassium (expressed as K_2O).

Fractions of agricultural fertilizer use applied on croplands were identified to be lower than 100 percent in 19 countries listed below (Ludemann et. al., 2023).

Country	N	P	K
Australia	90	70	80
Austria	90	90	90
Brazil	90	100	95
Canada	90	100	95
Chile	80	70	75
Finland	70	100	85
France	90	90	90
Germany	80	90	85
Ireland	23	22	37
Japan	80	100	90
Morocco	90	100	95
Netherlands	50	90	70
New Zealand	8	5	12
Poland	80	90	85
Slovenia	60	70	65
South Africa	90	90	90
Switzerland	70	70	70
United Kingdom	80	70	75
United States	80	100	90
Uruguay	90	90	90
Luxembourg	40	70	55
All other countries	100	100	100

The indicator *Use per capita* is calculated as:

$$U_{(i,c,y)} = \frac{F_{(i,c,y)}}{Population_{(c,y)}}$$

Where:

$U_{(i,c,y)}$ Use per capita of fertilizer nutrient i in country c and year y (in kg/capita)

$F_{(i,c,y)}$ Total agricultural use of fertilizer nutrient i in country c and year y (in tonnes)

$Population_{(c,y)}$ Population in country c and year y (in 1 000 persons)

i = Nutrient: nitrogen (N), phosphorus (expressed as P₂O₅) or potassium (expressed as K₂O).

The indicator *Use per value of agricultural production* is calculated as:

$$U_{(i,c,y)} = \frac{F_{(i,c,y)}}{\text{Value of agricultural production}_{(c,y)}}$$

Where:

$U_{(i,c,y)}$ Use per value of agricultural production of fertilizer nutrient i in country c and year y (in kg/1000 Int. \$)

$F_{(i,c,y)}$ Total agricultural use of fertilizer nutrient i in country c and year y (in tonnes)

*Value of agricultural production*_(c,y) Value of agricultural production in country c and year y (in 1 000 Int. \$)

i = Nutrient: nitrogen (N), phosphorus (expressed as P₂O₅) or potassium (expressed as K₂O).

Data sources

Data used in the calculation of these agro-environmental indicators are sourced from the FAOSTAT Inputs domains "[Fertilizers by Nutrient](#)", "[Land Use](#)", [Population](#) and [Value of agricultural production](#). Trends in the derived agro-environmental indicator are thus directly associated with the trends of the underlying data sources.

For the aggregations (regions and special groups), only countries with data for both agricultural use (numerator) and cropland area (denominator) are included in the calculation.

Useful links

International Fertilizer Industry Association (IFA) Database
<http://www.fertilizer.org>

United Nations Commodity Trade Statistics Database (COMTRADE)
<http://comtrade.un.org>

FAO & UNSD (2017) System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries: SEEA AFF. White cover version.
<https://seea.un.org/content/ag-for-fish>

UNSD (2017) Framework for the Development of Environment Statistics (FDES 2013) <https://unstats.un.org/unsd/envstats/fdes.cshtml>

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Citation FAO. 2023. FAOSTAT: Fertilizers by Nutrient. (License: CC BY-NC-SA 3.0 IGO). In: FAO.org [online]. Cited [insert date that the dataset was accessed in the following format: DD-MM-YEAR]. Available at: <http://www.fao.org/faostat/en/#data/RFN>.

Acknowledgements The FAOSTAT *Fertilizers by Nutrient* domain is developed and maintained by the Environment Statistics Team, FAO Statistics Division (ESS), with regular budget funding under SO2 and O6.

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