



Food and Agriculture Organization  
of the United Nations

ISSN 2709-006X [Print]  
ISSN 2709-0078 [Online]



FAOSTAT ANALYTICAL BRIEF 46

# Pesticides use, pesticides trade and pesticides indicators

Global, regional and country trends, 1990–2020

## HIGHLIGHTS

- **A major downward revision of total pesticides use in China significantly improved the accuracy of global pesticides use reported in the 2022 update.**
- **Despite a plateau reached in recent years, total pesticides use increased in the most recent decade by nearly 50 percent compared to the 1990s.**
- **Over the past three decades, yearly pesticides use averaged 1.58 kg per hectare, 0.37 kg per person and 0.79 kg per thousand international dollars of agricultural production.**
- **In 2020, the Americas imported the highest level of pesticides from other regions of the world, at 1.1 million tonnes and a value of USD 6.9 million.**
- **Africa applied the lowest levels of pesticides on a per area of cropland, per capita, and per value of agricultural production basis over the time period analysed.**
- **The total pesticides traded quantities increased by 30 percent in 2020 – the growth can mostly be contributed to traded disinfectants, which increased from 4.0 to 8.7 million tonnes from 2019 to 2020.**

## FAOSTAT PESTICIDES

### BACKGROUND

When applied responsibly, pesticides are a key agricultural input that can help to protect seeds and safeguard crops from unwanted plants, insects, bacteria, fungi and rodents. At the same time, pesticides can have negative environmental impacts through contamination of soil, water and non-target plants and animals that can decrease biodiversity and, in some cases, reduce crop yield. Pesticides use in agriculture as an input and the agri-environmental indicator measuring use by cropland area serve to monitor the use of pesticides across the globe as well as at the regional and country levels. The data have been updated with figures through 2020. The 2022 update of the pesticides use domain features improved imputation methods for countries that have historically used imports as a proxy for use in the past.<sup>1</sup>

Statistics of pesticides trade are relevant for monitoring of sustainable agriculture. In particular, they can help assess the global movement of pesticides and identify shortcomings in access to the global market of this key agricultural input. The FAOSTAT Pesticides Trade database contains data on internationally traded pesticides over the period 1961–2020. Data for the period 1961–1989 cover only monetary values, while data for the period 1990–2020 also include physical quantities. The 2022 update of the Pesticides Trade domain features data updates to 2020, with intra-regional and inter-regional

---

<sup>1</sup> See the ReadMe file on FAO, 2022a.

aggregates of pesticides to highlight trade within and between different regions of the world. The update of the Pesticides Indicators domain includes normalizations of pesticides application rates per hectare of cropland (kg/ha) as well as two additional normalizations including per capita (kg/person) and per value of agricultural production expressed in international dollar (kg/1000 I\$).

Figures for pesticides trade can exceed those of pesticides use for a combination of the following reasons: non-agricultural uses for imported pesticides such as those in the public health sector, storage of pesticides that are imported for use in subsequent years, and the importation of pesticide formulations including adjuvants to increase efficacy and shelf life.

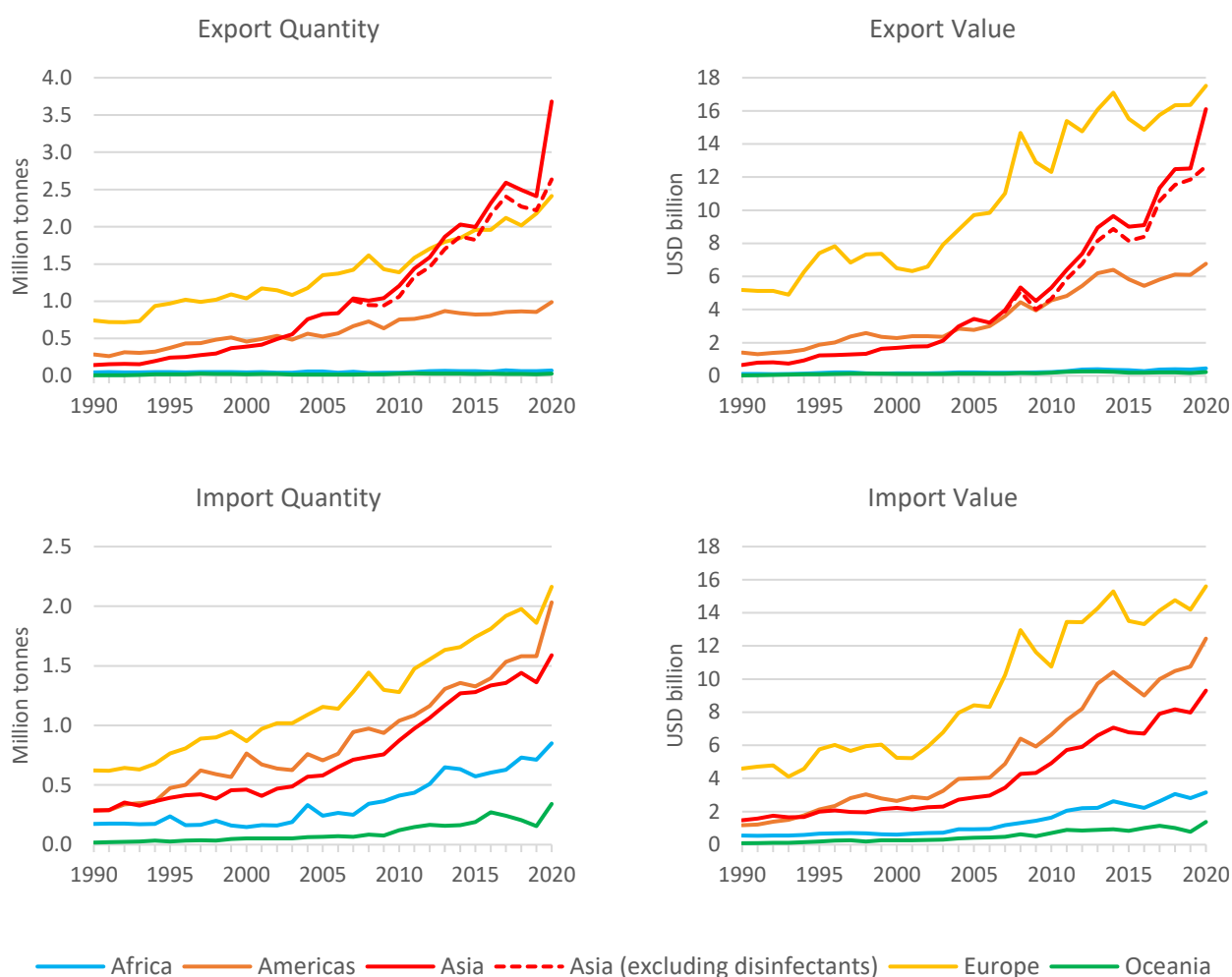
The 2022 update includes a major downward revision of total pesticides use in China representing an 85 percent decrease compared to previously disseminated data. The revision reduced world total pesticides use by 40 percent compared to previous data. This was the result of new information received from the country, clarifying that previous figures had been reported to FAO in total formulated products rather than in active ingredients. See also the domain's [country notes](#).

## GLOBAL

At the global level, total pesticides use in agriculture remained stable in 2020, at 2.7 million tonnes (Mt) of active ingredients. The worldwide application of pesticides per area of cropland was 1.8 kg/ha. On a per capita and per value of agricultural production basis, pesticides application was 0.69 kg/1000 I\$ and 0.37 kg/person, respectively. Total pesticides trade reached approximately 7.2 Mt of formulated products in 2020, with a value of USD 41.1 billion.

Despite a plateau reached in recent years, average total pesticides use increased in the most recent decade by nearly 50 percent compared to the 1990s, with pesticides use per area of cropland increasing from 1.2 to 1.8 kg/ha. The global application of pesticides increased across these two periods for herbicides, fungicides and bactericides, and insecticides, with increases in the share of herbicides (from 41 to 52 percent of total pesticides) and reductions in the share of fungicides (from 25 to 23 percent) and insecticides (from 24 to 18 percent). In 2020, there was a 30 percent increase in total pesticides traded quantities – the growth can mostly be attributed to traded disinfectants, which increased from 4.0 to 8.7 million tonnes from 2019 to 2020 (WTO, 2020) (Figure 2). It should be noted that the Harmonized System (HS) classification groups together disinfectants with other pesticides products under the subheading HSN Code 3808: Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products. Although much of the traded disinfectants are not ultimately destined for use in agriculture, it is important to note the contribution of these products to the sharp increase in trade. Over the past three decades, pesticides use averaged 1.58 kg per ha per year, 0.37 kg per person per year, and 0.79 kg per 1000 I\$ per year (Figures 4, 5 and 6).

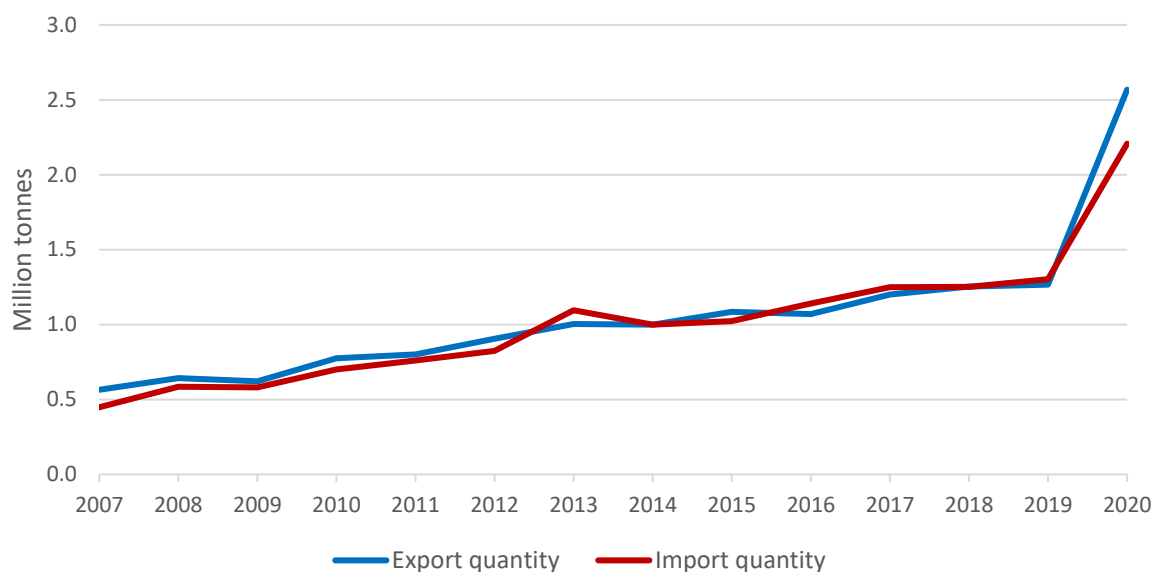
Figure 1: Total pesticides export and import quantities and values by region



**Note:** Includes intra-regional trade.

**Source:** FAO. 2022. FAOSTAT: Pesticides Trade. In: FAO. Rome. Cited July 2022.  
<http://www.fao.org/faostat/en/#data/RT>

**Figure 2: Global disinfectants exports and imports**



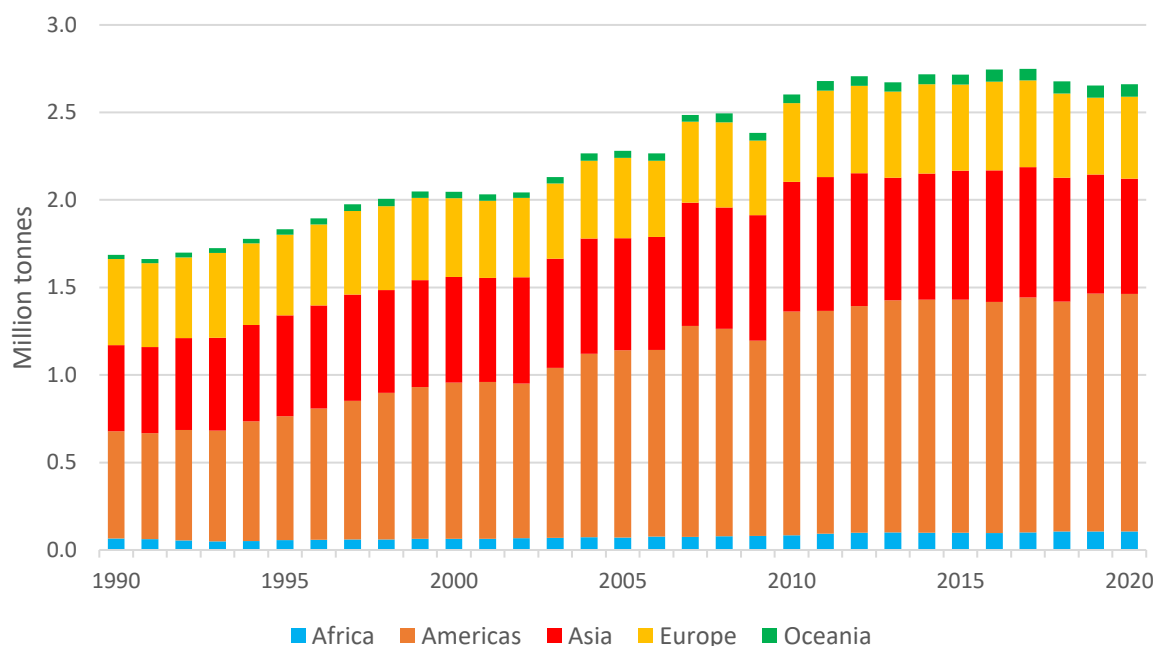
**Source:** FAO. 2022. FAOSTAT: Pesticides Trade. In: FAO. Rome. Cited July 2022. <http://www.fao.org/faostat/en/#data/RT>

## REGIONAL

In 2020, Asia had the highest levels of pesticides exports with 3.7 Mt corresponding to a value of USD 16.1 billion, as shown in Figure 1. The large quantities of pesticides exports for the region are mostly due to a remarkable increase in disinfectants by more than 450 percent compared to the previous year. The region also exported the most pesticides to other regions of the world with quantities and values of 2.5 Mt and USD 10.8 billion, respectively. As displayed in Figure 3, the region used large quantities of pesticides (averaging 0.65 million tonnes per year over the past three decades). Asia was below the world average on a per capita, per value of agricultural production and per hectare basis over the whole period, averaging 0.17 kg per person per year, 0.47 kg per 1000 I\$ per year and 1.17 kg per ha per year, respectively.

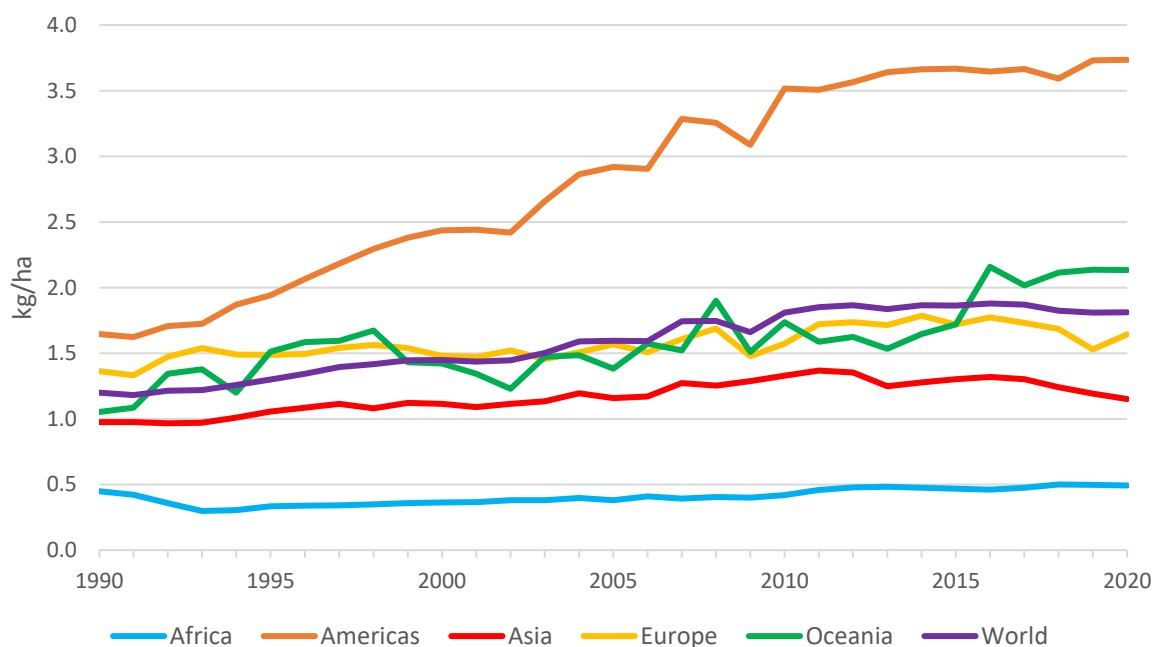
Pesticides use in agriculture in Europe increased by just 3 percent between the 1990s and the most recent decade, most likely due to the stringent European Common Agricultural Policy put in place, which monitors and controls the use of pesticides. The region has the lowest proportion of pesticides use derived from insecticides (12 percent), as seen in Figure 7. Including intra-regional trade, European countries imported more than 1.2 million tonnes of pesticides on average per year during the entire period (Figure 1), highlighting the trade partnerships within the region. The region's pesticides use per area of cropland was approximately 1.6 kg/ha in 2020, below the world average. Over the whole period, Europe's application of pesticides per hectare of cropland was near the world average (1.57 kg per ha per year) and was slightly above on a per capita (0.64 kg per person per year) and per value of agriculture basis (0.92 kg per 1000 I\$ per year).

Figure 3: Total pesticides use by region



**Source:** FAO. 2022. FAOSTAT: Pesticides Use. In: FAO. Rome. Cited July 2022.  
<http://www.fao.org/faostat/en/#data/RP>

Figure 4: Pesticides use per area of cropland by region



**Source:** FAO. 2022. FAOSTAT: Pesticides indicators. In: FAO. Rome. Cited July 2022.  
<http://www.fao.org/faostat/en/#data/EP>

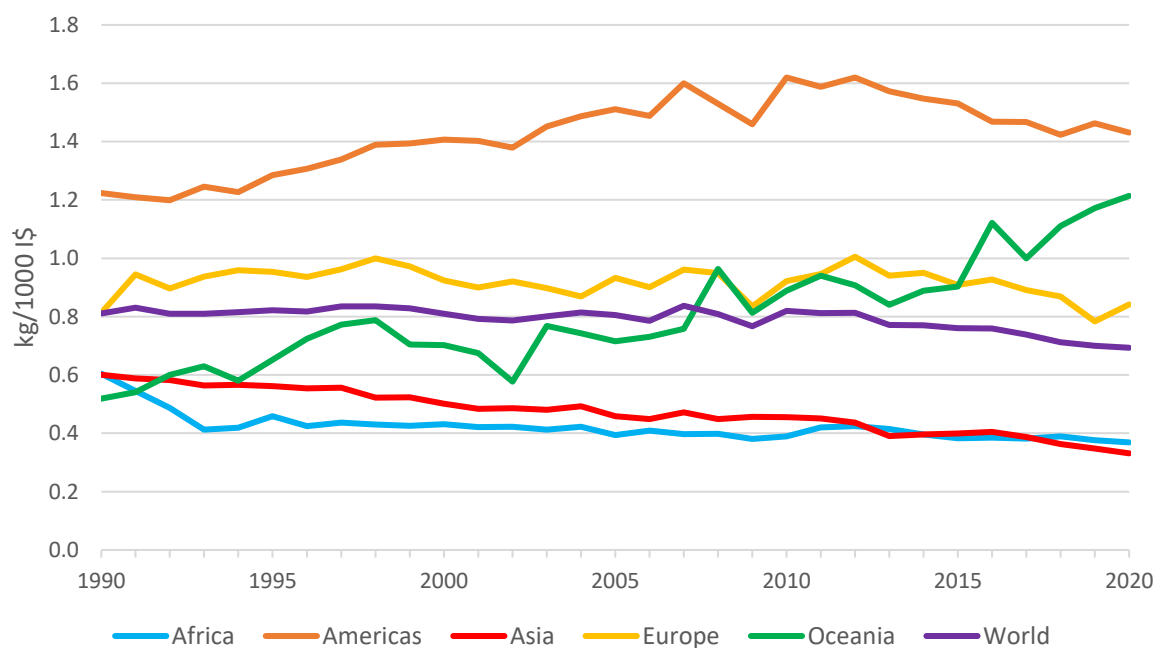
The Americas imported the highest level of pesticides from other regions of the world in 2020: 1.1 Mt corresponding to a value of USD 6.9 billion. In that year, 0.6 Mt of disinfectants were imported from other regions – this was a 160 percent increase compared to the previous year. Over the time period analysed, the Americas applied the highest level of pesticides in agriculture, averaging more than 1 Mt of pesticides per year. The region also applied the highest levels of pesticides per area of cropland (2.83 kg per ha per year), per capita (1.17 kg per person per year), and per value of agricultural production (1.43 kg per 1000 I\$ per year). The region augmented herbicides use from 362 to 852 kilotonnes (kt), fungicides use from 93 to 177 kt, and insecticides use from 159 to 181 kt per year in the most recent decade compared to the 1990s.

Oceania traded low levels of pesticides, with most of the exports occurring between countries within the region. In 2020, total imports within the region were 342 kt with a value of USD 1.4 million. Of these, most were traded internally, with a mere 30 kt with a value of USD 0.22 exported outside of the region. The region applies the lowest levels of pesticides, averaging approximately 62 kt per year in the most recent decade, and represents less than 1 percent of the global use in this period. Oceania applied 1.8 kg/ha of pesticides in the most recent decade compared to 1.4 kg/ha in the 1990s. The region increased herbicides use from 20 to 41 kt, fungicides use from 3 to 5 kt, and insecticides use from 7 to 13 kilotonnes per year over the same period. The region applied low of pesticides on a per ha of cropland basis (1.58 kg per ha per year), on a per capita basis (1.30 kg per person per year), and when normalized by the value of agricultural production (0.80 kg per 1000 I\$ per year).

Most of Africa's pesticides imports come from countries outside of Africa, and the majority of exported pesticides remain in the region. In the year 2020, total pesticides imports in the region were 850 kt (USD 3.1 million), of which 779 kt (USD 2.8 million) came from other regions of the world, and total pesticides exports were 71 kt (USD 0.45 million) of which only 20 kt were exported to non-African countries (USD 0.12 million). The share of herbicides (32 percent), fungicides and bactericides (33 percent), and insecticides (27 percent) in total pesticides use were stable in the most recent decade. Africa uses low levels of pesticides, at 0.11 tonne per year in the most recent decade. The region applied the lowest levels of pesticides per area of cropland, per capita, and per value of agricultural production basis over the time period analysed (0.41 kg per ha per year, 0.11 kg per person per year, and 0.42 kg per 1000 I\$ per year, respectively).

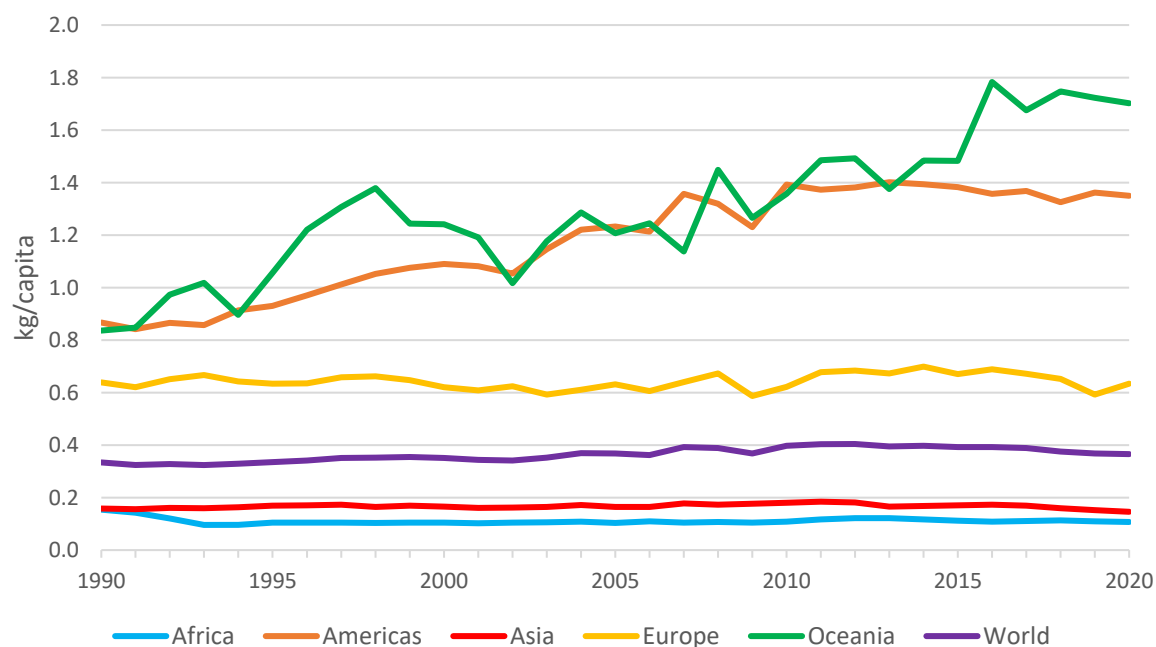


Figure 5: Pesticides use per value of agricultural production by region



Source: FAO. 2022. FAOSTAT: Pesticides indicators. In: FAO. Rome. Cited July 2022. <http://www.fao.org/faostat/en/#data/EP>

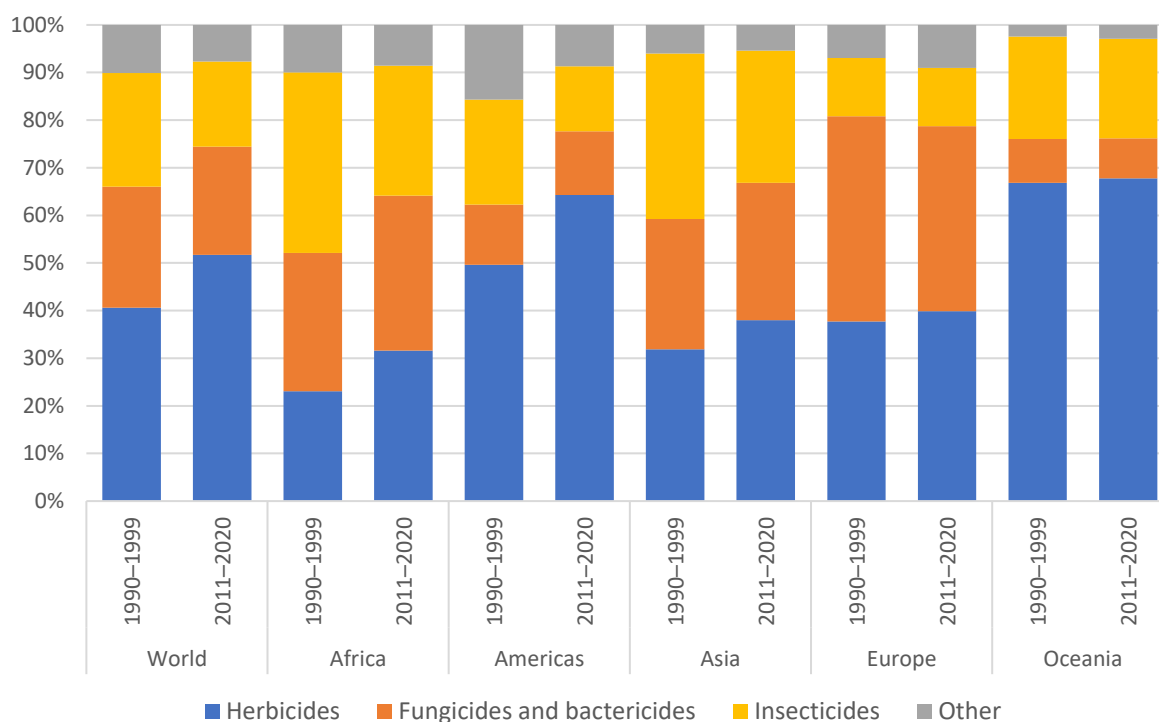
Figure 6: Pesticides use per capita by region



Source: FAO. 2022. FAOSTAT: Pesticides indicators. In: FAO. Rome. Cited July 2022. <http://www.fao.org/faostat/en/#data/EP>



**Figure 7: Pesticides use by region and category, 1990–1999 and 2011–2020**



**Source:** FAO. 2022. FAOSTAT: Pesticides Use. In: FAO. Rome. Cited July 2022. <http://www.fao.org/faostat/en/#data/RP>

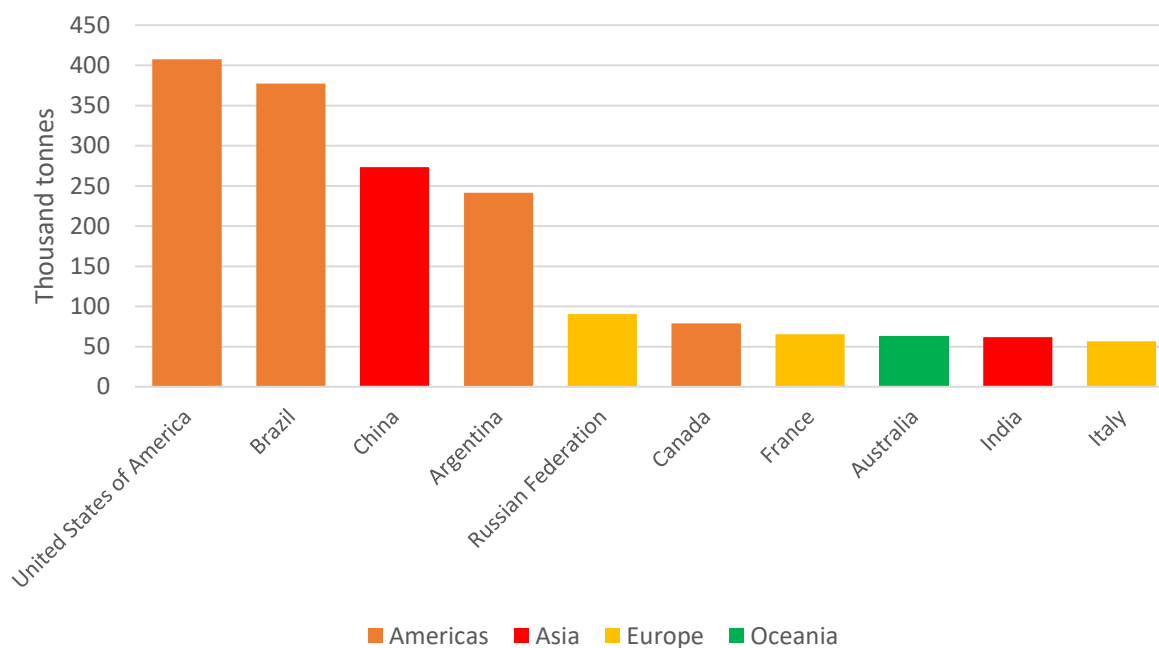
## COUNTRY

Map 1 shows wide disparities between the pesticides application rates within regions: for example, in Africa, while most countries applied low levels of pesticides to cropland in 2020, Mauritius, Seychelles and Egypt applied levels above the global average. In Oceania, which generally has low levels of pesticides use per cropland area, Samoa, Fiji and New Zealand stand out as exceptions. The more industrialized countries in Western Europe and Northern Europe applied higher levels than the rest of the region. Most of the countries with the highest application rates in Asia are located in Western Asia. In the Americas, Saint Lucia is the country with the highest level of pesticides application to cropland worldwide.

Figure 8 shows that the United States of America was the largest user of pesticides in 2020, with 408 kt of pesticides applications for agricultural use. Next in the top 10 are Brazil (377 kt), China (273 kt), Argentina (241 kt), the Russian Federation (91 kt), Canada (79 kt), France (65 kt), Australia (63 kt), India (61 kt) and Italy (57 kt). As noted earlier, values for China were significantly revised downward in this dissemination (-70 percent). As a result, China is no longer the largest user of pesticides, moving instead to third place.

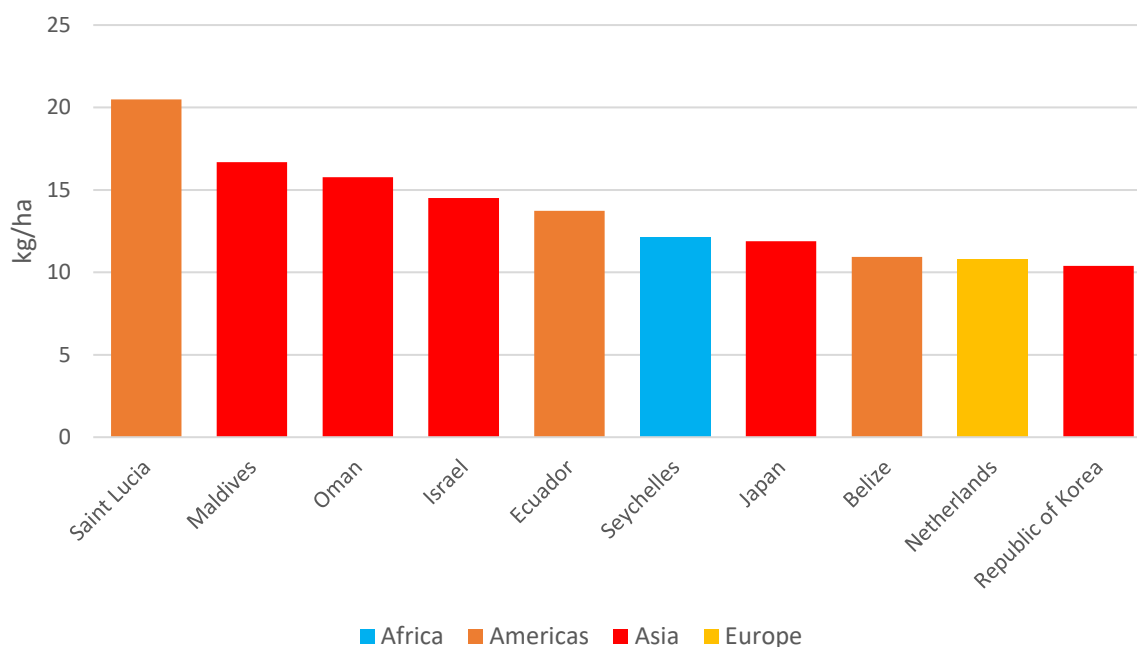
Figure 9 displays the top countries for pesticides use per area of cropland for 2020, which are Saint Lucia (20 kg/ha), Maldives (17 kg/ha), Oman (16 kg/ha), Israel (15 kg/ha), Ecuador (14 kg/ha), Seychelles (12 kg/ha), Japan (12 kg/ha), Belize (11 kg/ha), the Netherlands (11 kg/ha) and the Republic of Korea (10 kg/ha).

Figure 8: Pesticides use, top countries (2020)



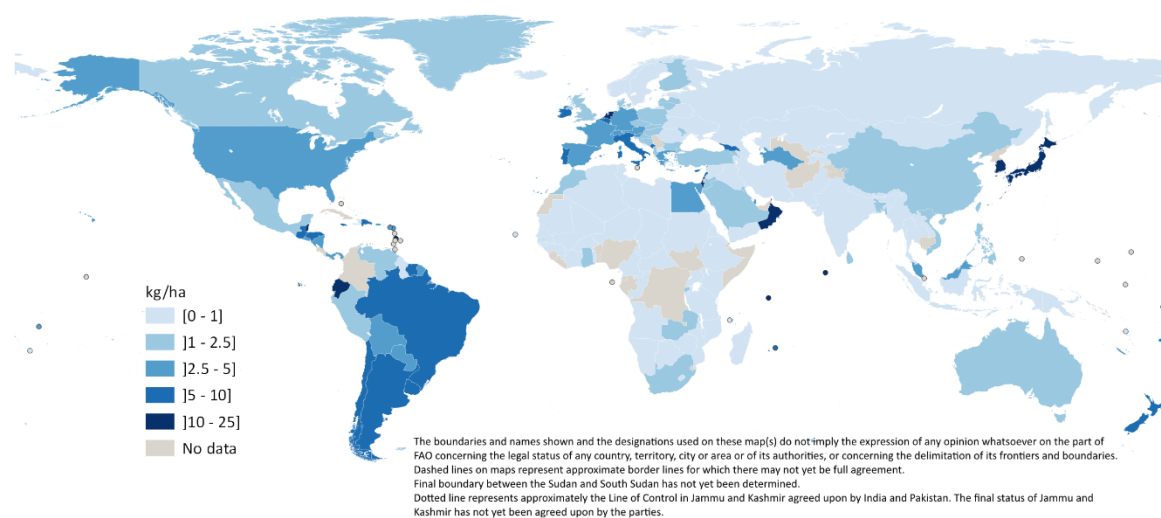
**Source:** FAO. 2022. FAOSTAT: Pesticides Use. In: FAO. Rome. Cited July 2022.  
<http://www.fao.org/faostat/en/#data/RP>

Figure 9: Pesticides use per cropland area, top countries (2020)



**Source:** FAO. 2022. FAOSTAT: Pesticides indicators. In: FAO. Rome. Cited July 2022.  
<http://www.fao.org/faostat/en/#data/EP>

**Map 1: Pesticides use per cropland area (2020)**



**Source:** FAO. 2022. FAOSTAT: Pesticides indicators. In: *FAO*. Rome. Cited July 2022. <http://www.fao.org/faostat/en/#data/EP> based on UN Geospatial. 2020. Map geodata [Shapefiles]. New York, USA, United Nations (UN).

## EXPLANATORY NOTES

- > The FAOSTAT Pesticides Use domain contains information on the use of major pesticide groups:
- > 1. Insecticides (Chlorinated hydrocarbons, Organo-phosphates, Carbamates–insecticides, Pyrethroids, Botanical and biological products and Others not elsewhere classified);
- > 2. Mineral Oils;
- > 3. Herbicides (Phenoxy hormone products, Triazines, Amides, Carbamates–herbicides, Dinitroanilines, Urea derivatives, Sulfonyl urea, Bipiridils, Uracil, Others not elsewhere classified);
- > 4. Fungicides and Bactericides (Inorganic, Dithiocarbamates, Benzimidazoles, Triazoles Diazoles, Diazines Morpholines, Others not elsewhere classified);
- > 5. Seed Treatment-Fungicides (Dithiocarbamates, Benzimidazoles, Triazoles Diazoles, Diazines Morpholines, Botanical products and biological, Others not elsewhere classified);
- > 6. Seed Treatment-Insecticides (Organo-phosphates, Carbamates–insecticides, Pyrethroids, Others not elsewhere classified);
- > 7. Plant Growth Regulators;
- > 8. Rodenticides (Anti-coagulants, Cyanide Generators, Hypercalcaemics, Narcotics, Others not elsewhere classified);
- > 9. Other Pesticides NES (not elsewhere specified);
- > 10. Disinfectants.
- > Conversion factors were used to convert data in formulated products to active ingredients in those cases where only data in formulated products were reported. Because the subset of countries where data repair into AI was performed could not be considered representative of their regions, we used global conversion factors only, by pesticides type where possible, and a global generic conversion factor when not possible (see country notes for actual values used).
- > New addition with the 2020 update: gap-filled pesticides sub categories for the 10 categories listed above are now disseminated along with the Pesticides (total) category.
- > Response rate and imputations:

The Pesticides Use domain has as a primary source of data questionnaires annually dispatched by FAO to the focal points indicated by the governments of the different countries and territories. Data are supplemented with international sources such as [Eurostat](#) pesticides sales data.

The FAOSTAT Pesticides Trade domain contains information on the trade of pesticides products in either: a) finished forms and/or packaged products; or b) separate chemically-defined compounds relevant to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.

The FAOSTAT Pesticides Trade domain contains information on the trade of pesticides classified under code 38.08 of the International Convention on the Harmonized Commodity Description and Coding System, including: insecticides; fungicides; herbicides; disinfectants; and others, with time series for 1961–2020.

## REFERENCES

**FAO.** 2022a. FAOSTAT: Pesticides Use. In: *FAO*. Rome. Cited July 2022.

<http://www.fao.org/faostat/en/#data/RP>.

**FAO.** 2022b. FAOSTAT: Pesticides indicators. In: *FAO*. Rome. Cited July 2022.

<http://www.fao.org/faostat/en/#data/EP>.

**FAO.** 2022c. FAOSTAT: Pesticides trade. In: *FAO*. Rome. Cited July 2022.

<http://www.fao.org/faostat/en/#data/RT>.

**United Nations.** 2019. *Methodology Guide for UN Comtrade User on UN Comtrade Upgrade 2019* [online]. New York. <https://comtrade.un.org/data/MethodologyGuideforComtradePlus.pdf>

**United Nations.** 2021. UN Comtrade Database. In: *UN*. New York. Cited July 2022.

<https://comtrade.un.org/>

**WTO (World Trade Organization).** 2020. *Trade in medical goods in the context of tackling COVID-19: developments in the first half of 2020*. Geneva.

[https://www.wto.org/english/tratop\\_e/covid19\\_e/medical\\_goods\\_update\\_e.pdf](https://www.wto.org/english/tratop_e/covid19_e/medical_goods_update_e.pdf)

This analytical brief was prepared by Nathan Wanner, Giorgia DeSantis, Andrea Alcibiade and Francesco N. Tubiello, FAO Statistics Division. Support to the Pesticides data collection, analysis and dissemination process was provided by the Environmental Statistics team. Amanda Gordon is greatly acknowledged for her support in connection to the FAOSTAT dissemination platform.

Required citation: FAO. 2022. *Pesticides use, pesticides trade and pesticides indicators – Global, regional and country trends, 1990–2020*. FAOSTAT Analytical Briefs, no. 46. Rome. <https://doi.org/10.4060/cc0918en>

Cover photo: ©FAO/Francesco N. Tubiello

## CONTACTS

Statistics Division – Economic and Social Development

[statistics@fao.org](mailto:statistics@fao.org)

[www.fao.org/food-agriculture-statistics/en/](http://www.fao.org/food-agriculture-statistics/en/)

**Food and Agriculture Organization of the United Nations**

Rome, Italy

© FAO, 2022



Some rights reserved. This work is available under a CC BY-NC-SA 3.0 IGO licence