

GLOBAL CROP CONSERVATION AND USE METRICS

# TOMATOES

*(Solanum lycopersicum L.)*



Cover photo: Michael Major for ICBA

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## Global crop conservation and use metrics

# TOMATOES

*(Solanum lycopersicum L.)*



With support from



## Description

This report provides an up-to-date overview of the global status of *ex situ* conservation of genetic resources of tomato and its wild relatives, including key metrics on:

- global statistics on crop production, trade, and availability in food supplies;
- the identity and composition of genebank collections;
- the Multilateral System (MLS) status of accessions in these collections;
- storage, regeneration, and safety duplication status;
- documentation, information systems, and research resources;
- germplasm distribution;
- varietal registrations and releases; and
- crop networks and partnerships

## Introduction and background on tomatoes

Tomatoes (*Solanum* L. section *Lycopersicon*) originated in western South America, likely in Peru and Ecuador (Jenkins, 1948; Razifard *et al.*, 2020). The domestication process started in this region and further evolved in Mesoamerica, particularly Mexico (Blanca *et al.*, 2022). Spanish colonizers introduced tomatoes to Europe in the 16th century, though the crop was initially met with suspicion due to its resemblance to toxic members of the nightshade family. Today, tomatoes are one of the world's most important and widely consumed vegetables, valued for their nutritional content, including vitamin C, potassium, lycopene (an antioxidant), and other beneficial compounds (Bergougnoux, 2014). They are used fresh in salads, sandwiches, and salsas, or processed into sauces, pastes, juices, and ketchup, forming a cornerstone of Mediterranean, Latin American, and many other cuisines. The tomato's economic importance is substantial, as it ranks among the top vegetable crops globally, supporting agricultural economies and food industries worldwide while contributing significantly to human nutrition and culinary diversity (Bergougnoux, 2014).

Based on the most recently available production statistics from FAOSTAT, reporting for the year 2023, tomatoes are cultivated in at least 167 countries on 5.4 million hectares

worldwide, producing over 192 million tonnes at a value of USD 116.1 billion (FAO, 2025a). The largest producers include China (70 million tonnes), India (20.4 million tonnes), Türkiye (13.3 million tonnes), and the USA (12.3 million tonnes), as well as Egypt, Italy, Mexico, Brazil, Spain, Nigeria, and Iran, each producing over 3 million tonnes per annum.

There is considerable international trade in tomatoes, with over 14 million tonnes exported per annum of the vegetable as well as processed products (peeled and juice), with Mexico, Italy, Netherlands, Spain, Morocco, and Türkiye each reporting exporting over 600,000 tonnes each year (FAO, 2025a). Among the 193 countries reporting importing tomatoes and their products, the top recipients include the USA, Germany, the UK, France, Iraq, Pakistan, the Russian Federation, and the Netherlands, all importing over 300,000 tonnes each year.

Tomatoes are a major contributor to calories in the food supplies of over 91 countries, to protein in over 114 countries, and to food weight in over 154 countries (Table 1). Production, trade, and food supply metrics all indicate that tomatoes are widely utilized outside of their regions of origin, implying significant international interdependence with regard to crop genetic resources.

**Table 1.** Global status of tomato production, trade, availability in food supplies, and public interest. Production, trade, and food supply statistics from FAOSTAT (2015 to 2018 average). Number of countries refers to the count of countries where the crop is reported as within the top 95 percent of crops in terms of contribution to production, trade, or food supply. The evenness metric quantifies evenness of production, trade, or availability in food supplies across world regions, where 0 equals highly uneven and 1 equals completely even. The international interdependence metric quantifies degree of production, trade, or availability in food supplies outside of the primary region of diversity of the crop, where 0 equals low estimated international interdependence and 1 equals high estimated international interdependence. Wikipedia metric is public pageviews over one year (2019) of the taxon name of the crop. All values from Khoury *et al.* (2023).

Metric	Global value	Number of countries where significant contributor	Evenness of contribution across world regions	Estimated international interdependence
Harvested area (ha)	4,868,699	60.00	0.35	0.98
Total production (tonnes)	177,759,835	113.75	0.30	0.98
Gross production value (current thousand USD)	90,140,840	115.50	0.30	0.98
Export quantity (tonnes)	13,281,852	55.50	0.31	0.88
Export value (current thousand USD)	13,461,505	59.00	0.29	0.86
Import quantity (tonnes)	12,381,708	124.00	0.33	0.98
Import value (current thousand USD)	13,275,073	140.25	0.28	0.99
Contribution to calories in food supplies (kcal/capita/day)	11.00	91.75	0.57	1.00
Contribution to protein in food supplies (g/capita/day)	0.56	114.50	0.54	1.00
Contribution to fat in food supplies (g/capita/day)	0.14	55.25	0.54	1.00
Contribution to food weight in food supplies (g/capita/day)	20.83	154.75	0.55	1.00
Number of public pageviews on Wikipedia over one year	8,263			

## Identity and composition of *ex situ* collections

*Solanum* L. (Solanaceae) is an enormous genus of more than 1,200 species (Messeder *et al.*, 2024; WFO, 2025), which contains over 20 cultivated species, including major domesticated crops such as potato (*Solanum tuberosum* L.), eggplant (*Solanum melongena* L.), and tomato (*Solanum lycopersicum* L.), as well as regionally important species, including African eggplant (*Solanum macrocarpon* L.), Ethiopian eggplant (*Solanum aethiopicum* L.), lulo or naranjilla (*Solanum quitoense*), pepino (*Solanum muricatum* Aiton), tree tomato or tamarillo (*Solanum betaceum* Cav.), cocona (*Solanum sessiliflorum* Dunal), bush tomato (*Solanum centrale* J.M.Black), and turkey berry (*Solanum torvum* Sw.) (Hilgenhof *et al.*, 2023).

A published genepool concept is available for tomatoes (*Solanum lycopersicum* L.) (USDA, 2025), with the primary and secondary genepools confined to *Solanum* section *Lycopersicon* (Peralta *et al.*, 2008; Moreels *et al.*, 2023).

The primary genepool contains species from *Solanum* section *Lycopersicon*, Esculentum group:  
*Solanum cheesmaniae* (L. Riley) Fosberg  
*Solanum galapagense* S. C. Darwin & Peralta  
*Solanum pimpinellifolium* L.

The secondary genepool contains species from *Solanum* section *Lycopersicon*, Arcanum,

**Table 2.** Major *ex situ* collections of tomato genetic resources. Top 20 institutions listed in descending order by total number of accessions. Number of accessions and storage condition information from Genesys and FAO WIEWS (2025), with supplementary information as noted. Multilateral System (MLS) status from Plant Treaty GLIS (2025) and from Genesys and FAO WIEWS (2025).

Institution Code	Institution name	Number of accessions	Percent of total	Cumulative percent	Number of accessions in long term storage (-18-20 C)	Number of accessions included in MLS (from Plant Treaty GLIS)	Number of accessions included in MLS (from genebank collections databases)
TWN001	World Vegetable Center	9,470	15.2%	15.2%	9,242	7,912	8,386
USA003	Northeast Regional Plant Introduction Station, Plant Genetic Resources Unit, USDA-ARS, New York State Agricultural Experiment Station, Cornell University	6,460	10.4%	25.5%	Not listed*	0	0
USA974	Seed Savers Exchange	5,852	9.4%	34.9%	Not listed	0	0
DEU146	Genebank, Leibniz Institute of Plant Genetics and Crop Plant Research	4,652	7.5%	42.4%	4,643	17	19
USA176	C.M. Rick Tomato Genetic Resources Center, Department of Vegetable Crops, University of California Davis	4,230	6.8%	49.2%	Not listed*	0	0
ESP026	Generalidad Valenciana. Universidad Politécnica de Valencia. Escuela Técnica Superior de Ingenieros Agrónomos. Banco de Germoplasma	3,460	5.5%	54.7%	2,062	0	1
HUN003	Centre for Plant Diversity	1,997	3.2%	57.9%	405	0	250
ESP027	Gobierno de Aragón. Centro de Investigación y Tecnología Agroalimentaria. Banco de Germoplasma de Hortícolas	1,856	3.0%	60.9%	1,735	0	0
BRA012	Embrapa Hortaliças	1,735	2.8%	63.7%	Not listed	0	0
UKR021	Institute of Vegetable and Melon Growing	1,637	2.6%	66.3%	948	0	0
POL003	Plant Breeding and Acclimatization Institute	1,596	2.6%	68.9%	1,596	0	0
BRA003	Embrapa Recursos Genéticos e Biotecnologia	1,581	2.5%	71.4%	Not listed	0	0
BGR001	Institute for Plant Genetic Resources 'K.Malkov'	1,489	2.4%	73.8%	827	0	17
CZE122	Gene bank	1,432	2.3%	76.1%	1,432	70	1,432
NLD037	Centre for Genetic Resources, the Netherlands	1,423	2.3%	78.4%	1,423	83	86
AUS165	Australian Grains Genebank, Agriculture Victoria	1,174	1.9%	80.3%	1,167	1,174	1,174

TUR001	Plant Genetic Resources Department	871	1.4%	81.6%	871	0	0
CUB014	Instituto de Investigaciones Fundamentales en Agricultura Tropical	808	1.3%	82.9%	Not listed	0	0
GHA091	Plant Genetic Resources Research Institute	806	1.3%	84.2%	Not listed	77	299
UZB006	Uzbek Research Institute of Plant Industry	750	1.2%	85.4%	Not listed	0	0
	Other institutions (n = 114)	9,081	14.5%	100.0%	2,734	818	955

\* but known to conserve accessions in long-term storage conditions

Hirsutum, and Peruvianum groups:

*Solanum arcanum* Peralta

*Solanum chilense* (Dunal) Reiche

*Solanum chmielewskii* (C. M. Rick et al.) D. M. Spooner et al.

*Solanum corneliomulleri* J. F. Macbr.

*Solanum habrochaites* S. Knapp & D. M. Spooner

*Solanum huaylasense* Peralta

*Solanum neorickii* D. M. Spooner et al.

*Solanum pennellii* Correll

*Solanum peruvianum* L.

The tertiary gene pool contains species from *Solanum* sections Juglandifolia and Lycopersicoides:

*Solanum lycopersicoides* Dunal

*Solanum sitiens* I. M. Johnst.

*Solanum ochranthum* Dunal

*Solanum juglandifolium* Dunal

Here we also include species that have documented use as graftstock for tomatoes (USDA, 2025), including:

*Solanum aethiopicum* L.

*Solanum sisymbriifolium* Lam.

Data compilation for this report on tomato genetic resources included the crop and all taxa included in the published gene pool concept listed above. Based on the latest data in global genetic resource databases, germplasm collections of tomato and its

assessed wild relatives are present in at least 134 institutions worldwide, collectively maintaining 62,360 accessions (Table 2, Table 3; Supplementary Table 1). The institutions are distributed globally, including large collections in the Americas, Europe, Asia, and Australia. The World Vegetable Center maintains an international collection for the crop, while the largest national and other collections are in the USA, Germany, Spain, Hungary, Brazil, Ukraine, Poland, Bulgaria, and Czechia; these international and national collections collectively maintain over three-quarters of documented accessions worldwide.

The information reported in the global databases is somewhat lower than the number of accessions reported for the crop (71,061) in the major germplasm collections listed in *The Third Report on the State of the World's Plant Genetic Resources for Food and Agriculture* (FAO, 2025b). Curiously, all of the major collections listed in the FAO document are also in the global genetic resource databases, but the numbers of accessions are much higher in the FAO document for: NBPGR India (IND001) with 2,911 accessions, NARO Japan (JPN183) with 2,595 accessions, PGRC Canada (CAN004) with 2,574 accessions, and BGLACONSULTA (ARG1350) with 1,711 accessions (for comparison, see Supplementary Table 1).

**Table 3.** Composition of *ex situ* collections of tomato genetic resources. Main *ex situ* collections data from Genesys and FAO WIEWS (2025). Primary and secondary regions information from Khoury *et al.* (2023) and subsequent research for this summary. Botanic gardens data from BGCI PlantSearch (2025).

Metric	Number	Percentage
Total number of accessions in genebank collections	62,360	
Number of institutions holding genebank collections	134	
Number of distinct taxonomic names in genebank collections	24	
Number of accessions of crop wild relatives (CWR) in genebank collections	3,499	5.6%
Number of accessions of weedy materials in genebank collections	51	0.1%
Number of accessions of landraces in genebank collections	20,373	32.7%
Number of accessions of breeding materials in genebank collections	5,915	9.5%
Number of accessions of improved varieties in genebank collections	16,270	26.1%
Number of accessions of other materials in genebank collections	7,467	12.0%
Number of accessions not marked with an improvement type in genebank collections	8,785	14.1%
Number of countries where germplasm has been collected for genebank collections	144	
Number of accessions in genebank collections from the primary region(s) of diversity	2,734	4.4%
Number of accessions in genebank collections from the primary and secondary region(s) of diversity	7,471	12.0%
Number of taxa in botanic garden collections	19	
Number of botanic gardens holding collections of crop or its wild relatives	112	

The International Board for Plant Genetic Resources (IBPGR)/International Plant Genetic Resources Institute (IPGRI) Register of Base Collections, which included collections that had formed (or had been proposed for) agreements with the international institutions based on long-term conservation of crop gene pools on global or regional bases during the 1970s through 1990s (IBPGR/IPGRI, 1993; Thormann *et al.*, 2019), listed, for tomato:

- Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE) (an international institute, located in Costa Rica) – global collection
- Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) (Germany) – global collection (agreement dated 1990)
- Institute of Plant Breeding (IPB) (Philippines) – regional collection for Asia (agreement dated 1981)
- USDA National Plant Germplasm System (NPGS) (USA) – global collection (agreement dated 1981)

Based on the number of current accessions (Table 2, Supplementary Table 1), it appears that all of these collections continue to maintain diverse tomato germplasm.

Approximately 24 taxonomic names are present in germplasm collections, including the crop as well as wild relatives and some hybrid accessions (Supplementary Table 2). The largest collections are of the crop as well as of *S. pimpinellifolium*, *S. aethiopicum*, *S. peruvianum*, *S. habrochaites*, *S. chilense*, *S. pennellii*, and *S. neorickii*, all of which are represented by over 100 accessions.

Landraces make up the largest proportion of germplasm collections (32.7%), followed by improved varieties (26.1%), breeding materials (9.5%), and wild relatives (5.6%) (Table 3); these percentages are estimates based on available data, noting that 14.1% of accessions do not have biological status data and another 12% are marked as “other” materials. Tomato germplasm has been collected from at least 144 countries, with approximately

4.4% of accessions originating from the primary regions of diversity of the crop (i.e. Andean South America and Mesoamerica) and 12% from primary and secondary (i.e. South-west Europe) regions; these statistics are also estimates, as 2.6% of tomato landrace accessions and 7.7% of wild relative accessions do not contain information even of the country where the accession was collected. Information on botanic garden collections from BGCI PlantSearch indicate that 112 botanic gardens collectively conserve 19 taxa in the tomato gene pool. All of these taxa are also conserved in genebank collections.

Aside from the taxa that appear to have limited representation in germplasm collections, the global genetic resources databases do not offer insights on diversity gaps, but published research has indicated specific priority species and geographic regions for further collecting for conservation. In a global *ex situ* conservation gap analysis of the wild relatives of major crops, Castañeda-Álvarez *et al.* (2016), assessing 12 tomato wild relatives, listed one (*S. huaylasense*) as of high priority for further collecting, and three other species (*S. arcanum*, *S. corneliomulleri*, and *S. pennellii*) as of medium priority.

## Multilateral System status of accessions in *ex situ* collections

*Solanum* sections *Tuberosa* (potato) and *Melongena* (eggplant) are listed in Annex I of the International Treaty on Plant Genetic Resources for Food and Agriculture (Plant Treaty) and are thus included in its Multilateral System of Access and Benefit Sharing (MLS). Tomato and its close wild relatives are not listed. This said, institutions can voluntarily place their collections under the MLS. Of the 62,360 accessions conserved globally,

approximately 16.1% are held in international institutions (i.e., mainly the World Vegetable Center), and are included in the MLS of the Plant Treaty, with the remainder maintained in national and other collections (Table 4).

As of 2025, 10,178 accessions are formally included in the MLS according to the Plant Treaty's GLIS database, and 19,240 accessions have been assigned Digital Object Identifiers

**Table 4.** Representation of tomato accessions in international and national institutions, number of accessions with DOIs, and representation of accessions in the Multilateral System of Access and Benefit Sharing of the International Treaty on Plant Genetic Resources for Food and Agriculture. Main *ex situ* collections data from Genesys and FAO WIEWS (2025). DOI and MLS data from Plant Treaty GLIS (2025).

Metric	Number	Percentage
Number of accessions in genebank collections in international institutions	10,012	16.1%
Number of accessions in genebank collections in national or other institutions	52,348	83.9%
Number of accessions in genebank collections in Annex I	0	0%
Number of accessions with DOI (Plant Treaty GLIS 2025)	19,240	
Number of accessions included in the Multilateral System (MLS) (Plant Treaty GLIS 2025)	10,178	
Number of accessions included in the Multilateral System (MLS) (genebank collections databases)	12,619	20.2%
Number of accessions included in the Multilateral System (MLS) that are in international collections (genebank collections databases)	8,884	14.2%
Number of accessions not included in the Multilateral System (MLS) (genebank collections databases)	20,224	32.4%
Number of accessions without information regarding inclusion in the Multilateral System (MLS) (genebank collections databases)	29,517	47.3%

(DOIs). Per the relevant fields in the global genetic resources databases, 12,619 accessions (20.2% of world total) are listed as included in the MLS; this may be an underestimate, noting that 47.3% of accessions

do not have MLS status data. Among twelve non-Annex 1 crops analyzed in reports equivalent to this one, tomatoes have among the highest proportion of accessions recorded as included in the MLS.

## Storage conditions, regeneration status, and safety duplication

As expected for an orthodox seed crop, the great majority (at least 85%) of tomato accessions are conserved as seed, with 54.9% of these accessions listed as conserved under long-term cold-storage conditions (Table 5). Information on storage in general is missing for 14.9% of all accessions, and information on seed storage type (i.e., long, medium, or short term) is missing for 26.8% of seed accessions.

Current regeneration status and needs cannot be directly derived from the global germplasm databases. FAO WIEWS reporting for the *Third State of the World's Plant Genetic Resources for Food and Agriculture* (FAO, 2025b) for the years 2014 to 2019, documented 2,210 tomato accessions regenerated during this time by reporting institutions, with 2,335 accessions identified as needing regeneration and 1,871 of these lacking funds to conduct the regeneration.

Analysis of the location of safety duplication sites of tomato germplasm, as listed in Genesys, indicates that at least 15.6% of accessions are safety duplicated in an active collection (i.e., apart from potentially being duplicated at the Svalbard Global Seed Vault [SGSV]) outside of the country of the main collection (Table 5). The actual extent of safety duplication of tomato accessions worldwide, when also considering safety duplication within the same country, may be higher than this estimate, given that some national genebanks, such as the USA, typically provide safety backup of their collections in a different location within the country. Information from the SGSV database from 2025 indicates that approximately 34.9% of total accessions worldwide are duplicated in Svalbard.



**Table 5.** Storage conditions of tomato *ex situ* collections, regeneration status, and safety duplication status. Main *ex situ* collections data from Genesys and FAO WIEWS (2025). Regeneration status information from FAO WIEWS (2025); data from 2014 to 2019. Safety duplication out of the country data based only on Genesys (2025) data. Svalbard Global Seed Vault data from SGSV portal (2025).

Metric	Number	Percentage
Number of accessions held in seed storage in genebank collections	53,015	85.0%
Number of accessions held in short-term seed storage in genebank collections	140	0.3%
Number of accessions held in medium-term seed storage in genebank collections	9,569	18.1%
Number of accessions held in long-term seed storage in genebank collections	29,085	54.9%
Number of accessions held in seed storage of undefined type in genebank collections	14,221	26.8%
Number of accessions held in field storage in genebank collections	65	0.1%
Number of accessions held in <i>in vitro</i> storage in genebank collections	2	0.0%
Number of accessions held in cryo storage in genebank collections	3	0.0%
Number of accessions held as DNA in genebank collections	0	0.0%
Number of accessions held in other storage in genebank collections	0	0.0%
Number of accessions not marked with a storage type in genebank collections	9,283	14.9%
Number of accessions in genebank collections regenerated 2014–2019	2,210	26.3%
Number of accessions in genebank collections in need of regeneration 2014–2019	2,335	27.8%
Number of accessions in genebank collections in need of regeneration without budget for regeneration 2014–2019	1,871	22.3%
Number of accessions safety duplicated out of the country in genebank collections	9,168	15.6%
Number of accessions in genebank collections safety duplicated in Svalbard	21,770	34.9%

## Documentation, information systems, and research resources

A descriptor list for tomatoes was published in 1996 by the international agricultural research community (IPGRI, 1996). The World Vegetable Center published a descriptor list in 2015 (WorldVeg, 2015).

The estimated completeness of passport information for tomato accessions listed in Genesys is 6.1 on a scale of 0 (no data) to 10 (complete data), which indicates that a sizable amount of data is available, but also that there are gaps that it would be valuable to fill. At least seven tomato characterization and evaluation datasets are available via Genesys, covering a total of 5,650 accessions.

Four metrics of the current degree of digital sequence information (DSI) for tomatoes (from the National Center for Biotechnology Information USA database), two metrics of published literature on the crop (Google Scholar and PubMed Central), and one metric of the degree of research resources such as herbarium specimens (from the Global Biodiversity Information Facility - GBIF), are listed in Table 6. Tomatoes, along with beets, onions and garlic, and lettuce, stand out compared to many other vegetables in terms of the degree of DSI resources, published literature, and research resources in GBIF (Khoury *et al.*, 2023).

**Table 6.** Documentation, information systems, and research resources for tomatoes. Passport data completeness index (PDCI) from Genesys (2025), based on the methods outlined in van Hintum *et al.* (2011). Global Biodiversity Information Facility data from GBIF (2025). All other metrics data from Khoury *et al.* (2023).

Metric	Number
Passport data completeness index (range 0-10) as a median value across accessions in genebank collections	6.1
Number of genes as recorded in NCBI's Entrez database as of 2022	83,581
Number of genomes as recorded in NCBI's Entrez database as of 2022	1
Number of nucleotides as recorded in NCBI's Entrez database as of 2022	937,343
Number of proteins as recorded in NCBI's Entrez database as of 2022	880,243
Number of publications listed in Google Scholar with taxon name in title published between 2009 and 2019	4,740
Number of publications listed in PubMed Central with taxon name in text as of 2022	30,266
Number of research materials as recorded in GBIF (2025)	2,596,356

## Germplasm distributions and varietal registrations and releases

Germplasm distributions and varietal development statistics for tomatoes are listed in Table 7. Germplasm distribution data from FAO WIEWS and the Plant Treaty Data Store reflect different reporting scopes: FAO WIEWS primarily reports distributions from national genebanks, while the Plant Treaty Data Store includes all transfers made under the SMTA, encompassing distributions made by genebanks as well as by breeding programs and other organizational types (Khoury *et al.*, 2025). Distributions as reported in the FAO WIEWS dataset were made from institutions in 30 countries, with the largest numbers of samples distributed from institutions in Romania, the Netherlands, Nigeria, Canada, India, Spain, Sweden, Ghana, France, and Turkey, and were primarily to within-country national agricultural research centers, to farmers or non-governmental organizations

(NGOs), and to other (unspecified) users (Khoury *et al.*, 2025). In the Plant Treaty dataset, the providers of the most samples were located in Canada, the Netherlands, Costa Rica, and China, and the recipients of the most samples were located in Canada, the Netherlands, Iran, Italy, France, Germany, Nigeria, China, and Egypt. Tomatoes are among the most distributed vegetable crops in both these datasets (Khoury *et al.*, 2023) (Table 7). This said, the differences in numbers of samples distributed as recorded by FAO WIEWS versus the Plant Treaty Data Store is likely a reflection of the lack of inclusion of the crop in Annex 1 of the Plant Treaty.

Information on varietal registrations and releases indicate that tomatoes are also among those vegetables with the largest numbers of varieties in development.

**Table 7.** Tomato germplasm distributions and varietal registrations and releases. FAO WIEWS distributions data is annual average over years 2014 to 2019. Plant Treaty Data Store distributions data is annual average over years 2015 to 2021. Evenness metric quantifies evenness of germplasm distributions across world regions, where 0 equals highly uneven and 1 equals completely even. International Union for the Protection of New Varieties of Plants (UPOV) PLUTO data is annual average over years 2014 to 2018. FAO WIEWS varietal releases data is annual average over years 2015 to 2019. All metrics data from Khoury *et al.* (2023), with Plant Treaty Data Store additions for more recent years (2019 to 2021).

Metric	Number
Average annual number of accessions distributed worldwide as recorded in FAO WIEWS	2,002.7
Average annual number of samples distributed worldwide as recorded in FAO WIEWS	7,020.0
Average annual number of samples distributed worldwide as recorded in the Plant Treaty Data Store	898.3
Number of countries receiving germplasm as recorded in the Plant Treaty Data Store	11.4
Evenness of distributions across world regions as recorded in the Plant Treaty Data Store	0.8
Average annual number of varietal registrations worldwide as recorded in UPOV's PLUTO	1,061.8
Average annual number of varietal releases worldwide as recorded in FAO WIEWS	417.4

## Networks and partnerships

Currently active networks focused on the crop include:

- The [Asia and Pacific Seed Association \(APSA\)-World Vegetable Center \(WorldVeg\) Vegetable Breeding Consortium](#)
- The Africa Vegetable Breeding Consortium (AVBC)
- The European Cooperative Programme for Plant Genetic Resources (ECPGR) [Solanaceae Working Group](#)
- The USDA ARS [Tomato Crop Germplasm Committee](#) (also [here](#))
- Communities related to tomato genetics and genomics, e.g. [Solanaceae Genomics Network](#)

## Conclusions

Tomatoes are essential vegetables in many cuisines worldwide. Their genetic resources are bolstered by the activities taking place in collections in national and subnational agricultural research organizations as well as at the World Vegetable Center. Available data indicates that these collections, in combination, are diverse and extensive, although they do not represent the full range of species and populations of wild relatives that could be conserved *ex situ* and made available for use. Lack of inclusion of the crop on Annex 1 of the Plant Treaty constrains international access to germplasm, with only around 20.2% of total accessions worldwide currently included in the MLS. There are considerable amounts of associated research resources, and there has been much activity in germplasm distributions and varietal development for the crop. Further efforts are required to: regenerate accessions in need; more fully secure these accessions in long-term seed storage conditions and safety backup all unique accessions, including at the SGSV; and provide more complete accession-level passport information as well as generate further characterization and evaluation datasets.

## Methods and materials

Primary data sources for the metrics reported in this summary include: [Genesys](#); World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture of the Food and Agriculture Organization of the United Nations ([FAO WIEWS](#)); Botanic Gardens Conservation International Plant-Search database ([BGCI PlantSearch](#)); Global Information System of the International Treaty on Plant Genetic Resources for Food and Agriculture ([Plant Treaty GLIS](#)); Data Store of the International Treaty on Plant Genetic Resources for Food and Agriculture ([Plant Treaty Data Store](#)); Svalbard Global Seed

Vault portal ([SGSV portal](#)); International Union for the Protection of New Varieties of Plants (UPOV) [PLUTO database](#); FAOSTAT; National Center for Biotechnology Information's Entrez database ([NCBI Entrez](#)); [Google Scholar](#); [PubMed Central](#); [Wikipedia](#); and the Global Biodiversity Information Facility ([GBIF](#)). Some of these data were acquired from literature/databases including [Khoury et al. \(2023\)](#) and [Khoury et al. \(2025\)](#). Data processing, metric calculation, and table generation were conducted in R, with code available on this [GitLab repository](#). Extended methods are available [here](#).

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## Supplementary information

**Supplementary Table 1:** Full list of *ex situ* collections of tomato genetic resources, in descending order by total number of accessions. Number of accessions and storage condition information from Genesys and FAO WIEWS (2025), with supplementary information as noted. Multilateral System (MLS) status from Plant Treaty GLIS (2025) and from Genesys and FAO WIEWS (2025).

Institution Code	Institution name	Number of accessions	Percent of total	Cumulative percent	Number of accessions in long term storage (-18-20 C)	Number of accessions included in MLS (from Plant Treaty GLIS)	Number of accessions included in MLS (from genebank collections databases)
TWN001	World Vegetable Center	9,470	15.2%	15.2%	9,242	7,912	8,386
USA003	Northeast Regional Plant Introduction Station, Plant Genetic Resources Unit, USDA-ARS, New York State Agricultural Experiment Station, Cornell University	6,460	10.4%	25.5%	Not listed	0	0
USA974	Seed Savers Exchange	5,852	9.4%	34.9%	Not listed	0	0
DEU146	Genebank, Leibniz Institute of Plant Genetics and Crop Plant Research	4,652	7.5%	42.4%	4,643	17	19
USA176	C.M. Rick Tomato Genetic Resources Center, Department of Vegetable Crops, University of California	4,230	6.8%	49.2%	Not listed	0	0
ESP026	Generalidad Valenciana. Universidad Politécnica de Valencia. Escuela Técnica Superior de Ingenieros Agrónomos. Banco de Germoplasma	3,460	5.5%	54.7%	2,062	0	1
HUN003	Centre for Plant Diversity	1,997	3.2%	57.9%	405	0	250
ESP027	Gobierno de Aragón. Centro de Investigación y Tecnología Agroalimentaria. Banco de Germoplasma de Hortícolas	1,856	3.0%	60.9%	1,735	0	0
BRA012	Embrapa Hortaliças	1,735	2.8%	63.7%	Not listed	0	0
UKR021	Institute of Vegetable and Melon Growing	1,637	2.6%	66.3%	948	0	0

Institution Code	Institution name	Number of accessions	Percent of total	Cumulative percent	Number of accessions in long term storage (-18-20 C)	Number of accessions included in MLS (from Plant Treaty GLIS)	Number of accessions included in MLS (from genebank collections databases)
POL003	Plant Breeding and Acclimatization Institute	1,596	2.6%	68.9%	1,596	0	0
BRA003	Embrapa Recursos Genéticos e Biotecnologia	1,581	2.5%	71.4%	Not listed	0	0
BGR001	Institute for Plant Genetic Resources 'K.Malkov'	1,489	2.4%	73.8%	827	0	17
CZE122	Gene bank	1,432	2.3%	76.1%	1,432	70	1,432
NLD037	Centre for Genetic Resources, the Netherlands	1,423	2.3%	78.4%	1,423	83	86
AUS165	Australian Grains Genebank, Agriculture Victoria	1,174	1.9%	80.3%	1,167	1,174	1,174
TUR001	Plant Genetic Resources Department	871	1.4%	81.6%	871	0	0
CUB014	Instituto de Investigaciones Fundamentales en Agricultura Tropical	808	1.3%	82.9%	Not listed	0	0
GHA091	Plant Genetic Resources Research Institute	806	1.3%	84.2%	Not listed	77	299
UZB006	Uzbek Research Institute of Plant Industry	750	1.2%	85.4%	Not listed	0	0
MDA011	Institute of Genetics, Physiology and Plant Protection	619	1.0%	86.4%	Not listed	0	0
MNG030	Institute of Plant and Agricultural Science	525	0.8%	87.3%	149	0	0
BGD206	Lal Teer Seed Limited	513	0.8%	88.1%	513	0	0
ROM007	Suceava Genebank	495	0.8%	88.9%	123	19	19
ARM008	Scientific Centre of Vegetable and Industrial Crops	463	0.7%	89.6%	86	131	145
ESP058	Consejo Superior de Investigaciones Científicas. Estación Experimental La Mayora	432	0.7%	90.3%	58	0	0
CRI001	Centro Agronómico Tropical de Investigación y Enseñanza	388	0.6%	90.9%	388	388	388
USA995	National Center for Genetic Resources Preservation	309	0.5%	91.4%	Not listed	0	0
PRT001	Banco Português de Germoplasma Vegetal	307	0.5%	91.9%	5	0	0
UKR008	Ustymivka Experimental Station of Plant Production	277	0.4%	92.4%	73	0	0
GBR006	Warwick Genetic Resources Unit	272	0.4%	92.8%	Not listed	0	0
ROM019	Research and Development Institute for Vegetables and Floriculture Vidra	257	0.4%	93.2%	Not listed	0	0
SDN002	Agricultural Plant Genetic Resources Conservation and Research Centre	257	0.4%	93.6%	257	0	0

Institution Code	Institution name	Number of accessions	Percent of total	Cumulative percent	Number of accessions in long term storage (-18-20 C)	Number of accessions included in MLS (from Plant Treaty GLIS)	Number of accessions included in MLS (from genebank collections databases)
ROM055	Research and Development Station for Vegetables - Bacau	235	0.4%	94.0%	15	0	0
ESP133	Región de Murcia. Instituto Murciano de Investigación y Desarrollo Agrario y Alimentario. Fruticultura	196	0.3%	94.3%	5	0	0
VNM049	Plant Resources Center	192	0.3%	94.6%	Not listed	0	0
GBR017	Henry Doubleday Research Association	185	0.3%	94.9%	Not listed	0	0
ARM005	Institute of Botany	177	0.3%	95.2%	Not listed	0	0
ALB026	Plant Genetic Resources Center	156	0.2%	95.5%	156	0	0
PHL129	Institute of Plant Breeding-National Plant Genetic Resources Laboratory	156	0.2%	95.7%	Not listed	0	0
NGA010	National Centre for Genetic Resources and Biotechnology	135	0.2%	95.9%	135	129	135
SVK001	National Agricultural and Food Centre (NPPC), Research Institute of Plant Production (RIPP)	127	0.2%	96.1%	Not listed	0	0
ITA393	CREA-Centro di Ricerca Genomica e Bioinformatica - Sede di Montanaso Lombardo	126	0.2%	96.3%	Not listed	0	0
JOR105	National Agricultural Research Center	126	0.2%	96.5%	Not listed	0	0
SWE054	Nordic Genetic Resource Center	117	0.2%	96.7%	117	0	0
ARE003	International Center for Biosaline Agriculture	104	0.2%	96.9%	Not listed	110	104
USA016	Plant Genetic Resources Conservation Unit, Southern Regional Plant Introduction Station, University of Georgia, USDA-ARS	93	0.1%	97.0%	Not listed	0	0
AZE015	Genetic Resources Institute	85	0.1%	97.2%	Not listed	0	0
ARM059	Agrobiotechnology Scientific Center	82	0.1%	97.3%	74	0	6
JPN183	NARO Genebank	80	0.1%	97.4%	10	0	0
PRT102	Banco de Germoplasma - Universidade da Madeira	68	0.1%	97.6%	Not listed	0	68
BGD215	Advanced Seed Research & Biotech Centre	67	0.1%	97.7%	Not listed	0	0
TZA016	National Plant Genetic Resources Centre	67	0.1%	97.8%	67	0	0
FRA011	Unité de Génétique et Amélioration des Fruits et Légumes, Plant Biology and Breeding, INRAE Avignon	55	0.1%	97.9%	Not listed	0	0
UGA528	Uganda National Genebank	54	0.1%	97.9%	Not listed	0	0

Institution Code	Institution name	Number of accessions	Percent of total	Cumulative percent	Number of accessions in long term storage (-18-20 C)	Number of accessions included in MLS (from Plant Treaty GLIS)	Number of accessions included in MLS (from genebank collections databases)
GUY021	National Agricultural Research and Extension Institute	53	0.1%	98.0%	Not listed	0	0
ESP200	Govern de les Illes Balears. Conselleria de Presidència. Direcció General d'Agricultura i Desenvolupament Rural. Institut de recerca i formació agrària i pesquera	52	0.1%	98.1%	Not listed	0	0
BGD003	Bangladesh Agricultural Research Institute	45	0.1%	98.2%	45	0	0
MDA010	Laboratory for Plant Genetic Resources	45	0.1%	98.3%	Not listed	0	0
PER034	Estación Experimental Agraria Donoso	45	0.1%	98.3%	3	0	0
COL029	Centro de Investigación La Selva, Corporación Colombiana de Investigación Agropecuaria	43	0.1%	98.4%	Not listed	0	0
MKD001	Faculty of Agriculture, University Ss. Cyril and Methodius	42	0.1%	98.5%	Not listed	0	0
ZMB048	National Plant Genetic Resources Centre	42	0.1%	98.5%	42	22	0
BGD099	Bangladesh Rural Advancement Committee (BRAC)	41	0.1%	98.6%	Not listed	0	0
ESP198	Comunidad de Madrid. Consejería de Medio Ambiente, Vivienda y Ordenación del Territorio. Instituto Madrileño de Investigación y Desarrollo Rural. Banco de Variedades Locales de Madrid	41	0.1%	98.7%	10	0	0
ZMB030	SADC Plant Genetic Resources Centre	41	0.1%	98.7%	41	0	0
CHE001	Agroscope Changins	39	0.1%	98.8%	37	0	39
ESP004	Centro Nacional de Recursos Fitogenéticos	39	0.1%	98.9%	39	0	0
ITA391	CREA-Centro di Ricerca Orticoltura e Florovivaismo - Sede di Pontecagnano	37	0.1%	98.9%	Not listed	0	1
HRV044	College of Agriculture at Križevci	36	0.1%	99.0%	14	0	0
POL101	Research Institute of Horticulture	36	0.1%	99.0%	36	0	0
ITA363	Dipartimento di Chimica, Biologia e Biotecnologie, Università degli Studi Perugia	32	0.0%	99.1%	32	0	0
LKA036	Plant Genetic Resources Centre	30	0.0%	99.1%	Not listed	0	0
NGA136	Biodiversity Education and Resource Centre	30	0.0%	99.2%	Not listed	0	0

Institution Code	Institution name	Number of accessions	Percent of total	Cumulative percent	Number of accessions in long term storage (-18-20 C)	Number of accessions included in MLS (from Plant Treaty GLIS)	Number of accessions included in MLS (from genebank collections databases)
EST019	Estonian Crop Research Institute	29	0.0%	99.2%	23	0	0
ISR002	Israel Gene Bank for Agricultural Crops, Agricultural Research Organisation, Volcani Center	27	0.0%	99.3%	Not listed	0	0
MKD007	Fabia CSB Bogdanci	27	0.0%	99.3%	Not listed	0	0
KEN212	Genetic Resources Research Institute	26	0.0%	99.3%	26	4	5
AUT001	Austrian Agency for Health and Food Safety	25	0.0%	99.4%	Not listed	0	0
BIH039	Institute of Genetic Resources, University of Banja Luka	22	0.0%	99.4%	22	0	0
COL017	Corporación Colombiana de Investigación Agropecuaria, AGROSAVIA	22	0.0%	99.5%	22	0	0
GRC005	Greek Genebank, Institute of Plant Breeding and Genetic Resources	22	0.0%	99.5%	Not listed	0	0
LBY006	National Bank for Plant Genetic Resources	21	0.0%	99.5%	Not listed	0	0
BGD028	Bangladesh Institute of Nuclear Agriculture (BINA)	19	0.0%	99.6%	Not listed	0	0
ECU023	Departamento Nacional de Recursos Fitogenéticos	16	0.0%	99.6%	16	0	0
ETH085	Ethiopian Biodiversity Institute	16	0.0%	99.6%	15	0	0
LTU006	Lithuanian Institute of Horticulture	15	0.0%	99.6%	4	0	11
AZE005	Vegetable Growing Research Institute Public Legal Entity	14	0.0%	99.7%	Not listed	0	0
LVA009	Latvian State Forest Research Institute 'Silava'	14	0.0%	99.7%	14	0	0
ROM021	Research and Development Station for Plant Culture on Sands Dabuleni	14	0.0%	99.7%	Not listed	0	0
UKR028	Institute of Horticulture	14	0.0%	99.7%	Not listed	0	0
ESP172	Cabildo Insular de Tenerife. Centro de Conservación de la Biodiversidad Agrícola de Tenerife	11	0.0%	99.7%	Not listed	0	0
GBR004	Millennium Seed Bank - Royal Botanic Gardens Kew	11	0.0%	99.8%	Not listed	0	0
MDG048	Laboratoire des semences et ressources phytogénétiques, FOFIFA	11	0.0%	99.8%	Not listed	0	0
AUT047	HBLFA Gartenbau Schönbrunn	9	0.0%	99.8%	9	0	0
ITA435	Banca del Germoplasma Vegetale	9	0.0%	99.8%	9	0	9

Institution Code	Institution name	Number of accessions	Percent of total	Cumulative percent	Number of accessions in long term storage (-18-20 C)	Number of accessions included in MLS (from Plant Treaty GLIS)	Number of accessions included in MLS (from genebank collections databases)
RUS001	N.I. Vavilov All-Russian Research Institute of Plant Industry	9	0.0%	99.8%	Not listed	0	0
CAN004	Plant Gene Resources of Canada, Saskatoon Research and Development Centre	8	0.0%	99.8%	8	0	8
CMR205	Ecogerm Farmers	7	0.0%	99.8%	Not listed	0	0
HRV045	Faculty of Agrobiotechnical Sciences Osijek, University J.J. Strossmayer in Osijek	7	0.0%	99.9%	Not listed	0	0
NGA026	Obafemi Awolowo University	7	0.0%	99.9%	Not listed	0	0
TCD022	Institut Tchadien de Recherche Agronomique pour le Développement	7	0.0%	99.9%	Not listed	10	0
PER001	Centro Internacional de la Papa	6	0.0%	99.9%	6	0	6
DEU159	External Branch North of the Department Genebank, IPK, Potato Collection in Gross-Luesewitz	5	0.0%	99.9%	5	0	5
ARG1350	Banco Activo de Germoplasma de La Consulta	4	0.0%	99.9%	Not listed	0	0
AUT025	Referat Pflanzengesundheit und Spezialkulturen	4	0.0%	99.9%	4	0	0
BIH036	Faculty of Agriculture and Food Sciences, University of Sarajevo	4	0.0%	99.9%	Not listed	0	0
LTU001	Lithuanian Institute of Agriculture	4	0.0%	99.9%	4	0	4
THA300	Genebank	4	0.0%	99.9%	3	0	0
BLR011	Republican Unitary Enterprise 'Research and Practical Centre of the National Academy of Sciences of Belarus for Arable Farming'	3	0.0%	99.9%	Not listed	0	0
GBR251	The James Hutton Institute	3	0.0%	99.9%	Not listed	0	0
ITA368	Banca del germoplasma autoctono vegetale regionale	3	0.0%	99.9%	3	0	0
LBN002	International Centre for Agricultural Research in Dry Areas	3	0.0%	99.9%	Not listed	0	0
UKR026	Institute of Potato Production	3	0.0%	100.0%	Not listed	0	0
UKR048	Institute of the Southern Vegetable and Melon Growing	3	0.0%	100.0%	3	0	0
AUT005	Genebank Tirol	2	0.0%	100.0%	Not listed	0	0
BOL317	Estación Experimental de Toralapa	2	0.0%	100.0%	Not listed	0	0
BRA008	Embrapa Arroz e Feijão	2	0.0%	100.0%	Not listed	0	0

Institution Code	Institution name	Number of accessions	Percent of total	Cumulative percent	Number of accessions in long term storage (-18-20 C)	Number of accessions included in MLS (from Plant Treaty GLIS)	Number of accessions included in MLS (from genebank collections databases)
CUB005	Instituto Nacional de Ciencias Agrícolas	2	0.0%	100.0%	Not listed	0	0
ECU308	Estación Experimental Central de la Amazonia	2	0.0%	100.0%	Not listed	0	0
TTO010	Central Experiment Station, Research Division, Ministry of Agriculture, Land and Fisheries	2	0.0%	100.0%	Not listed	0	0
UGA132	Plant Genetic Resource Centre	2	0.0%	100.0%	2	0	0
ZWE049	Genetic Resources and Biotechnology Institute-Department of Research and Specialist Services	2	0.0%	100.0%	Not listed	0	0
AZE007	Viticulture and Wine-making Research Institute	1	0.0%	100.0%	Not listed	0	0
BEL002	Gembloux agro-biotech, Université de Liège, département des Sciences agronomiques, Phytotechnie tropicale et Horticulture	1	0.0%	100.0%	Not listed	0	1
BFA084	Commission nationale de gestion des ressources phytogenétiques	1	0.0%	100.0%		5	0
HRV041	Faculty of Agriculture, University of Zagreb	1	0.0%	100.0%	Not listed	0	0
IND001	National Bureau of Plant Genetic Resources	1	0.0%	100.0%	1	0	0
MWI041	Malawi Plant Genetic Resources Centre	1	0.0%	100.0%	1	0	1
ROM077	Research and Development Station for Vegetables - Iernut	1	0.0%	100.0%	Not listed	0	0
SWZ015	National Plant Genetic Resources Centre	1	0.0%	100.0%	1	0	0
UKR023	Donets'k Experimental Station	1	0.0%	100.0%	1	0	0
UKR100	Cherkasy Institute of Agroindustrial Production	1	0.0%	100.0%	1	0	0
ZAF062	RSA National Plant Genetic Resources Centre	1	0.0%	100.0%	1	0	0

**Supplementary Table 2:** Full list of taxonomic names in *ex situ* genetic resource collections, in descending order by number of accessions conserved. Germplasm data from Genesys and FAO WIEWS (2025).

Taxon	Number of accessions (from genebank collections databases)
<i>Solanum lycopersicum</i> L.	56,779
<i>Solanum pimpinellifolium</i> L.	1,693
<i>Solanum aethiopicum</i> L.	1,326
<i>Solanum peruvianum</i> L.	727
<i>Solanum habrochaites</i> S. Knapp & D. M. Spooner	695
<i>Solanum chilense</i> (Dunal) Reiche	268
<i>Solanum pennellii</i> Correll	162
<i>Solanum neorickii</i> D. M. Spooner, G. J. Anderson & R. K. Jansen	117
<i>Solanum cheesmaniae</i> (L. Riley) Fosberg	97
<i>Solanum corneliomulleri</i> J. F. Macbr.	97
<i>Solanum chmielewskii</i> (C. M. Rick, Kesicki, Fobes & M. Holle) D. M. Spooner, G. J. Anderson & R. K. Jansen	80
<i>Solanum galapagense</i> S. C. Darwin & Peralta	69
<i>Solanum arcanum</i> Peralta	49
<i>Solanum sisymbriifolium</i> Lam.	47
<i>Solanum lycopersicoides</i> Dunal	37
<i>Solanum sitiens</i> I. M. Johnst.	26
<i>Solanum ochranthum</i> Dunal	24
<i>Solanum juglandifolium</i> Dunal	22
<i>Solanum lycopersicum</i> x <i>racemigerum</i>	14
<i>Solanum lycopersicum</i> x <i>humboldtii</i>	12
<i>Solanum huaylasense</i> Peralta	8
<i>Solanum lycopersicum</i> x <i>pimpinellifolium</i>	8
<i>Solanum lycopersicum</i> x <i>cerasiforme</i> L.	2
<i>Solanum lycopersicum</i> x <i>cheesmaniae</i>	1

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