Global Thematic Land Use Cover Datasets Characterizing Agricultural Covers

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Abstract

There is a wide variety of global thematic Land Use Cover (LUC) datasets characterizing agricultural covers. Most of them focus on cropland areas, providing information on their extent or the percentage of cropland cover on the ground. In some cases, the focus is more specific and they provide information on cropland irrigation practices. In other cases, specific maps charting the extension of different crops are also available. In this chapter, we review 8 different datasets with a spatial resolution of at least 1 km. There are many other datasets characterizing agricultural covers at coarser resolutions, such as the Historic Croplands Dataset, GMRCA or GIAM. Their coarse resolution hampers their potential application in practice, which is why they are not described in detail in this chapter. Nor do we analyse FROM-GC, a dataset mapping the extent of global cropland at 30 m, because it is not currently accessible. GFSAD30 has the highest resolution of all the datasets reviewed (30 m). It also provides some of the most up-to-date information (2015). However, it only charts the extent of cropland. As part of an associated project, GFSAD1KCD and GFSAD1KCM characterize cropland areas in 9 and 7 categories respectively at 1 km for 2010. They provide information on the irrigation status of the crops. GFSAD1KCD and GFSAD1KCM were obtained from data fusion. This method is commonly used in the production of many of the cropland datasets reviewed: IIASA-IFPRI cropland map, Global Synergy Cropland Map, Unified Cropland Layer (UCL) and ASAP Land Cover Masks. The IIASA-IFPRI (2005) and ASAP maps provide information on the proportion of cropland at a spatial resolution of 1 km. ASAP also includes a map on rangeland covers, and as such is the only dataset described in this chapter that maps a cover other than croplands. The Global Synergy Cropland Map (2010) and the Unified Cropland Layer (2014) also map cropland proportions, although they have been produced at higher spatial resolutions: 500 and 250 m respectively. The Global Cropland Extent product maps the extent of cropland at 250 m based on imagery from 2000-2008. Although thematically limited, this dataset is less affected by time variability, as it is based on imagery taken over a long period (8 years). Finally, GRIPC maps the extent of three types of cropland area (irrigated, rainfed and paddy crops) at 500 m for 2005.

Keywords

Agriculture • Cropland • Pastureland • Global Cropland Extent • IIASA-IFPRI Cropland Map • GRIPC • GFSAD1KCM • GFSAD1KCD • Global Synergy Cropland Map • UCL • GFSAD30 • ASAP Land Cover Masks

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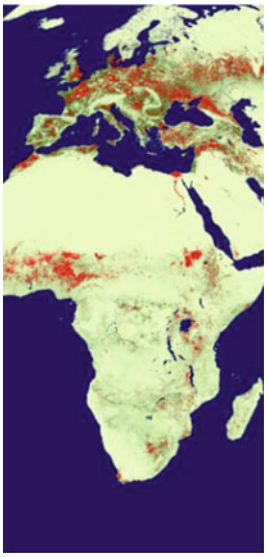
1 Global Cropland Extent



	Product
	LULC thematic
	Dates
	2000 / 08
	Formats
	Raster
	Pixel size
	250 m
	Theme
	Cropland extent
	Extent
	Global
	Updating
	Not expected
	Change detection
	No (only one date)
	Overall accuracy
	Not specified
Website of reference	**Website Language** English
https://glad.umd.edu/projects/croplands/globalindex.html	
Download site	
https://glad.umd.edu/projects/croplands/dataindex.html	
Availability	**Format(s)**
Open Access	.tiff
Technical documentation	
Pittman et al. (2010)	
Other references of interest	
–	

Project

The Global Cropland Extent was a map developed for the Global Agriculture Monitoring Project (GLAM). The project, promoted by NASA, the USDA, and Maryland and South Dakota State universities, aimed to take advantage of the new generation of NASA satellite observations to enhance the agricultural monitoring and crop-production estimation work carried out by the USDA Foreign Agriculture Service (FAS). At the time it was produced, Global Cropland Extent was the highest resolution cropland map at global scale produced using synoptic inputs.

Production method

The Global Cropland Extent map was obtained after thresholding a crop probability layer obtained from 16-day composites of MODIS imagery for the period 2000–2008. The probability layer was generated by averaging the results from multiple decision-tree classifications. They were trained with sub-pixel data obtained from multiple sources: GeoCover, AfriCover, USDA, Cropland Data Layer, NLCD, Agriculture and Agri-Food Canada, South Africa State of the Environment and CLC.

The selected threshold for differentiating between cropland and non-cropland areas in the probability layer was decided on the basis of information from the FAS Production, Supply and Distribution (PSD) database. The database provided, per country, the median harvested area of production field crops (barley, corn, cotton, oats, rice, rye, sorghum, soybeans and wheat) for the period 2000–2008. The pixels with the highest cropland probability were then considered cropland until those area thresholds were met. In the European Union, the threshold was defined for the whole EU area rather than at country level.

Product description

The Global Cropland Extent map is distributed in tiles following the MODIS tile grid.[1] To identify the file or files that fall within their area of interest, users must know the horizontal and vertical tile numbers that identify each area. The download only includes the raster file with the cropland information and no additional data is provided.

The Cropland probability layer can also be downloaded following the same procedure. In addition, the project provides a global mosaic at a spatial resolution of 1 km, merging all the tiles in one file.

Downloads

Global Cropland Extent h17v04
– Raster file with cropland extent (.tiff)

Global Cropland Probability h17v04
– Raster file with cropland probability (.tiff)

Legend and codification

Global Cropland Extent	
Code	Label
0	Cropland
1	No cropland
254	Water

Global Cropland Probability	
Code	Label
0	Water
1–100	Cropland probability (1–100%)

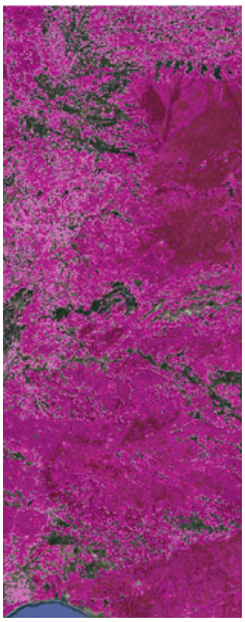
Practical considerations

According to the accuracy analyses carried out by the production team, the Global Cropland Extent map shows important accuracy differences when mapping cropland areas. Intensive broadleaf crop regions (corn and soybean) are the best mapped, while wheat-growing regions and, especially, rice production regions, present low levels of accuracy. The dataset also has problems mapping cropland areas in regions without intensive agriculture, like Africa.

Because of the 8-year timespan of the MODIS imagery used as an input for the production of the Global Cropland Extent, the dataset can be considered insensitive to inter-annual variability of cropland covers.

[1] The MODIS tile grid is available at https://modis-land.gsfc.nasa.gov/MODLAND_grid.html.

2 IIASA-IFPRI Cropland Map



	Product
	LULC thematic
	Dates
	2005
	Formats
	Raster
	Pixel size
	1 km
	Theme
	Percentage of cropland cover
	Extent
	Global
	Updating
	Not expected
	Change detection
	No (only one date)
	Overall accuracy
	Expected to be > 82%
Website of reference	**Website Language** English
https://geo-wiki.org/Application/index.php	
Download site	
https://geo-wiki.org/Application/index.php	
Availability	**Format(s)**
Open Access after registration	.img
Technical documentation	
Fritz et al. (2015)	
Other references of interest	
Fritz et al. (2011)	

Project

The IIASA-IFPRI Cropland Map was produced by an international consortium of researchers led by the International Institute for Applied Systems Analysis (IIASA) and the International Food Policy Research Institute (IFPRI). The project builds on the experience and the method proposed by Fritz et al. (2011) for mapping cropland areas in sub-Saharan Africa. It is part of a broader plan to provide better LUC mapping for food security studies and policies.

The aim of the project was to improve the spatial representation of cropland areas by fusing existing datasets. Unlike previous efforts, the focus was on cropland percentage instead of cropland extent. In addition, the project delivered the first ever global field-size map.

Production method

The IIASA-IFPRI Cropland Map was obtained by merging the cropland cover information provided by global (GLC2000, MODIS 2005, GlobCover), regional (CLC, AFRICOVER, Cropland mask for Africa) and national (14 countries) datasets. The datasets with a spatial resolution finer than 1 km were resampled and combined in a common grid at a spatial resolution of 1 km. For those datasets that do not provide information about the percentage of cropland, and merely inform about its presence or absence, minimum, average and maximum percentages of cropland cover were assigned according to the definition of the cropland categories.

Once all the input information had been homogenized, the different datasets were combined in a synergy layer. The synergy layer defines the cropland areas according to the agreement of the input datasets. The combination of datasets was hierarchical, according to their accuracy, which was determined by reference data collected through the Geo-Wiki platform. Together with the synergy layer, three other layers stating the minimum, average and maximum cropland percentage cover were obtained by averaging the minimum, average and maximum cropland percentage values from the input maps.

The final IIASA-IFPRI Cropland Map was obtained by combining the synergy and average cropland percentage layers with national cropland statistics provided by FAO. The areas with the highest probability of being cropland according to the synergy layer were selected until the total surface area for cropland according to FAO statistics for each country was reached. The specific area of cropland allocated to each pixel (e.g. 70 ha of cropland) was determined based on the average cropland percentage cover layer.

Finally, a visual verification with Google Earth imagery was carried out at the national level to correct possible omission errors.

Product description

The dataset can be downloaded as a single compressed file (.zip), including the raster with the LUC information and an auxiliary file with a brief technical description of the raster file.

Downloads

IIASA-IFPRI Cropland map
– Raster file with cropland percentage (.img) – Text file with technical information about the raster

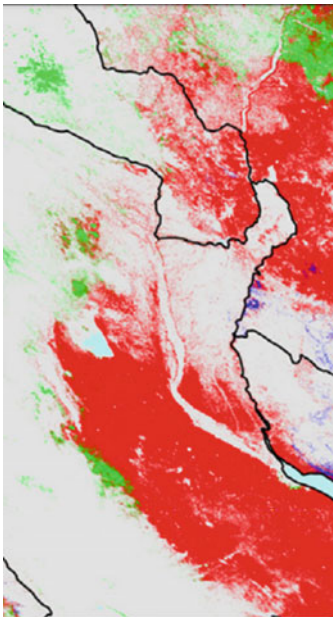
Legend and codification

Code	Label
0–100	Cropland Coverage (0-100%)

Practical considerations

The IIASA-IFPRI Cropland Map can be accessed online via the Geo-Wiki platform. The associated field-size map can be very useful for researchers studying food security and other aspects of cropland uses and practices. The field-size map can be downloaded and visualized at the same website as the Cropland map.

3 GRIPC—Global Rainfed, Irrigated, and Paddy Croplands



	Product
	LULC thematic
	Dates
	2005
	Formats
	Raster
	Pixel size
	500 m
	Theme
	3 cropland classes out of 4
	Extent
	Global
	Updating
	Not expected
	Change detection
	No (only one date)
	Overall accuracy
	Expected to be >69%
Website of reference	**Website Language**
Not available	English
Download site	
http://ftp-earth.bu.edu/public/friedl/GRIPCmap/?C=S;O=A	
Availability	**Format(s)**
Open Access	.tiff
Technical documentation	
Salmon et al. (2015)	
Other references of interest	
Liu et al. (2018)	

Project

Global Rainfed, Irrigated and Paddy Croplands (GRIPC) is a map developed by researchers from German and American universities, who aimed to overcome some of the limitations of previous datasets focusing on irrigated croplands. At the time it was released, the dataset offered an up-to-date representation of irrigated croplands across the world at the highest spatial resolution available. It could be useful for those studying agricultural productivity, agricultural hydrology and food security in general.

Production method

The GRIPC map is made up of 4 different categories. Uncropped areas were extracted from the non-cropland categories of the MODIS Land Cover database for the period 2004–2006. Paddy croplands were independently mapped from different sources, such as crop inventories, due to the challenges involved in classifying cloudy imagery in the tropics. Rainfed and irrigated cropland were mapped using a decision-tree classification algorithm (C4.5) and the "boosting" machine learning technique.

MODIS imagery was used as the input for the classification. Climate and agroecozones data were also used as auxiliary datasets. Probability layers obtained from the classification were combined with information from national and subnational cropland inventory-based datasets to finally map the rainfed and irrigated cropland areas. The information from these datasets served to define the probabilities of each category occupying a pixel. Then, the classification results were combined with these probabilities using a Bayes' rule to obtain the final map.

Product description

GRIPC is distributed in 273 tiles, according to the MODIS tile grid.[2] Users must consult the tiles that correspond to their area of interest. A lower-resolution version of the product, at 5 arc minutes, and a file with the main technical characteristics of the dataset, are also available for download.

Downloads

GRIPC h17v04
– Raster file with cropland information (.tiff)

Legend and codification

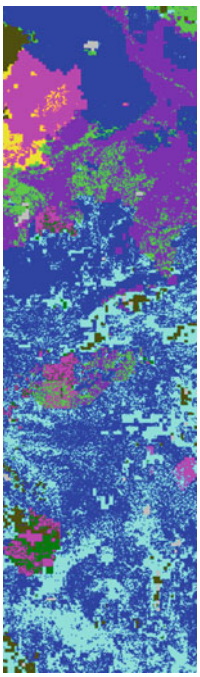
Code	Label	Code	Label
1	Rainfed cropland	3	Paddy cropland
2	Irrigated cropland	4	No cropland

Practical considerations

GRIPC does not map various important irrigated cropland categories, such as deficit irrigation (irrigation occurring less than once a year), permanent crops (orchards and vineyards) and unharvested pastures. As there is no official website describing the GRIPC and its characteristics, users wishing to find out more about this dataset should consult the scientific paper in which it was presented (Pittman et al. 2010).

[2] The MODIS tile grid is available at https://modis-land.gsfc.nasa.gov/MODLAND_grid.html.

4 GFSAD1KCM and GFSAD1KCD



	Product
	LULC thematic
	Dates
	2010
	Formats
	Raster
	Pixel size
	1 km Minimum mapping unit: 0.81 ha
	Theme
	5 cropland classes out of 7, focusing on cropland extent (GFSAD1KCM) 8 cropland classes out of 10, focusing on crop dominance (GFSAD1KCD)
	Extent
	Global
	Updating
	Not expected
	Change detection
	No (only one date)
	Overall accuracy
	Expected to be >70%
Website of reference	**Website Language** English
https://lpdaac.usgs.gov/products/gfsad1kcmv001/ https://lpdaac.usgs.gov/products/gfsad1kcdv001/	
Download site	
https://lpdaac.usgs.gov/products/gfsad1kcmv001/ https://lpdaac.usgs.gov/products/gfsad1kcdv001/	
Availability	**Format(s)**
Open Access after registration	.tiff
Technical documentation	
Teluguntla et al. (2020), USGS EROS (2017)	
Other references of interest	
Friedl et al. (2010), Pittman et al. (2010), Portmann et al. (2010), Ramankutty et al. (2008), Thenkabail and Lyon (2009), Thenkabail et al. (2009), Thenkabail et al. (2010), Thenkabail et al. (2011), Thenkabail et al. (2012), Yadav and Congalton (2018), Yu et al. (2013)	

Project

The GFSAD1KCM and GFSAD1KCD datasets were created by NASA and the USGS within the context of the MEaSUREs (Making Earth System Data Records for Use in Research Environments) programme. MEaSUREs is one of the competitive programmes of the Earth Science Data Systems (ESDS), which aims to take full scientific advantage of NASA missions.

MEaSUREs projects make use of data from NASA satellites to produce innovative products that meet the needs of the research community, inform policy-making and provide a better understanding of the planet. GFSAD (Global Food Security Support Analysis Data) is a specific MEaSUREs project focused on mapping agricultural areas to contribute to global food security policies. The project aims to improve global cropland mapping, by providing a methodology that can map cropland areas across the world quickly, consistently and accurately.

As part of the GFSAD projects, cropland maps have been produced at three different spatial resolutions (1 km, 250 m and 30 m). The maps at 1 km and 30 m cover the whole globe. Various different supranational datasets are available at 250 m for Africa, Australia and South Asia at different years of reference. A similar dataset at 250 m is also available yearly for the United States from 2001 to 2013.

For the product at 1 km, two complementary maps were generated: GFSAD1KCM, mapping the extent of cropland at a global level, and GFSAD1KCD, which maps crop dominance across the world. The map at 30 m is described later in this chapter.

Production method

GFSAD1KCM and GFSAD1KCD were produced separately by aggregating different existing products. The input maps were first resampled at the same resolution (1 km) and later overlaid.

GFSAD1KCM was created by aggregating the maps produced by Thenkabail et al. (2009, 2011), Pittman et al. (2010), Yu et al. (2013), and Friedl et al. (2010). Cropland extent was obtained by agreement of these four maps. Other information and indicators, such as irrigation status, irrigation or rainfed dominance, were obtained from the map developed by Thenkabail et al. (2009, 2011).

GFSAD1KCD was created by combining the global irrigated and rainfed cropland area map produced by the International Water Management Institute with the maps of dominant global crop-types produced by Ramankutty et al. (2008), Monfreda et al. (2008), and Portmann et al. (2010). In both cases, the maps were obtained from data for the period 2007–2012.

Product description

GFSAD1KCM and GFSAD1KCD can be downloaded from various different servers or tools, such as Data Pool, NASA Earthdata Search, USGS EarthExplorer and the DAAC2Disk Utility. In all cases, users download a raster file with the cropland information. Downloads from Data Pool also include a metadata file and a preview image of the product.

Downloads

GFSAD1KCDv001
– Raster file with crop dominance information

GFSAD1KCMv001
– Raster file with cropland extent

Legend and codification

GFSAD1KCD	
Code	Label
0	Ocean or Water areas
1	Irrigated (Wheat and Rice)
2	Irrigated Mixed Crops 1 (Wheat, Rice, Barley, Soybeans)
3	Irrigated Mixed Crops 2 (Wheat, Rice, Cotton, Orchards)
4	Rainfed (Wheat, Rice, Soybeans, Sugarcane, Corn, Cassava)
5	Rainfed (Wheat, Barley)
6	Rainfed (Corn, Soybeans)
7	Rainfed Mixed Crops (Wheat, Corn, Rice, Barley, Soybeans)
8	Fractions of Mixed Crops (Wheat, Maize, Rice, Barley, Soybeans)
9	Non-cropland areas

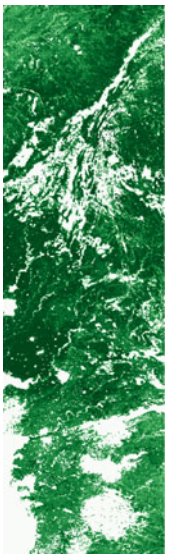
GFSAD1KCM			
Code	Label	Code	Label
0	Ocean or Water areas	4	Croplands, Rainfed, Minor Fragments
1	Croplands, Irrigation Major	5	Croplands, Rainfed, Very Minor Fragments
2	Croplands, Irrigation Minor	9	Non-Cropland areas
3	Croplands, Rainfed		

Practical considerations

GFSAD1KCM and GFSAD1KCD were produced independently for different purposes and cannot therefore be compared. Although GFSAD1KCD provides information on crop dominance, it can also be used to study cropland extent.

According to the authors, data about cropping intensity can be obtained from this product using a time-series of Normalized Difference Vegetation Index (NDVI) data.

5 Global Synergy Cropland Map



	Product
	LULC thematic
	Dates
	2010
	Formats
	Raster
	Pixel size
	500 m
	Theme
	Percentage of cropland cover
	Extent
	Global
	Updating
	Not expected
	Change detection
	No (only one date)
	Overall accuracy
	Expected to be >90%
Website of reference	**Website Language** English
https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/ZWSFAA	
Download site	
https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/ZWSFAA	
Availability	**Format(s)**
Open Access	.tiff
Technical documentation	
Lu et al. (2020) .tiff	
Other references of interest	
Yu et al. (2020)	

Project

The Global Synergy Cropland Map is a dataset created within the framework of the Spatial Production Allocation Model (SPAM), which maps agriculture production across the world. It is a joint effort involving different institutions and universities across the world: AGRIRS, IFPRI Chinese Academy of Agricultural Sciences and Victoria University of Wellington.

The project team aimed to create a more accurate cropland dataset that would be useful for agricultural monitoring and food security policies and studies. The obtained map is a critical input of SPAM.

Production method

A self-adapting statistics allocation model (SASAM) is used to generate the Global Synergy Cropland Map, using LUC datasets at global, supranational and national scales as input, as well as FAO agricultural statistics at national and subnational levels.

Two layers were generated by the model. Firstly, an agreement layer, which shows the level of agreement of all the datasets regarding the location of cropland areas, and secondly, an average cropland percentage layer, obtained by calculating the average of all the input maps. For the agreement layer, datasets with a higher accuracy are given more weight. This accuracy is based on the agreement between each input dataset and the FAO statistics. For the cropland percentage layer, the cropland category definitions in the input maps were translated into cropland percentages.

The final cropland map was obtained after executing the SASAM model, which allocated cropland in the areas with the highest probability in the agreement layer until the total surface area for cropland according to FAO statistics for each country was reached.

Product description

The raster file showing the cropland percentage can be downloaded separately. However, we recommend the full download, which also contains additional information about the dataset, such as its level of confidence.

Downloads

Global synergy cropland map (full download)
– Raster file with cropland percentage (.tiff) – Raster file with information about the confidence level of the cropland map (.tiff) – A text file with information about the downloaded product

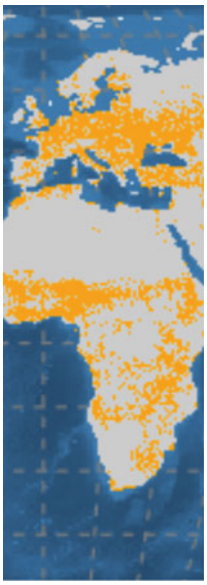
Legend and codification

Code	Label
0-1	Cropland extent percent (0–100%)

Practical considerations

More information about the associated SPAM project is available at www.mapspam.info. The website includes all the spatial datasets about agricultural production generated as part of the project. These complement the information provided by the cropland map reviewed here.

6 UCL—Unified Cropland Layer



	Product
	LULC thematic
	Dates
	2014
	Formats
	Raster
	Pixel size
	250 m
	Theme
	Percentage of cropland cover, although for some areas it only informs about the extent
	Extent
	Global
	Updating
	Not planned
	Change detection
	No (only one date)
	Overall accuracy
	Expected to be >83%
Website of reference	**Website Language** English
https://figshare.com/articles/dataset/ucl_2014_v2_0_tif/2066742	
Download site	
https://figshare.com/articles/dataset/ucl_2014_v2_0_tif/2066742	
Availability	**Format(s)**
Open Access	.tiff
Technical documentation	
Waldner et al. (2016)	
Other references of interest	
–	

Project

The Unified Cropland Layer (UCL) is one of the results of the SIGMA (Stimulating Innovation for Global Monitoring of Agriculture and its Impact on the Environment in support of GEOGLAM) project. SIGMA was a European funded project that sought to improve agricultural monitoring and forecasting tools, using earth observation data. The project was made up of 22 renowned international institutions, many of which were experts in agricultural monitoring. In addition, the project was part of the European contribution to the Global Agricultural Geo-Monitoring (GEOGLAM) initiative.

12 of the 22 institutions involved in this project took part in the production of the UCL. Its aim was to enhance the global mapping of cropland areas, contributing to studies and activities assessing the current situation of cropland areas across the world, assessing crop land changes and providing new data for the production of cropland statistics. The UCL uses the definition of cropland proposed by the Joint Experiment of Crop Assessment and Monitoring (JECAM).

Production method

The UCL was obtained by combining the best available LUC cropland datasets for each area of the world. To this end, up to 49 different LUC datasets at global, regional and national scales were reviewed and assessed. They were resampled at a spatial resolution of 250 m and, when several dates were available, the closest to 2014 was selected.

The best dataset was selected on the basis of a multi-criteria analysis considering 4 different criteria: (i) match between the legend and the definition of cropland used by the UCL; (ii) match between the spatial resolution and the cropland pattern in each area; (iii) the timeliness of the datasets regarding the UCL year of reference (2014); and (iv) the confidence level of each dataset.

Each input source was scored according to the four criteria. The scores were later reviewed by experts on the topic. After this review, the scores were combined to create a single indicator. The dataset with the highest score in this indicator was selected for each pixel. When the input datasets provided information on the proportion of cropland, this information was maintained. In all other cases, the UCL only differentiates binarily between cropland and non-cropland areas.

Product description

The UCL download includes the raster file with the cropland information, as well as a preview image of the product and the technical paper describing the map. Each file can also be downloaded independently.

Downloads

Unified Cropland Layer
– Raster file with cropland information (.tiff) – Preview image of the map (.png) – Paper describing the map

Legend and codification

Code	Label
0-100	Cropland proportion (0-100%)

7 GFSAD30 Cropland Extent

	Product
	LULC thematic
	Dates
	2015 (2010 for North America)
	Formats
	Raster
	Pixel size
	30 m
	Theme
	Extent of Cropland
	Extent
	Global
	Updating
	Not expected
	Change detection
	No (only one date)
	Overall accuracy
	Expected to be > 91%
Website of reference	**Website Language** English
https://www.usgs.gov/centers/wgsc/science/global-food-security-support-analysis-data-30-m-gfsad	
Download site	
https://croplands.org/ https://croplands.org/downloadLPDAAC	
Availability	**Format(s)**
Open Access	.tiff
Technical documentation	
Gumma et al. (2020), Oliphant et al. (2019), Phalke et al. (2020), Teluguntla et al. (2018), Xiong et al. (2017)	
Other references of interest	
Teluguntla et al. (2015)	

Project

Global Food Security-support Analysis Data 30 metre (GFSAD30) was a project aimed at producing high-resolution cropland maps to inform global food and water security studies and policies. The project sought to overcome some of the limitations presented by previous cropland datasets, such as sources of uncertainty, insufficient precision in the allocation of cropped areas, and a lack of information regarding the intensity and irrigation status of cropland areas.

GFSAD30 was the continuation of earlier projects (the GFSAD1KCM and GFSAD1KCD datasets described above) with similar purposes. They all formed part of the MEaSUREs (Making Earth System Data Records for Use in Research Environments) programme, which promotes the use of data from NASA missions to produce innovative products that are useful for research and policy-making.

Various different US institutions (USGS, BAER Institute, U.S. Department of Agriculture, U.S. Environmental Protection Agency) and universities (New Hampshire, California, Wisconsin, Northern Arizona) took part in the project, together with Google and institutions from other countries (ICRISAT, IAARD).

A global map of cropland extent at a spatial resolution of 30 m for the reference year 2015 was delivered as part of the project. The global map was obtained after merging different maps that had been independently produced for seven different regions across the world. The map for North America was produced for the reference year 2010, instead of 2015.

Production method

GFSAD30 is made up of 7 datasets which were independently produced for different regions across the world: Europe, Middle East, Russia and Central Asia; Africa; Australia, New Zealand, China, and Mongolia; Southeast and Northeast Asia; North America; and South America. Each dataset was produced following a specific production method, although they all share certain common features.

The same imagery source (Landsat) was used for all 7 datasets. Sentinel-2 imagery was also used to map the extent of cropland in Africa. Other auxiliary data, such as elevation data from the SRTM radar, were used for the production of several datasets. In all cases, the extent of cropland was computed using the Google Earth Engine (GEE) platform.

The classification workflow varies in each case. The most frequent classification method was the random forest algorithm. For some datasets, like Africa, additional classifiers (support vector machines, an object-based classifier) were also used. In addition, in order to take the geographical variability within the mapped area into account, producers usually split the classification into agro-ecological zones (AEZs).

Product description

GFSAD30 is distributed in tiles with a 10º edge for each of the mapped regions. Datasets are available from different servers or tools, including Data Pool, NASA Earthdata Search, USGS EarthExplorer and the DAAC2Disk Utility. We recommend users to download the dataset through NASA Earthdata Search and USGS EarthExplorer, on which the geographical coverage of each tile can be visualized.

In most cases, the download only includes a raster file with the extent of cropland in .tiff format. Nonetheless, the download from the Data Pool server also includes a metadata file and a preview image of the product.

Downloads

GFSAD30AFCE v001
– Raster file with cropland extent

Legend and codification

Code	Label
0	Water
1	Non-Cropland
2	Cropland

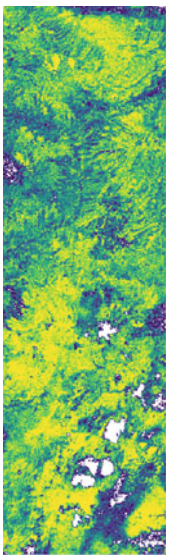
Practical considerations

The global map obtained after merging the 7 GFSAD30 datasets can be consulted online at the project's website.[3] The website also includes other important products for mapping cropland at coarser scales (250 m, 1 km), as well as datasets about irrigated/rainfed cropland areas for South Asia, Iran, Afghanistan and Australia. Users can also download a dataset validating the product (GFSAD30VAL).[4]

In addition to the technical documentation published as reports and papers in journals, other interesting technical documents are also available on the website.[5]

[3] www.croplands.org.
[4] https://lpdaac.usgs.gov/products/gfsad30valv001/.
[5] https://www.croplands.org/documents.

8 ASAP Land Cover Masks



	Product
	LULC thematic
	Dates
	2019
	Formats
	Raster
	Pixel size
	1 km (resampled from 250 m original resolution)
	Theme
	Percentage of cropland/rangeland covers
	Extent
	Global
	Updating
	Not planned
	Change detection
	No (only one date)
	Overall accuracy
	Not specified
Website of reference	**Website Language** English
https://mars.jrc.ec.europa.eu/asap/index.php	
Download site	
https://mars.jrc.ec.europa.eu/asap/download.php	
Availability	**Format(s)**
Open Access	.tiff
Technical documentation	
Meroni et al. (2019)	
Other references of interest	
Pérez-Hoyos et al. (2017a), Pérez-Hoyos et al. (2017b), Rembold et al. (2019), Vancutsem et al. (2013)	

Project

Anomaly hot Spots of Agricultural Production (ASAP) is an online decision support system developed and maintained by the Monitoring Agricultural Resources unit (MARS) of the Joint Research Centre (JRC) of the European Commission to monitor anomalies in global agricultural production. The system supports early warnings and assessments on food security, so providing a useful tool for many international organizations working in this field.

Two land cover maps charting global crop and rangeland cover fractions were specifically produced for ASAP and are accessible to any interested user. These layers are required to compute anomalies based on rainfall and vegetation index data, which are later translated into timely warnings about potential food security problems.

The maps rely on previous work carried out for similar purposes by the JRC. In their studies of Africa, the maps follow a similar approach to that proposed by Vancutsem et al. (2013) and further refined by Pérez Hoyos (2017a).

Production method

The cropland and rangeland cover maps for ASAP were produced by combining the best available LUC data for each country. To select the best available source for each case, different criteria were employed depending on the country or geographical area. The selected data sources for each map (cropland, rangeland) also varied.

For Africa and part of Asia (Bangladesh, Indonesia, Laos, Myanmar, Thailand, Timor-Leste, Philippines and Vietnam), 8 global LUC datasets (CGLS-LC100, GLC2000, GLCNMO, GlobCover, GLC30, LC-CCI, MODISLC, S2 Prototype Land Cover) were compared according to different criteria. In the African case, the most suitable dataset was selected on the basis of timeliness, spatial resolution, agreement with FAO statistics, accuracy and expert knowledge. In the Asian case, only accuracy and agreement with FAO statistics were considered.

For the rest of the countries, when a suitable regional dataset was available, this was the one selected. In the cases when a suitable dataset was not available, the global LUC dataset with the highest spatial resolution was chosen. If this was not considered valid when assessed against Google Earth imagery, the FAO-GLCshare dataset was selected in its place.

The maps were initially produced at 250 m and later resampled at 1km in line with the requirements of the ASAP system.

Product description

The raster files containing the cropland and rangeland cover information can be downloaded from the ASAP website. No auxiliary information is available for these datasets.

Downloads

ASAP crop mask
– Raster file with cropland percentage (.tiff)

ASAP rangeland mask
– Raster file with rangeland percentage (.tiff)

Legend and codification

ASAP crop mask	
Code	Label
0-100	Cropland Coverage (0–100%)

ASAP rangeland mask	
Code	Label
0-100	Rangeland Coverage (0–100%)

Practical considerations

Although not directly available for download, access to the original map at a spatial resolution of 250m is possible on request to the members of the ASAP Team.[6] Previous versions of the dataset for Africa developed by Vancutsem et al. (2013) and Pérez Hoyos (2017a) can also be accessed in the same way.

[6] https://mars.jrc.ec.europa.eu/asap/about.php.

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