Using Curated Datasets

Food and Agriculture Organisation

Royal Geographical Society with IBG

Advancing geography and geographical learning

www.fao.org/faostat/

Food and Agriculture Organisation (FAOSTAT)

The Food and Agriculture Organisation is a branch of the United Nations that aims to defeat hunger and coordinate international efforts to create better food security. As part of this mission, it also provides free access to all-country data, on food, agriculture and trade ranging from 1961 to the present day. This data forms the basis of numerous reports and publications focussing on nutrition and how people access food around the world.

How do I access the data?

The above link is for the homepage of the FAOSTAT site. From here one should select **Explore Data** to enter the main part of the site. There are many different ways to access the data. On the first page are a number of **Domains** which take the researcher through to further search filters. Selecting one of these gives you filters by **Country**, **Region** and **Special Groups**, by **Year**, by a vastly comprehensive list of more detailed **Items** (subgroups of that domain - see below) and by **Element** (the way in which the data is measured). Once the required filters are applied, one can select to **Show Data** (which brings up a table of results further down the page) or one can **Download Data** to export the data to a spreadsheet programme. One can also choose to **Visualise Data** which creates a choropleth map or a similar graphic which can also be downloaded. The **Metadata** tab gives further information about how and when the data was collected and collated. On the right hand side of the page there is the option to download the data as a **Bulk Download** and as a separate data file.

Domains available on FAOSTAT

- Food Production (e.g. livestock processed)
- Food Trade (e.g. trade indices)
- Food Balance (e.g. food supply)
- Food Security (e.g. by gender)
- Prices (e.g. exchange rates)
- Agricultural Inputs (e.g. pesticide use)
- Population (e.g. annual change)
- Agricultural Investment (e.g. machinery)
- Macro-statistics (e.g. capital stock)
- Agri-Environmental Indicators (e.g. livestock manure)
- Emissions - Agriculture (e.g. burning savanna)
- Emissions - Land Use (e.g. grassland)
- Forestry (e.g. trade flows)
- Research and Development (e.g. expenditure)
- Emergency Response (e.g. food aid shipments)

Alternatively, under the **Selected Indicators** tab a researcher can select a particular geographical region or country and see a PDF profile listing a lot of the data for that location, or a series of maps and graphs will show the data graphically.

Under the **Compare Data** tab a researcher can choose a **Domain** and a **Country** to allow the site to produce a graph comparing data from 1961 to the present day as well as an accompanying data table. Selecting the **Add Filter** button allows one to compare this graph with data in another domain or another country.

One can also use the search box to search quickly for a particular **Indicator** or **Commodity**.

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How can I use this in my teaching?

The study of food and agriculture is essential to many key topics in geography. Students studying development often begin by looking at the economic basis on which countries are seen as developed, emerging or developing economies and the number of people employed in primary industry is a key indicator of this. Students recognise that a country's ability to farm and trade in primary products is key to them developing any further along the development spectrum and measures such as food security and expenditure in agricultural technology can be good indicators of where a country is in these terms.

Studying the trade in food offers further insights into larger global systems and globalisation – where we get our food from and how our tastes in food has changed shows us how connected we are to other places around the world.

One's ability to eat enough good quality food is also linked to the study of health and diseases and students wishing to investigate any aspect of health would be well advised to also look into the food security of a country and areas of malnutrition.

Curriculum Links

This curated dataset links to a number of parts of the National Curriculum and is relevant to GCSE and A Level Specifications.

Key Stage Three:	An understanding of human geography relating to economic activity in the primary sector.
	An understanding of how human and physical processes interact to influence and change landscapes and environments.
GCSE:	An overview of how humans use, modify and change ecosystems and environments in order to obtain food.
	A detailed study of food supplies recognising the changing characteristics and distribution of demand and supply, past and present impacts of human intervention, and issues related to their sustainable use and management at a variety of scales.
A Level:	An understanding of the impact of human activity as a factor causing change within landscape systems.
	An investigation into international trade and access to markets in the contemporary world.
	An investigation of the impact of relationships and connections on people and place such as through food production, circulation and consumption.

The following specifications make particular reference to food and agriculture:

GCSE:			**A Level:**		
AQA	Cambridge IGCSE	Edexcel A	AQA	CIE	Eduqas
OCR B			OCR		

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An example data walk-through

A student wishes to use the FAOSTAT site to find the top country producers of certain key and cash crops and whether they have changed in the last fifty years. They believe that more of the world's key and cash crops will now be produced in what would be considered developing countries compared to fifty years ago when they believe that the distribution of top producers would have been more spread out.

First the student decides which key crops they are going to study. They create the following list based on their knowledge of global trade and cash crops: rice; wheat; maize; bananas; tobacco; sugar; tea, cocoa and coffee. They then go to the FAOSTAT site and select the **Crops** domain. They then make four further filtered selections. Under **Countries** they select **Select All**, under **Elements** they select **Production Quantity**, under **Years** they select **1968** and **2018** and under **Items** they select all the crops they have chosen in the list above.

	Top producer in	
	1968	2018
Bananas	Brazil	India
Cocoa Beans	Ghana	Ivory Coast
Coffee (green beans)	Brazil	Brazil
Maize	USA	USA
Rice (paddy)	China	China
Sugar cane	India	Brazil
Tea	India	China
Tobacco (unmanufactured)	China	China
Wheat	USSR	China

To allow the student to sort and filter the data further (to find the top producer of each crop) they select to **Download Data** into an Excel spreadsheet.

One thing the student noticed straight away was that there was actually a far larger total number of country producers in 2018 than in 1968. The results also showed that as the student thought, in 2018 there were in fact fewer countries listed in the top producers of key crops than in 1968 but only by an order of 1.

With only a small number of crops being considered the results were extremely limited, so the student decided to look in addition at how the area that was harvested to these crops has also changed over time. The student was particularly interested to study the crops that had remained with the same top producer over the fifty years. The student wanted to know if the area of land harvested had also stayed roughly the same in that period for those countries. The same method was deployed with the exception of choosing World under the **Countries** filter and **Area Harvested** under the **Element** filter. The results showed that for the most part very little had changed in the production of coffee, maize rice and tobacco over the time period compared to other crops.

	Area harvested (thousand ha)		% change
	1968	2018	
Bananas	2467	5729	+132%
Cocoa Beans	4079	11835	+190%
Coffee (green beans)	9079	10584	+17%
Maize	111678	193743	+73%
Rice (paddy)	129265	167133	+29%
Sugar cane	9586	26270	+174%
Tea	1554	4193	+170%
Tobacco (unmanufactured)	3773	3369	-11%
Wheat	224875	214791	-4%

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Suggested delivery activities

Top Trumps

Students can use the data from the FAOSTAT to design 'Top Trumps' cards based on food security statistics. They can choose eight different indicators which would cover a range of factors that contribute to food security or food insecurity and make up cards for around twenty different countries. Students should justify why they have chosen the eight indicators they have and why other indicators may have been rejected for the game. Students can then play the game against each other. This will get them to think and discuss the different aspects that contribute to food security, as well as learning about the particular food security issues that face certain countries. They can conclude the game by trying to place the countries in order from food secure to food insecure, again justifying their choices to their peers.

Compare and Contrast

Students can look at how the production of certain foodstuffs has increased over time and investigate the reasons for this. Students can hypothesise whether the rise may be a result of increased global trade of a product (and increased globalisation leading to changing tastes and a larger global market) or an increase in the population of countries that have a strong tradition of eating the food concerned. Students will be able to recognise that some food is eaten globally while others are consumed more by some countries over others from the data on FAOSTAT, as well as garner trade information to see where products are being consumed in the highest quantities. They will be able to use this information to see which of the scenarios (or if both scenarios) are true.

Location, Location, Location

Each student in the class is given a crop to investigate on the FAOSTAT site. From 1961 to the present day, (in five year periods) the student should chart the countries where the majority of each crop has been produced. This should be plotted on a GIS map layer to create a flow diagram, showing how the location of the production of the crop has changed over time. Combining these map layers together may reveal that some countries or regions have become superpowers of agriculture in different decades.

Students should use this type of mapping to then predict where the future agricultural superpowers will be. Students can justify their choices and evaluate the choices of others.

Pearson Product Moment

Pearson Product Moment is a statistical test which measures the strength and polarity of any correlation between two sets of continuous data which are paired against each other. The test uses real data rather than rankings of the data in sequence.

Students could use a number of different continuous indicators from the FAOSTAT site and investigate whether they are correlated. It is likely to involve the use of a two paired variables (such as pesticide use and the total amount of cereal crops) and either how these change with different countries or how they change on a temporal scale. A guide to calculating the Pearson Product Moment can be found on the next page.

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A Guide to Calculating Pearson Product Moment using FAOSTAT Data

Pearson Product Moment is a statistical test which measures the strength and polarity of any correlation between two sets of continuous data which are paired against each other. The test uses real data rather than rankings of the data in sequence. The result given will be a value between –1 (indicating a perfect negative correlation) and +1 (indicating a perfect positive correlation).

Using the data from the FAOSTAT site, a student may wish to see if there is any correlation, and the strength of that correlation between the use of pesticides worldwide and the amount of cereal crops being produced year on year.

Worked example:

	Cereal production (x)		Pesticide Use (y)		
	Value (million tonnes)	d_x^2	Value (thou. tonnes)	d_y^2	$d_x d_y$
1995	1899	88767	2689	329763	171091
1996	2061	18479	2795	219258	63653
1997	2096	10188	2918	119198	34849
1998	2085	12530	2975	83088	32266
1999	2082	13211	3088	30713	20143
2000	2059	19027	3063	40100	27622
2001	2105	8453	3030	54406	21444
2002	2054	20431	3066	38908	28194
2003	2074	15114	3161	10455	12570
2004	2286	7932	3343	6360	7103
2005	2266	4770	3416	23333	10549
2006	2256	3488	3460	38711	11621
2007	2348	22820	3747	234014	73076
2008	2521	105017	3792	279577	171348
2009	2492	87062	3707	196914	130934
2010	2467	72934	3962	488252	188706
	(mean) 2197	(Σ) 510221	(mean) 3263	(Σ) 2193047	(sum) 1005169

The relevant data (between 1995 and 2010) was downloaded from the FAOSTAT site and tabulated. The mean values (x bar and y bar) for cereal production and pesticide use were also calculated. Then the deviation (the difference between each x value and its mean: d_x and d_y) were calculated and squared to remove any negative values. $d_x d_y$ was also calculated for each value.

The Pearson Product Moment Correlation Coefficient (r) was then calculated using the following formula:

$$r = \frac{\Sigma (d_x d_y)}{\sqrt{\Sigma (d_x^2) \times \Sigma (d_y^2)}}$$

In this case the value of r has a value of **0.95**. This is known as the calculated value. The positive r value indicates a strong positive correlation. The significance of the test needs to be calculated using an appropriate significance table. This tells the student the extent to which one can be sure that the results are meaningful and the level to which one can be sure that the results did not occur by chance. The student compares the r value with the critical value for the appropriate number of sets of paired data. If the calculated value (regardless of the correlation direction) is greater than the critical value, the r value is deemed to be significant. In this case, the degrees of freedom (n-1) is **15** which makes the critical value **0.412**. Therefore, there is a significant positive correlation between pesticide use and cereal crop production.

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