

For the Plant Health Year

Continuing ideas for exploring the environment - in the 2020 International Year of Plant Health by Jeanie Clark

What has been the key topic of 2020 globally? As the world found itself in a pandemic with no cure, it discovered how quickly a disease can spread and disrupt life - an (ill) health lesson last learnt a century ago with the Spanish flu.

But humans share the Earth with other living things. Might there be learnings from this pandemic that we can transfer as knowledge for diseases of other creatures and plants? As 2020 is also the *International Year of Plant Health (IYPH)*, this article will focus on one plant to answer, and suggest resources for, this.

To begin, the IYPH's slogan is "**Protecting plants, protecting life**" and its basic messages are [1]:

- 1 healthy plants combat hunger;
- 2 healthy plants and their products need borders for protection from threats;
- 3 trade rules keep plants safe when being moved;
- 4 healthy plants protect the environment;
- 5 investment and research is needed for healthy plants; and
- 6 monitoring gives early warning of threats.

Why would plant health matter? At a personal scale, a starting point could be to create a drawing to show what plants are in your garden and why their health matters to your family. On a wider scale, consider how some of your plants fit into food chains or webs and are part of photosynthesis and carbon capture.

Food chains

Do you know which fresh fruit is the most popular - by global exports? If the 'baby' plant photo (top left) doesn't help, look at the 'adult' plant photo (left). Yes, it's bananas. It has the simplest food chain: bananas eaten by us!

But there are other life forms that may like to eat bananas! A free fill-in exercise [2] at the TES website gives a banana-based **food chain** as bananas to moths to spiders to a Great Curassow, a South American bird.

Food chains combine to form food webs. A simple banana-based **food web** is: bananas; eaten by banana aphids, root borers and banana skippers; these first two insects are eaten by ants and wasps eat the third; birds eat ants and wasps. Try drawing this food web, then check it at the Science Quiz webpage [3].

Energy

Energy moves in these chains and webs: from plants (**producers** of energy); to **herbivores** (plant eaters); to **omnivores** (plant/meat eaters); and/or to **carnivores** (meat eaters); and when not 'eaten', any can be rotted away by **decomposers** into the soil.

Where do plants get their energy? Sunlight through **photosynthesis**, courtesy of the leaves (as a factory), takes in carbon dioxide from the air, and breaks it apart. The **carbon** is stored by being made into sugars (energy) to grow the plant while the **oxygen** returns to the air as a waste - which other living things need to breathe! There are lots of resources on the



web about this process: Sheppard Software has a very simple diagram [4]; Articulate's diagram is more complex [5]; and Quintessential's goes into the greatest detail [6]. Did your food chain/web include sunlight for photosynthesis, e.g. like [7]?

Bananas

What do you know about this fruit? Here are a couple of Australian websites with plenty of general information: *Australian bananas* [8] and *Fresh for Kids* [9].

Where do bananas grow? For a quick global (2016) view, try

the Kidstir's simple word puzzle [10]. The pattern of the spread of something over an area is called '**distribution**' in geography. It can apply from garden to world coverage. **Maps** are a geographic technique to capture and summarise a distribution visually. They can be done in many ways, with different uses, e.g. : dot locations, coloured regions and sizing countries .

World Mapper shows how much a country has of something by its size on their map. 2016's world banana harvest, using the United Nation's Food and Agricultural Organizations information, is on map no. 223 [11]. Try to work out which country the big ones are, and which countries have almost no production, before checking in the notes below the map, where the names are given.

The 'Select Year' box provides links to see which countries have gone up or down in production over the 2000-2016 period. Any idea which countries may have changed? (It's in the notes below the map.)

Knoema world maps also show production by country, by using a more traditional colour coding [12]. Click on a country

to see the detailed data and a graph of production over time. There is a timeline along the bottom of the map. Change the blue indicator back to 2016, to match the 2016 *World Mapper* one.

Which sort of map gives a better quick idea of who grows the most? Which one works better to give a quick idea of the whole global production? Are there other ways in which one of these maps conveys the information better than the other? Like all information, visual presentations have different uses in how well they convey data.

While *World Mapper* showed change over time as a block of years, *Knoema* shows change as a sequence. Set its timeline along the bottom to 1961 and click on the arrow. Note that while the coloured scale (red for the least, green for the most) doesn't change, the amount of production in each category does. Which of these two ways for presenting changes over a time is more useful - and for what purposes? Note that both these websites have lots of other topics to explore.

Using the two maps together, did you notice any drops in production? *World Mapper's* notes identify three countries from 2000-2016. *Knoema's* graphs of these countries show how much their losses were. But neither gives a cause nor if the losses mattered.

Given the global distribution of bananas to 30°N/S of the Equator, where would Australian plantations be? Look for a map of Australian banana distribution: by individual dot locations, e.g. [13], and/or by shaded regions, e.g. [14]. Which one works

better? If you don't know the history of how bananas came to Australia, refer to the earlier general websites.

Banana's 'pandemic'

Would you miss bananas if they were wiped out? There is such a threat to them! *Panama TR4*, a fungus, threatens the health of the world's bananas. Recall how tiny a fungus can be (*Otherways* issue 165 page 47) and how quickly it can grow from the mould experiment (*Otherways* issue 166 page 47).

TR4 appeared first in the 1960s in Taiwan. In the last 30 years, it has spread to all banana-growing regions - four-fifths of world production is now threatened! It reached Darwin in 1997 and North Queensland in 2015.

How did TR4 spread? Before there were any symptoms, TR4's tiny invisible fungus spores were in contaminated plant material or soil being moved from one place to another. The spread is currently contained, but farmers must monitor for outbreaks to protect their plants.

Covid-19 comparisons

Like Covid-19, *Panama TR4*:

- is tiny and invisible - but it lives in the soil;
- can't be detected until symptoms appear: wilting of leaves, rotting of stems, death;
- is incurable - as the affected soil can't be 'healed', the fungus takes decades to die out;
- spread quickly around the (banana) world, as no one knew it was hitching a ride [15];
- can only be stopped by quarantine, so there are



strict rules about movement in and out of banana plantations for: soil, water, plant materials, machinery and people;

- may hurt people's health – if bananas disappear.

To fight the Panama TR4 threat:

- banana plants are regularly monitored, like monitoring being done with Covid-19;
- scientists are trying to create a new type of banana that TR4 can't hurt, while other scientists are trying to create a vaccine so Covid-19 won't be able to hurt people.

Besides bananas, many other living things, have biosecurity threats and protections (i.e. those from pests, fungi and diseases). So, our pandemic experiences could help develop understanding of the need for exclusion zones,

quarantines and rules to protect plants and creatures, e.g. Fruit Fly in Northern Victoria.

IYPH

There are many resources available about biosecurity threats. The IYPH has a free pdf book with activities to cover the big issues [16]. IYPH Australia provides free biosecurity resources for children [17], including six pdf books on garden threats and a Costa Georgiadis video.

What threats to plant health may there be in your garden? How can protecting your plants, protect other life, including your family's?

The IYPH reminds us that plant health protects life and so also, ultimately, human health.

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Links to webpages in this article

IYPH

[1] <http://www.fao.org/plant-health-2020/home/en/>

Food chains/webs

[2] <https://dryuc24b85zbr.cloudfront.net/tes/resources/6062169/image?width=500&height=500&version=1396347833000>

[3] http://www.sciencequiz.net/newjcsceience/jcbiology/ecology/mcq/images/banana_web01.png

Photosynthesis

[4] <https://www.sheppardsoftware.com/content/animals/kidscorner/foodchain/photosynthesis.htm>

[5] <http://blogs.articulate.com/images/blogs/rel/uploads/2008/08/photosyn2-450.gif>

[6] <http://cdn4.kidsdiscover.com/wp-content/uploads/2013/08/Photosynthesis-Infographic-Kids-Discover.png>

[7] <https://cdn.playbuzz.com/odn/ef768ff0-8996-470f-878a-e0255414b654/8c68eea2-418c-49de-8e51-cbc460e39ba8.jpg>

Bananas

[8] <https://australianbananas.com.au/>

[9] <https://freshforkids.com.au/fruit/banana.html>

[10] <https://kidstir.com/where-bananas-grow/>

[11] <https://worldmapper.org/maps/banana-production/>

[12] <https://knoema.com/atlas/topics/Agriculture/Crops-Production-Quantity-tonnes/Bananas-production?type=maps>

[13] https://freshforkids.com.au/uploads/2018/01/banana_map.jpg

[14] <https://australianbananas.com.au/files/images/regions.png>

[15] <http://www.promusa.org/display3300>

IYPH student resource books

[16] <http://www.fao.org/3/ca9327en/CA9327EN.pdf>

[17] <https://planthealthyear.org.au/school-student/>

“For the Plant Health Year”

Otherways, 167m Nov 2020 pp 47-49

IYPH

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- [3] http://www.sciencequiz.net/newjcscience/jcbiology/ecology/mcq/images/banana_web01.png

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- [5] <http://blogs.articulate.com/images/blogs/rel/uploads/2008/08/photosyn2-450.gif>
- [6] <http://cdn4.kidsdiscover.com/wp-content/uploads/2013/08/Photosynthesis-Infographic-Kids-Discover.png>
- [7] <https://cdn.playbuzz.com/cdn/ef768ff0-8996-470f-898a-e0255414b654/8c68eea2-418c-49de-8e51-cbc460e39ba8.jpg>

Bananas website information

- [8] <https://australianbananas.com.au/>
- [9] <https://freshforkids.com.au/fruit/banana.html>
- [10] <https://kidstir.com/where-bananas-grow/>
- [11] <https://worldmapper.org/maps/banana-production/>
- [12] <https://knoema.com/atlas/topics/Agriculture/Crops-Production-Quantity-tonnes/Bananas-production?type=maps>
- [13] https://freshforkids.com.au/uploads/2018/01/banana_map.jpg
- [14] <https://australianbananas.com.au/files/images/regions.png>
- [15] <http://www.promusa.org/display3300>

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- [17] <https://planthealthyear.org.au/school-student/>