Can drinking tea help us understand climate change?

June 20 2016, by Jeff Atkins

Litter bags are constructed using a fine mesh material (e.g. nylon). Litter is then placed inside and then sealed, creating a "bag" that is then buried or placed on the soil surface, such as these in West Virginia, US. Credit: Jeff Atkins)

For the price of a cup of tea, or perhaps several, we are making strides towards better understanding climate change thanks to Judith Sarneel, a researcher at Umeå University in Sweden, and her colleagues: Joost Keuskamp, Bas Dingemans, Taru Lehtinen, and Mariet Hefting. Sarneel developed the Tea Bag Index—a simple and reliable way to figure out the speed at which decomposition occurs. The Tea Bag Index is now being rolled out in a massive, global citizen science campaign with the goal to strengthen our understanding of global decomposition patterns and better inform climate models.

So how does it work? Tea bags are weighed, buried in the soil, dug up after 90 days, and then reweighed. The amount of mass loss during the time the tea bag is buried is divided by the duration of time the tea bag is buried which gives us the decomposition rate—a normalized value of mass lost per unit of time (e.g. grams per day). Decomposition rates vary globally, from incredibly rapid rates in warm, humid areas such as the tropics, to glacially slow rates in the Arctic.

The Tea Bag Index, or TBI, is an extension of a technique ecologists have used for decades. The earliest publications employing litter bags date back to the work of ground-breaking ecologists such as Bocock and Gilbert (1957) and Shanks and Olson (1961). The litter bag consists of leaf litter encased in some type of mesh bag that is either buried or place on the surface of the soil and allowed to stay in position for a period of time before it is recovered and then analyzed.

The Tea Bag Index conquers a common problem encountered when comparing studies of litter decomposition—a common decomposition source. It is difficult to compare decomposition rates of different types of litter. Birch leaves are different from oak leaves which are different from eucalyptus. By using only green and rooibos tea sources, from a common manufacturer, Sarneel's protocol subverts this problem and through a "power-by-numbers" approach, seeks to move science

forward.

I spoke to Sarneel recently by email about the project.

Q: How did you and your collaborators arrive upon tea as a common decomposition source?

We were struggling making many litterbags, and we could not find the right fabric. I discussed this with Joost Keuskamp, the first author on the methods paper, during a tea break at a conference, we realized that the tea bag was actually a ready-made litter bag. I was writing my thesis at that time, and as an excuse to go out and do some field work, I started to bury tea on a sunny day. Later the idea was developed further in a course together with Bas Dingemans and Taru Lehtinen, and we came up with the idea to use different tea types as proxies for different phases in the decomposition process.

Q: What are the advantages and disadvantages of using tea bags?

One advantage is that tea is easy to obtain. You skip a lengthy preparation step as you just order it online. You also get information about a two phase decomposition model with one measurement in time. The disadvantages that apply to normal litterbag studies also apply to [tea bags](#) such as root ingrowth, limitations of mesh size and thus of organisms consuming your litter, and very fine soil particles entering your bag.

Q: How big is the project right now?

It is increasing superfast! We published the method in 2013, were funded in 2014, did pilots with 250 schools in 2015 and now, large

global networks like Nutnet, ICOS and ITEX started to implement it, and we currently launched a call. This resulted in a high amount of applications. We have people from all continents, except for Antarctica, who will participate. In the school project, the media kind of jumped on it too. So everybody who wants to get some media attention, tell the journalists you are burying tea!

Q: What do you feel will be the major contributions?

We aim to reach both researchers and the general public. Researchers have shown great interest, and we expect a large contribution from them. However, many schools across Europe will also contribute a significant amount of data. It is a perfect project for them, as the tea can be in the soil during their summer holidays. We aim therefore also to contribute to their understanding of the earth and important processes that influence the conditions on earth. Even if they may not always finish the experiment, I never consider the experiment to fail, as participants will have learned something, which they can apply in other areas too.

Q: How many people are participating?

So far, we had about 100 participants plus 250 school classes. This year another 100 school classes and many more researchers are joining.

Q: How do you think this will contribute to our understanding of decomposition?

Because we will be able to obtain such a high amount of data that is obtained using a standardized method, we will be able to much better understand interactions between different climate factors on a global scale. Such interactions may now often end up in the error term, because of lack of data. We want to make a global soil map of decomposition

that can be used for climate modeling.

Q: Have you gotten a positive response to your call for research collaboration?

Yes!

Q: Where in the world is best represented? Where is least-represented?

Europe is starting to be well represented, especially the northern part, the boreal regions. But also the tropics are starting to become rather well covered. Africa is less well presented, as well as the Neo tropics, areas such as Malaysia, Vietnam, Indonesia. Antarctica is missing thus far also.

More information: For more information, please visit the Tea Bag Index's website: decolab.org/tbi/concept.html

This story is republished courtesy of PLOS Blogs: blogs.plos.org.

Provided by PLOS Blogs