

## TEABAGS – comparing decomposition of litter carbon across sites

*Ika Djukic*  
*Umweltbundesamt, Austria*  
*(ika.djukic@umweltbundesamt.at)*

I would like to propose a project to study the decomposition rates across the sites by the use of the Tea Bag-Index (TBI) method.

Litter decomposition represents one of the largest fluxes in the global terrestrial carbon cycle and already diverse large-scale decomposition experiments were focusing on this fundamental soil process. However, these are most often conducted based on site specific litters and methodologies and comparison of similar data across different experiments and sites still poses a major challenge due to lack of common protocols and standard matrices. Moreover, there is a need for higher resolution measurements and with better global coverage in order to increase the predictor power of the models.

The Tea Bag-Index (TBI) provides a common methodology and metric to overcome the abovementioned limitations and can be used for the comparison of decomposition and basic soil function across sites and between experimental treatments.

In short, the Tea Bag-Index is a method which involves incubation of two types of Lipton tea bags (= two types of standardized litter with different decomposition characteristics) according to a standardized protocol at all sites. The method gives a measure of decomposition of the various litter fractions over time and the use of a standardized litter means that the decomposition rates can be compared across sites and/or treatments.

### OBJECTIVES:

- Studying the litter decomposition globally
- providing a “common metric” for decomposition comparison across the sites, biomes, ecosystems
- Using obtained data to validated global predictions
- Upscaling of measured decomposition rates to a range of future climate scenarios
- Linking obtained decomposition data to the other interdisciplinary measurements on site
- providing a basis for comparison of decomposition numbers to similar numbers obtained in other networks
- high-impact joint publications

### METHOD:

TBI is a simple, standardized, cheap and time-efficient method (see Keuskamp at al. 2013); involving 2 types of tea: Rooibos tea characterized by a slow decomposition rate and Green tea characterized by a faster decomposition rate. The advantage is that these teas are commercially available anywhere and the tea bags constitute a pre made “litterbag” reducing any variation related to user differences in preparation.

The tea bags shall be installed ideally at many sites for a specified length of time (i.e. 3 months 1, 2 and 3 years). The exactly experiment procedure will be described in a protocol, which will be provided after you have expressed interest in collaboration.

However, the approximately needed resources if you would have e.g. 3 sites with a study plot with two replicate areas per site, 4 tea bags of each tea type per sampling point (4) and replicate area in three years would be:

To do	Time [day]
Sample preparation & installation, if needed soil sampling (3x 100g per site)	2
Sample collection	1
Sample preparation	1
<b>SUM</b>	<b>10 (in 3 years)</b>
<b>Costs for tea (192 bags =5 packs of Green and Rooibos tea, respectively)</b>	<b>26 EUR</b>

### PERSPECTIVES

- The TBI method will provide a common metric for decomposition across the sites and thereby provide an excellent index for comparing process rates across the sites which is normally difficult when local litter is used.

- Improvement of the predictor power of models for carbon and nitrogen dynamics through high-resolution measurements across the ILTER sites (>700). Link to the other interdisciplinary measurements at the ILTER sites (e.g. nutrients and trace gas measurements) to draw the conclusions on the ecosystem functioning.
- Study the effect of plant diversity and composition on litter decomposition rates through the TreeDivNet, GLORIA
- Study of decomposition processes in the ecosystems, which are very vulnerable to the climate change (e.g. mountain areas and arctic regions; IAEA-Interregional project sites, G-Tree, INTERACT)
- Study the effect of extreme events on the litter decomposition (DROUGHTNET, ITEX, TERENO)
- Decomposition study under controlled laboratory conditions (University of Lisbon).
- Joint project proposal

#### PRACTICALITIES

**Instruction package:** “TBI”-package with relevant protocols for installation, retrieval instructions, template for data reporting, data handling and agreements etc. will be distributed.

**Involvement in the study,** data handling and publication will be discussed and agreements for data availability and IPR will be settled.

**Site commitment** involves that each site need to agree to the protocol and ensure that this is followed and to provide necessary basic site data (e.g. vegetation, soil and climate characteristics). The amount of work for each site is restricted to installation and collection of the bags and to send them to me.

Data: The TBI data will be available to all members and conditions for the use of these agreed.

**Publication and IPR conditions:** A publication based on the basic data from the TBI is foreseen. Involvement of a few participants from a given network will be natural and co-Authorships/acknowledgment in general will be agreed depending on the scientific contribution. IPR conditions for other publications will be decided as well.

**Project group and/or project responsible:** Representatives from networks may be directly involved in the study depending on interest in order to assure ownership and involvement and commitment by site owners.

**Data access:** The exact conditions for study according to the network access rules will be decided later. A general conduction via some sort of “virtual access” combined with actual access to a few sites for more detailed studies could be a useful “model”

→ **Sign up** until End of **January 2016**.

→ **Start** of the experiment **June 2016**.