“biogenic emissions and circularity of biobased products”

The goal of this research is to define specific methods for accounting biogenic emissions and to study the carbon biogeochemical cycle in relation to the circularity of commercial biologically based (bio-based) products and biofuels. Specifically this research line will possibly target specific case studies decided among one or more amongst: i) film bioplastics such as mulch films, ii) durable plastics such as Poly-Butylene-Succinate (PBS) and iii) charcoal derived from pyrolytic processes, aka biochar. The application of GWP\textsubscript{bio} as a specific global warming for biogenic sources has been included in the new metrics considered by the IPCC (2013) and namely in Chapter 8 and specific provisions have been indicated in the PEFCRs (Product Environmental Footprint Category Rules) stemmed from the Product Environmental Footprint initiative adopted in the European Union. These new developments can help defining the circularity of biologically-based products on the basis of renewable carbon contained in these products. The most advanced work to define in a procedural and systemic way the circularity of a commercial product makes reference to Ellen MacArthur Foundation and Granta Design (2015). However this methodology, as well similar methodologies, only address fossil based materials. This shortage is due to intrinsic difficulties in the definition of the renewable mass rate of the biogenic carbon. The research should lead to design operative methods to define a net balance of the uptake of carbon dioxide (growing phase), storage and release in the atmosphere. The connection with soil conditions and land management have to be considered in the renewability because the export of the biomass from the field influence the soil organic carbon density and the fertility. Methods are to be conceived and applied for general cases to include also industrial residues after post-processing and tertiary biomass (wastes).

This project is financed by “STAR-ProBio - Sustainability Transition Assessment and Research of Bio-based Products”, H2020, Grant Agreement no: 727740; in particular the activities of the research will make reference to the task 2.4.

Methods

Methods will make reference to ongoing research and will build on published material. Among the most prominent works, the following are worthy to be mentioned.


**Activities**

In the framework of the project Star-ProBio the collaborator is expected to take part to the following activities:

1) The collaborator will contribute to the following detailed activities.

- Formulation and definition of the circularity of natural materials and biomass stock. Uptake, storage, release times of the carbon.
- Conceptual model, system boundaries, assumptions and cut off rules. Consistent quantification of climate impacts due to biogenic carbon storage across selected case studies.
- Data collection and definition of the associated uncertainty.
- Assessment of the net emission balance for a specific biobased product in a cradle-to-grave cycle.
- Formulation of a flexible parametric model for a balanced account of carbon fluxes, their times and quantification of the related sustainable recycled material index.

1) The collaborator will contribute to the writing of papers and scientific reports related to this topic.

2) It is requested the participation to activities of the research group (EMRG-CIRSA) related to land use, land use management and environmental assessment of biomass treatment which can be functional to attain the described objectives; this may include also assistance to students for PhD thesis, master and bachelor thesis.