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Session 1 *Biorefining for Bioeconomy*

Oral

Bioeconomy systems sustainability assessment: embracing complexity

Julie Wohlfahrt[1*], Fabien Ferchaud[2], Benoît Gabrielle[2], Caroline Godard[4], Bernard Kurek[5], Chantal Loyce[6], Hélène Preudhomme[4], Olivier Therond[7]

[1]SAD-ASTER, INRA, Mirecourt, France

[2]AgroImpact, INRA, Laon, France

[3]UMR EcoSys, INRA-AgroParisTech, Université Paris-Saclay, Thiverval-Grignon, France

[4]Agro-Transfert Ressources et Territoires, Estrees-Mons, France

[5]UMR FARE, INRA-Université de Reims Champagne-Ardenne, Reims, France

[6]UMR Agronomie, INRA-AgroParisTech, Thiverval-Grignon, France

[7]UMR LAE, INRA-Université de Lorraine, Colmar, France

The European Union sets the objective of a sustainable bioeconomy as "to ensure an adequate supply of food and products of biological origin that are safe, healthy and of high quality by developing sustainable and resource-efficient production systems, related ecosystem services, restoration of biological diversity, competitive and economical processing and marketing chains in carbon". Bioeconomy appears as a key policy to integrate the great societal issues of climate change, food security, fossil fuel dependence, scarcity of natural resources and territorial and industrial development on a number of scales, from small territory to national scale, as sustainable production and use of biomass are inherent to the bioeconomy proposition. One major challenge for bioeconomy is then to be able to assess how its development will successfully achieve these different objectives in concrete situations, from biomass production and uses natural resources conservation. Several authors highlight the lack of knowledge regarding the reality of bioeconomy systems that limits the development of sustainable bioeconomy projects in territories.

Bioeconomy as a system is a relatively new concept that encompasses several sectors and disciplines (e.g.: agriculture, forestry, industry). The scientific community and stakeholders are then still quite scattered focusing on only one component of the bioeconomy system, e.g.: transformation process, forest-wood chains or biofuels production. Bioeconomy systems are also characterized by a high flexibility of resources, processes, stakeholders or transformation chains. Understanding the whole bioeconomy system and proposing sustainable organization to optimize biomass productions and uses requires accounting for the high level of complexity inherent to bioeconomy systems.

There is a need for a specific framework that deciphers bioeconomy systems in order to help their integrated assessment. Starting with territorial bioeconomy systems, we propose a description to help the concrete sustainability assessment and highlight the potential locks and levers for bioeconomy development.