Summary Biomob Masterclass 3: Mapping unused residues and wastes

Programme Masterclass

- 14h-14h05: Welcome and introduction
- 14h05-14h10: Recap 1st and 2nd Biomob session

Mapping residues/waste

- 14h10-14h25: Presentation by Wolter Elbersen (WUR) about how to identify, map and value waste streams
- 14h30-14h45: Questions and discussion
- 14h45-14h50: Short break

Waste/residues for clean shipping and tools from Data Science to identify those

- 14h50-15h00: Presentation by Susan van der Veen, BioHub Concept
- 15h00-15h20: Presentation by Luis Cutz, HTL-value chain and data science for identification of bio feedstock supply chains.
- 15h20-15h45: Questions and discussion

Discussion

- 15h45-15h55: Discussion developing the sustainable bio feedstock manifest
- 15u55-16h00: End of Masterclass

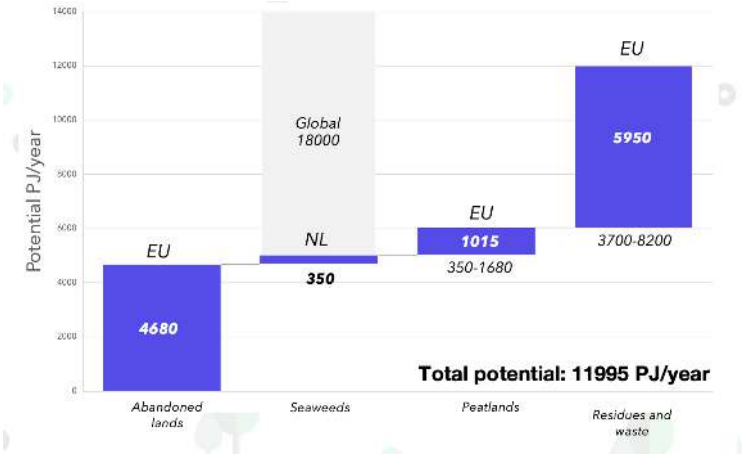
Introduction

In the previous Biomob Masterclasses we discovered that there is a lot of hidden bio feedstock potential. In the 2nd Masterclass, we looked at wetter ways of farming and identified seaweeds and paludiculture. Jaap van Hal (TNO) demonstrated that seaweed farming has a large energy potential (for 5,000 km2 up to 350 PJ) and estimated CO_2 emissions reduction potential (11 Mt per year), and its potential is not even fully developed yet. Paludiculture, defined as growing crops on rewetted peatlands, is also promising in terms of bioenergy potential and greenhouse gas emission (GHG) reduction. Drainage results in high GHG emissions, with 5% of annual EU emissions resulting from drainage of peatlands. Rewetting those peatlands could be equal to a European bioenergy potential of 130-1,680 PJ per year (if all drained peatlands are dedicated to paludiculture). Wetlands International aims for a multi-disciplinary approach (e.g. together with the local community, focus on biodiversity) to restore ecosystem services of peatlands. Hans Schutten (Wetlands International) provided a few examples of good practices in which this approach succeeded, for example in Ireland. Another example is Katingan (Indonesia), where a sustainable business model with the production of sago is developed for tropical livelihoods, and ecohydrology of the peatland is restored at the same time. In other words: a win-win.

With the past two masterclasses in our mind, the question rose which other bio feedstock streams are not fully developed yet/unused/waste. We identified that there are (big) streams of waste and

residues which are currently not developed, or simply thrown away. And interestingly, Imperial College London (Miss Panoutsou from Concawe) gave a presentation the week before this masterclass about sustainable bio-feedstock and availability in the EU and her conclusion was the same: there is a high potential from waste and residues. The study reveals that there is a potential of 88 – 196 Mtoe per year of biomass available for transport sector in 2050 that has no impact on biodiversity. Assuming a 50% conversion factor to final biofuel, this waste and residue base represents approximately 45 – 100 Mtoe equivalent amount of biofuels per year.

Together with the identified other potential advanced bio feedstock streams, a total of 11.995 PJ per year is available from abandoned lands (masterclass 1), seaweeds (only NL), peatlands and residues and waste.



In The Netherlands, the Routekaart National Biobrandstoffen states that the short-term potential is 4 Mton (in 2025), which could even rise up to 10 Mton in 2040. The highest hidden potential is within the agricultural sector, where large waste streams occur in cultivation, and large residue streams occur when (too much) residues are remained on the field.

Mapping residues and waste

Wolter Elbersen of WUR talked about mobilizing residues for biofuel production. He first gave an introduction on biomass categories (primary by-products, secondary by-products and tertiary by-products). He showed a previous study of the EU S2Biom project in which is stated that of the baseline potential, about half of biomass potential is currently used. This particularly applies to the forest biomass and biomass from waste. Agricultural potential from residues and dedicated crop potential is practically not used. He then focusses on which parts we could potentially mobilize, if nutrients could be recycled and what part of residues is needed for the soil to remain 'healthy.' Regarding the latter aspect, there are still a lot of remaining questions, however, some opportunities are clear. When residues (with proteins, starch and sugars) are left in the field, its protein functionality is mostly lost. Labile materials (starch, sugars, hemicellulose) decay fast with little value for the soil. The residue could potential be biorefined, to have a high (biofuel) and low (chicken and pig feed) protein product. The recalcitrant material could be returned to the soil to provide the nutrients.

The example of field residues has the overarching thought that there should be a focus on maintaining functionality. Almost all biomass is a mix of different components (fibres, lipids, protein etc.). If we want to re-use this biomass, there should be a focus on maintaining functionality. Wolter explains that they are developing a database of agri-residues in which current applications and information of biomass residues are put together, so that functionality is remained. He mentions verge grass, currently left or decomposed but a potential bio feedstock, and sludges, currently burnt but can potentially be used for soil as examples.

Waste/residues for clean shipping and Data Science as a tool to identify waste streams

BioHub Concept

Susan van der Veen, PhD Inclusive Value Chains at TU Delft, explained the BioHub concept as a win-win collaboration, as part of the Clean Shipping Project. This concept allows to align the ecological and economic needs of local stakeholders with the economic and sustainable interests of other actors within the value chain. Biomass from sources not affecting the food production is produced (e.g. forestry residues, agri residues) and are used as input for biorefinery. This gives two outputs: biochar, which can be used for soil fertilisation, energy production and water retention, and bio-oil, which can be used for example for biofuels for shipping. This gives local communities a safe and secure income when selling the biomass. Local communities and stakeholders could give additional impulses for regional development as soil management, employment, energy technology and education.

Susan showed a clear and interesting infographic, which is unfortunately now under development but will be available soon at https://www.cleanshipping.nl.

Luis Cutz

Luis Cutz, postdoc at TU Delft, took us to the world of developing a HTL value chain and the potential of data science to identify waste and residues.

HTL is a thermal process in which biomass is converted into crude-like oil. This oil has a high energy density and is a promising alternative for energy-insensitive fuels.

Luis said that data science can be used to identify crops and residues. Normally, it would take a lot of time to dive into all the potential residues and functionalities of those by hand. Instead, data science with the concept of tokenization could be used to accelerate this process. With tokenization, (characteristics of) residues which are previously mentioned in earlier literature can be easily found by computer, with the use of a programming language such as Python. The composition of biomass is needed to be known, referring to the earlier presentation of Wolter.

In the discussion session, a preview of the last session of the BioMob series is given, which will be a writing session regarding hidden potentials of bio feedstock, taken all the previous masterclasses into account. This can be presented in a manifest to guide ministries and politicians, but also bio feedstock suppliers and biofuel producers.