

Welcome to Rehap



Rehap is an EU-funded project that aims to strengthen the European bio-economy by creating novel materials from agricultural and forestry waste, and then considering how they can be used commercially in the green building sector.

A Happy New Year to you all. This edition of the Rehap newsletter, we will be looking closely at the success of a second project paper published in the Journal of Cleaner Production and of the successful development of a method to extract

a high yield of pure tannins from softwood bark. We will also hear from a number of researchers from BBEPP who have been busy representing Rehap at both the Nordic Wood Biorefinery Conference in Denmark, and the Iberoamerican Biorefineries Conference in Spain. A poster and a presentation were given.

Finally, we would like to reveal to you the first Rehap factsheet which highlights recent successful results: Assessing the availability of agroforestry residue.

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New paper provides forecast of agricultural harvesting residues in Europe

A new and spatially accurate forecast of the available waste biomass from agricultural activity in Europe has been made, with the results soon to be published. This data, gathered as part of the **Rehap** project, can be used by the second-generation bioconversion industry to drive Europe towards a post-petroleum age where materials and fuels are made from renewable resources.

The European Commission has recently been pushing a more sustainable renewable resource strategy, with the aim of ensuring food security, managing natural resources sustainably, and reducing dependence on non-renewable and unsustainable resources.

Part of this strategy involves modelling, mapping and accurately understanding the available biomass in the agroforestry sector. The idea is to find out what biomass is available across Europe, which could be used to create materials which are normally derived from fossil fuels.

In light of increasing demand for sustainably-sourced biomass, the EU-funded project Rehap is soon to publish a paper that uses new methods to provide a spatially explicit forecast of biomass potentials from the agricultural sector that are available for conversion into useful products.

The paper outlines the materials and methods of this forecast prediction, data on the specific

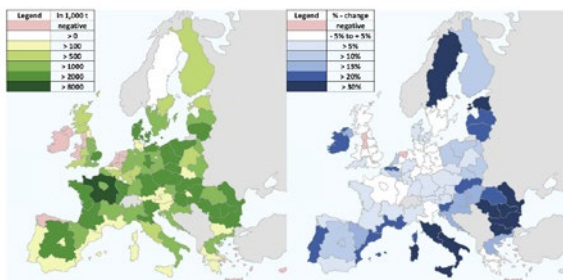
raw material yields and potentials, and results on the forecasted agricultural residue potentials of biomass until the year 2030 in the EU.

The broader aim of the Rehap project is to create new materials for the construction sector that are derived from agricultural and forestry waste. This new and spatially explicit forecast of where and when this waste can be found in Europe will ensure that any biomass they use is sustainably-sourced.

The publication of this paper will also provide other researchers access to the new and improved forecast, facilitating a significant step towards a greener and more resourceful use of natural resources in Europe, whilst promoting a more competitive bioeconomy.

By conducting this research, Rehap is leading the way in furthering the new EC strategy, as the results from this forecasting can be used for decision-making by those working in the bioeconomy to ensure that any biomass being used is not required for cultivation in agriculture, but will be facilitating the progression of the circular economy without damaging other sectors.

The paper, "Spatially explicit forecast of feedstock potentials for second generation bioconversion industry from EU agricultural sector until the year 2030", has been published in the **Journal of Cleaner Production**.



New process for full use of softwood bark ready for production

The pulp and paper industry and the wood product industry in Finland together produce three million tonnes of softwood bark as waste every year. Most of this is used in energy production, but useful raw materials can also be extracted from softwood bark to create bio-based products and materials. **Rehap** partner VTT has developed a method to extract a high yield of tannins from bark.

Softwood bark is available in significant quantities, not just in Finland but in a number of locations across Europe, and it has a lot of potential when it comes to the opportunities it can provide the future bioeconomy. **VTT** has developed a method to extract high yields of pure tannins from softwood bark for use as a raw material for producing resins used in wood products and other material applications. The residual fibre fraction can be used to produce sugar for fermentation products.

Traditionally, tannins are extracted from the bark by hot water extraction. The extraction yield will differ slightly depending on the origin and processing history of the raw material, but it is usually fairly low. For example, the yield from Scandinavian spruce and pine bark is around 10 per cent of the bark's weight. In addition, using the leftover bark residue as a source of sugar through enzymatic hydrolysis produces low yields, with much of the tannin and carbohydrates in the bark remaining unused.

The new process developed by VTT closely resembles the kraft process used to convert wood into wood pulp, using higher alkaline conditions and higher temperatures than hot water extraction. One third of the bark's weight can be isolated as a much purer tannin fraction through this process. The fibre fraction can also be hydrolysed far more easily than after hot water extraction.

VTT is a key partner in the EU-funded Rehap project, which is looking to create high-added value products for the construction industry from the agroforestry waste available across Europe. VTT has been developing the extraction, fractionation and purification protocols for the recovery of tannin, lignin and sugars from softwood barks.

BBEPP, FORESA and BIOSYNCAUCHO, all Rehap partners, also participated in the development and validation of the new patented process and the resulting fractions.



Rehap partake in Iberoamerican Biorefineries Conference

Running for its fourth year, the noteworthy Iberoamerican Congress on Biorefineries took place in Jaén, Spain and partner, Bio Base Europe Pilot Plant presented on their work and involvement in the **Rehap** project.



For 2018, the Iberoamerican Congress on Biorefineries returned to Jaén in Spain for the fourth edition (4-CIAB) on the 22-26 October, where the Iberoamerican community on biorefineries could network, share and gain new knowledge on the current developments happening in the field in both Europe and across the pond in Latin American countries.

The Iberoamerican Congress on Biorefineries has previously taken place in Los Cabos, Baja California (Mexico) in 2012, Jaén (Spain) in 2013 and Concepción (Chile) in 2015. The congress of Iberoamerican comprises of countries or territories in the Americas where Spanish or Portuguese are the predominant language, with Spain and Portugal included in this definition.

Across the two-day event there were 12 main sessions that were led by a keynote speaker and followed by a range of oral presentations from various projects and expert speakers. The sessions included, but not limited to:

- Biomass for biorefineries
- Biochemical processes
- Green chemistry
- Advances in biorefineries
- Techno-economic evaluation, sustainability and LCA analysis
- Lignin production and applications

Rehap, represented by partner Bio Base Europe Pilot Plant (BBEPP), took part in the session, Ongoing biorefinery projects, chaired by Frederik de Bruyn from BBEPP and Caterina Call from IMECAL.

Bio Base Europe's presentation discussed what it is doing as a multi-purpose pilot facility for bio-based products and processes, why piloting is important and the role they play in various partner projects, including Rehap: hot water extraction of tannins, solid liquid separation of the bark residues, scale-up of soda cooking, solid liquid separation after soda cooking, scale-up of the lignin precipitation and of the enzymatic hydrolysis.

In the wider biorefinery industry, it was noted that there is currently a lot of ongoing work involved with the agroforestry waste industry and the organic fraction of municipal solid waste and forestry waste such as residue leaves, pruning or dedicated crops.

(Based on the works presented at the 4-CIAB, Industrial Crops and Products will publish a special issue looking at: Biomass Fractionation; Bio-based products and materials; Bio-based Energy.)

For more information, visit the 4-CIAB website: <http://ceaema.ujaen.es/4CIAB/home-2/>

First project factsheet on the availability of agroforestry residues

Rehap has published an informative and fun factsheet to highlight some of the research and results currently developing, and taking a look at what lies ahead for the project.

The factsheet, the first in a series, explains some of the first publishable results from the project, titled, "Assessing the availability of agroforestry residues".

A brief description of what the project is doing was mentioned, before presenting a picture on how the project went about collecting the right data to understand which agriculture and forestry residues are available, and where, and how they can be used sustainably for the creation of bio-based construction materials.

The factsheet highlights the results and the next stage of the project, involving the development

of a methodology tool to forecast the potential waste residues across the EU till 2030.

There will be more factsheets coming your way, so keep your eyes on the website. (You will be able to find them on the website under Publications).

Take a look at the [factsheet here](#).



Project poster presented at Nordic Wood Biorefinery Conference

Rehap's latest developments in creating novel materials from agroforestry waste for use in the construction industry were presented at the 8th Nordic Wood Biorefinery Conference in October.

The Nordic Wood Biorefinery Conference (NWBC), the leading meeting forum for wood biorefinery professions, took place at the Scandic Marina Congress Centre in Helsinki, Finland on the 23-25 October 2018, hosted by VTT.

Karel De Winter, team leader in bioprocessing at Bio Base Europe Pilot Plant (BBEPP) and his colleagues presented the poster, "Creating novel materials from agricultural and forestry waste" as part of the Rehap project.

BBEPP, partner of Rehap, is tasked with developing and scaling-up new or existing bio-based and sustainable

processes to an industrial level. The research that was presented at NWBC focused on the extraction of tannins, lignin and carbohydrates from spruce bark. A detailed study on soda cooking and the subsequent isolation of lignin was completed before the processes were scaled.

The poster explained the soda cooking process and the precipitation of lignin. The soda cooking conditions were originated and developed by VTT, the latter was further developed by BBEPP and some optimisation on how to isolate the lignin took place.

The poster presents some of these results.



BBEPP also developed these precipitation and filtration processes at lab scale before testing them at pilot scale, processing 600kg of bark and demonstrating their scalability. Results revealed the amount of lignin available. **The poster can be found here.**

The Rehap poster was among a turnout of 34 posters at the conference.

The NWBC programme also covered a range of topics in the form of keynotes and talks on forests, dealing with desire and greed in transforming environment; policies and global megatrends; industrial developments in biorefinery; new concepts and applications from wood based raw material; side streams into value-added products; processing and tailoring properties; and the application of these processes.

The conference provided detailed insight from paper and pulping industries, revealing a lot of work being done on the validation of lignin and the use of this material in other industries. There was also a number of discussions on the alternative uses of bark for fuel processes by burning it and using it for energy. For Rehap, this opened up questions as to whether this alternative strategy has place within the project.

