GreenSolRes

Deliverable 5.1

# Report on techno/economic assessment of LVA production from lignocellulose

**Demonstration of solvent and resin production from lignocellulosic biomass via the platform chemical levulinic acid**

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BBI JU

Bio-based Industries Consortium

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## About GreenSolRes

The need to establish economic and sustainable large-scale operations for the conversion of renewable resources to chemical building blocks is becoming increasingly urgent in the context of climate change and depleting fossil fuel reservoirs. Pathways for manufacturing of bio-based fuels and chemicals have been developed but most of them rely on sugar and starch crops for feedstock. GreenSolRes aims at a sustainable and competitive industrial production of the platform chemical levulinic acid (LVA) from non-food lignocellulosic biomass. Further, the conversion of LVA and LVA esters into industry relevant building blocks γ-valerolactone (GVL), 1-methyl-1,4-butanediol (MeBDO) and 2-methyltetrahydrofuran (2-MTHF) will take place by new catalytic methods developed during the course of this project. Finally, these chemicals will be upgraded to solvents and resin monomers for the production of high added value adhesives and consumer products. This project was started in September 2016 and has a duration of five years.

### Project Coordinator

### Project Office

### Consortium

## About this document

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## Publishable Summary

A process for the production of levulinic acid (LVA) from lignocellulosic biomass was developed. Milled wood is continuously converted to LVA in a two-reactor setup using sulphuric acid as a catalyst. After concentration via flashing and removal of solid residues by filtration, the resulting liquid product mixture is sent to the downstream part of the process for LVA separation and purification.
The developed process was implemented in an Aspen Plus simulation including all recycle streams to generate consistent mass and energy balances as the basis for a techno-economic assessment of the LVA production. Furthermore, experimental results were used for validation of the process model. The resulting conversion rate for lignocellulosic biomass are in good agreement with each other as well as with literature data.
Based on the simulation results and the experimental data, operating costs were determined considering the required raw material, catalyst, solvent and utilities. Additionally, investment costs were calculated in order to determine the overall production costs for LVA. The biggest portion of the total costs is caused by the biomass feed. On this account, using waste biomass as feedstock is essential to increase the economic feasibility. Additionally, heat integration is a promising option to save energy and thereby reduce the production costs.