

Pineapple leaves for high quality fiber and other biobased applications

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A. Design Flagship Methodological Innovation

Objective(s)

- Explore how fiber extraction and other value addition of pineapple residues can be implemented;
- Better understand the agronomic, technical, economic, social-institutional and governance bottlenecks involved in pineapple residue transitions;
- Identify potential solutions to these bottlenecks.

Main (Key) Result

- Estimation of the amount of biomass available annually for the bio-economy, approximately 620,000 ton dry matter, of which 458,000 ton in the leaves.
- Literature-based description of pineapple leaf fiber characteristics and extraction process.
- Valorization options of pineapple residues can be categorized into fibers, chemical compounds, animal feed, substrate for different purposes, and energy.
- Smart combinations of the valorization options may contribute to viable business models including the extraction of pineapple leaf fibers (PALF) for the textile industry.
- Financial and environmental costs of current residue management are little known. More insights in these costs may stimulate the transition towards more biobased applications of the pineapple residues.



Figure 1. Harvesting of pineapple fruits.

Readiness

Considering the on-going developments in Costa Rica the extraction of and processing of fibers is in SRL 3, the initial testing of proposed solution(s) together with relevant stakeholders.

In Asia, developments are further, and the readiness level varies between SRL 7 (Indonesia) and SRL 9 (Philippines). In the Philippines pineapple fibers are used to produce vegetable leather, which is commercialized in Europe under the brand Piñatex. The fiber extraction and processing methods used in Asia are very labour-intensive. Considering the much higher wages in Costa Rica other, more automatized and less-labour demanding methods need to be developed requiring high investments in machinery.



Figure 2. Pineapple leaves (left) and the extracted pineapple leaf fibers (right).

Lessons learned

Many small initiatives addressing valorization options are being developed in Costa Rica, or are currently being restarted after the COVID-19 pandemics. However, there is little cooperation and coordination among the individual initiatives. An overarching solution pathway based on the cascading of different valorization options has not yet been developed and agreed upon by stakeholders. The large pineapple producers are not part of on-going small valorization initiatives and therefore their interests in an integrated approach is unclear. The government seems to focus on the compliance of current crop residue management but lacks the capacity to stimulate innovations in the current residue management towards biobased solutions.

Next steps

- Finishing final report with contextualization of the pineapple crop residue case, inventory of valorization options and fiber characteristics, description of the technical, socio-economic and social-institutional and governance barriers to the development of valorization options, and opportunities to remove these barriers.
- Supervision of one MSc student thesis focusing on business models for valorization options and optimization model for minimizing transport costs of the crop residues.
- Supervision of one MSc student thesis focusing on financial and environmental costs and benefits of current crop residue management practices and the alternative of harvesting residues.

