Editorial

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TAPPI Journal 2024 Best Research Paper focuses on realistic potential for using nonwood residues in sustainable packaging

Each year, the *TAPPI Journal* Editorial Board honors outstanding content by nominating and voting for the Best Research Paper published the previous year based on scientific merit, innovation, creativity, and clarity. TAPPI and the *TAPPI Journal* Editorial Board would like to congratulate the authors of the 2024 *TAPPI Journal* Best Research Paper: Antonio Suarez, Ashok Ghosh, Fritz Paulsen, and Peter W. Hart of Smurfit Westrock (formerly WestRock). The winning paper, "Life cycle carbon analysis of packaging products containing nonwood residues: A case study on linerboard and corrugating medium," was published in the March 2024 issue.

Suarez

Ghosh

Paulsen

Hart

All of the authors are part of the research team at Smurfit Westrock, where Suarez is a senior R&D scientist, Ghosh is senior principal R&D scientist, and Paulsen is the senior director of R&D. Hart, who organized the March special issue featuring peer-reviewed content from the 2023 TAPPI PEERS/IBBC conference, was a Research Fellow for Smurfit WestRock before he passed away in May 2024.

"Suarez's team's research examined pulp from nonwoods like wheat straw and sugarcane bagasse using a holistic life cycle analysis approach to project environmental performance in packaging products," said *TAPPI Journal* Editor-in-Chief Douglas Coffin. "The results can help mills make decisions about which fibers ensure a low carbon footprint."

As first author of the winning paper, Suarez will receive the Best Research Paper Award and its accompanying Honghi Tran Prize at TAPPICon, May 4-7, 2025, in Minneapolis, MN, USA. In a recent interview with *TAPPI Journal*, Suarez spoke about reasons for the study, its challenges, and interesting findings.

Within your research team, what prompted you to study use of nonwoods in packaging using this life cycle carbon analysis (LCCA) approach?

The concept of using nonwood residues as a replacement for wood fiber isn't new, but sustainability and circularity trends have increased attention toward these types of fibers in recent years. This raises questions about their impact on carbon emissions, especially as paper companies pledge to reduce their carbon footprint. We realized that there was a gap in knowledge to answer this question, and that there wasn't a holistic study evaluating nonwood pulps in the context of packaging in the United States, including carbon footprint and paper performance. So, we decided to answer the questions to this issue using life cycle analysis (LCA).

Why do you think there's not been a full LCCA study on nonwoods for this application prior to your study?

This is a complex topic, and there are many methodological assumptions that must be made. There is also the issue of data availability, although now there is greater availability of data than in the past. So, the complexity and the lack of data are likely why it wasn't previously approached.

Within Ecovinvent and United States Life Cycle Inventory (USLCI) databases you used for wheat straw and bagasse information, was it hard to isolate the data you needed? Was this the most time-consuming part of the project?

It definitely was. Building the life cycle inventory, evaluating data quality, and ensuring completeness was the most difficult and time-consuming part of the project. We chose those two particular databases because they are evaluated by experts, and they are updated to include new processes.

As to the amount of time the study took, I estimate it at six to eight months, although we weren't working on it exclusively the entire time. We just had to make sure the data and results were accomplishing the goal of the study.

How did you come up with the modifications/assumptions in the processes for wheat straw and bagasse – such as those regarding emissions from their production and transportation or carbon footprint of energy use, for example?

We used data from well-known databases, but at times, that data might not reflect the exact processes, such as the agricultural practices in the United States, or reflect the sources of electricity used in specific regions. We started with the available information in the databases and, when necessary, modified them to reflect actual processes based on literature and expert input.

What was the rationale for using a 30% nonwood pulp content for the assessment? Would this be a typical amount used?

Several past studies have suggested that nonwoods could replace up to 30% to 40% of wood fiber in paper products. Also, this number came from our market research department on customer questions about how much content would be meaningful to the customer base to claim that a product has nonwood fibers. Balancing this with operational capability, the 30% content amount was settled on for analysis as the most practical with customer significance.

ABOUT THIS PAPER

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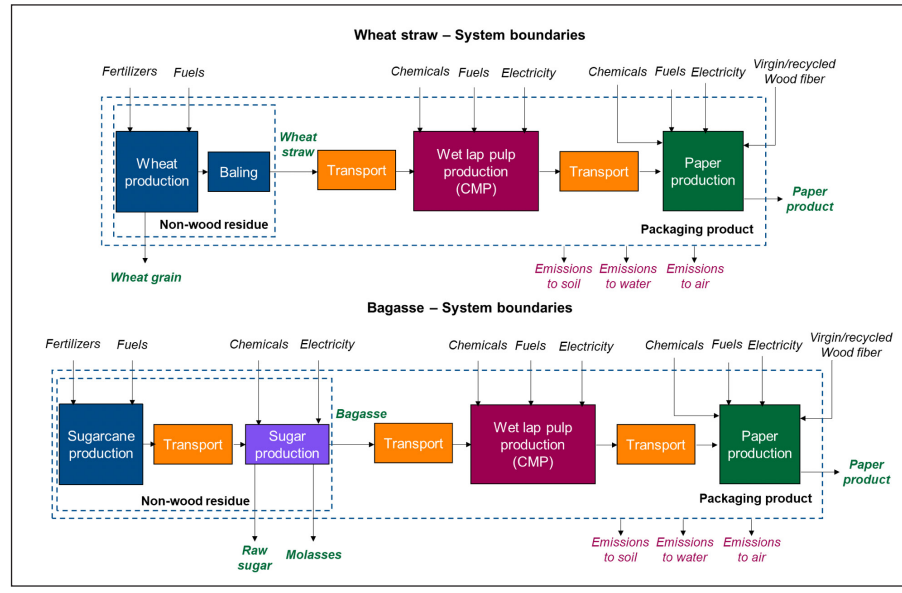
About this journal

Were you surprised that the findings showed a 15% to 100% higher global warming potential (GWP) for nonwood use than for wood-based linerboard and medium?

I was somewhat surprised by the variation we found, which was mostly due to the different allocation methods used. This emphasizes the need to evaluate the impact of assumptions and methodological aspects when performing an LCA to avoid biases in the study.

Will your team approach other such studies on nonwoods?

I believe this study answered many of our questions on the topic of the use of nonwood residues in packaging, but our team takes sustainability very seriously, so we are always looking for different ways to reduce our carbon footprint through LCA studies of this kind. **TJ**



Cradle-to-gate system boundaries for wheat straw-based (top) and bagasse-based (bottom) packaging paper made with chemimechanical pulp (CMP) process.