Environmental performance evaluation of Immature Coconut Substrate using the Ambitec-Life Cycle model

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The Immature Coconut Substrate (ICS) is a product innovation developed by EMBRAPA that acts as a physical support to seedling and to plant production in soilless cultivation. This work presents an environmental performance evaluation of the ICS innovation as compared to an existing technology that is a substitute product to the innovation, namely the Mature Coconut Substrate (MCS).

A specific decision support multicriteria model, Ambitec-Life Cycle, was applied to evaluate the environmental performance of the technologies along each phase of their life cycle, considering the vulnerability of the watersheds where each phase was located. Ambitec-Life Cycle is an expansion of the Ambitec-Agro System, a method applied at Embrapa to evaluate its agro-industrial innovations' environmental and socioeconomic impacts (Rodrigues *et al.*, 2003). The application of the model encompassed four phases of ICS and MCS life cycle: coconut husk disposal, coconut substrate production, coconut substrate use in rose seedling and production, and coconut substrate final disposal (Figure 1). A set of indicators evaluated the vulnerability of the watersheds where given phases of the innovation and of the existing technology life cycles were placed. The vulnerability index entered as a weight to those environmental performance indicators that were related to local or regional agro-industrial issues.

The performance of both technologies was evaluated using three scenarios in order to consider data variability: all indicators assuming average values; indicators assuming their highest values to ICS and lowest values to MCS (most favorable case to ICS), and; indicators assuming their lowest values to ICS and highest to MCS (most unfavorable case to ICS).

The life cycle phases of ICS and MCS were located in four different Brazilian watersheds with similar environmental vulnerabilities indices: Metropolitana, Litoral and Parnaíba, in the State of Ceará, and Baixo Mundaú, in the State of Alagoas. The functional unit adopted was the mass of substrate necessary to the production of one commercial rose of the Carola variety.

In a scale of 0 to 100, the final environmental performance of the ICS along its life cycle, considering the average values, was lower than the one of MCS (Figure 2). In phase 1 (coconut husk disposal), the environmental performance of ICS was much higher than the performance of MCS. In phases 2 and 3 (coconut substrate production and use), the performance of ICS was lower than MCS and, in the last phase, the technologies scored similarly.

Conversely, in the most favorable scenario to ICS, its final environmental performance was a little better than the performance of MCS, implying that data variability, in this work, did not assure best overall performance to neither one of the technologies.

Nonetheless, this environmental evaluation reinforced the importance of taking into account all the phases of a technology life cycle to compare its performance against its potential substitutes, in order to identify opportunities for improvements that benefits its entire life cycle.

References

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