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HOW DOES A DECISION-MAKING TOOL ENHANCE SPENT MUSHROOM SUBSTRATE VALORIZATION INTO POLYSACCHARIDES?

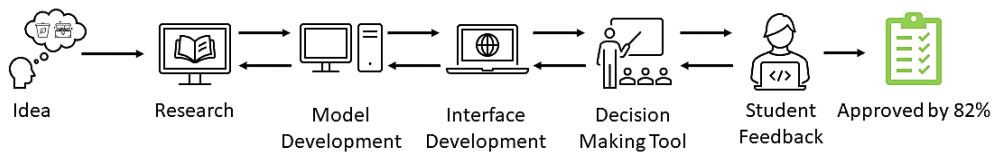
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Abstract – In mushroom farming, one kilogram harvested results in about five kilograms of spent mushroom substrate (SMS), posing an environmental management challenge. As an in-tune work with the concepts of circular economy, cleaner production, and waste minimization, this study has developed a mathematical model that analyses the valorisation potential of SMS through polysaccharide production. The in-depth mathematical model is based on a system dynamics approach, which explains the interactive interplay amongst the production process, related costs, energy consumption, and caused emissions. The model has been developed in a generic way. Therefore, it can be re-adjusted flexibly for a different cleaner production process. A user-friendly interface has been developed. Users can easily manoeuvre around the variables within the model that offers instantaneous insight into the environmental and economic impacts of SMS valorisation. This interface was later integrated into an educational context to serve as an interactive decision-making tool for cleaner production modelling. The main purpose of the developed tool was to favour understanding of causalities between production chains, energy consumption, labour, emissions, and expenses. This tool has been tested on master's degree students in a cleaner production course. Survey results show that 82 % of students report the need to incorporate similar decision-making tools in their learning curriculum. In sum, the application of system dynamics to the valorisation of SMS does not only present an attractive solution for this environmental problem but also shows great potential in setting educational backgrounds for an interactive and close-to-life learning process. It is recommended to develop more interactive tools available for students.

Keywords – *Bioeconomy; cleaner production; emissions; renewable energy; survey; system dynamics modeling*



Research study framework for decision making tool development and approval.