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From dumping to upcycling: Modelling environmental and economic impact of coffee cherry uses

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Abstract

Coffee by-products have the potential to contribute to a circular and sustainable bioeconomy by reducing waste and thus, environmental externalities, while also improving farmers' economic situation through additional income. Moreover, agricultural residues such as those from coffee production can serve as the basis for innovative new products. One notable example is the coffee cherry pulp or husk (cascara), a by-product generated during the coffee processing steps in producer countries. Coffee cherry pulp is traditionally used to produce compost and biogas or make tea, jam, or flour. While in recent years dried coffee cherries are increasingly used as the basis for infusions to produce caffeine-containing beverages.

However, utilising by-products is not a cost-free endeavour. Sometimes, new infrastructure needs to be built to re-organise the processing of raw material, or new harvesting techniques must be developed for the by-product. Additionally, creating new value chains may generate additional greenhouse gas emissions.

Thus, it remains unclear which use of the coffee cherry can increase or reduce environmental impacts, such as climate change mitigation, while also creating potential economic gains for farmers.

To address these issues, this study models selected and relevant use scenarios of the coffee cherry (i.e. dumping as the baseline, composting, biogas production, and local tea) with regard to their environmental and economic impacts. A life cycle assessment is carried out for each scenario, along with a cost-benefit analysis. The results will provide valuable insights into use scenarios, which can help inform decision-making regarding the utilisation of coffee by-products and highlight considerations for agricultural by-products in general. By this, the study may contribute to the development of a more circular bioeconomy.

Keywords: By-product, circular bioeconomy, coffee, LCA, upcycling