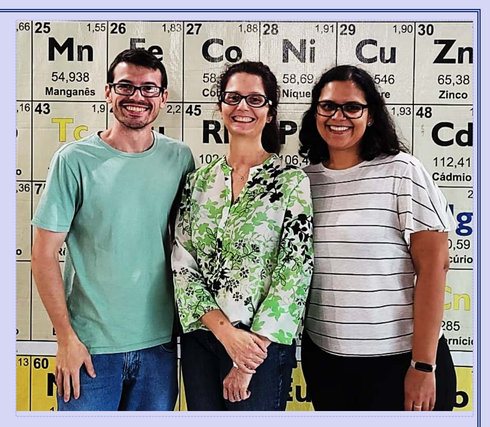
Obtaining high value-added bioproducts from a by-product of the coffee production chain



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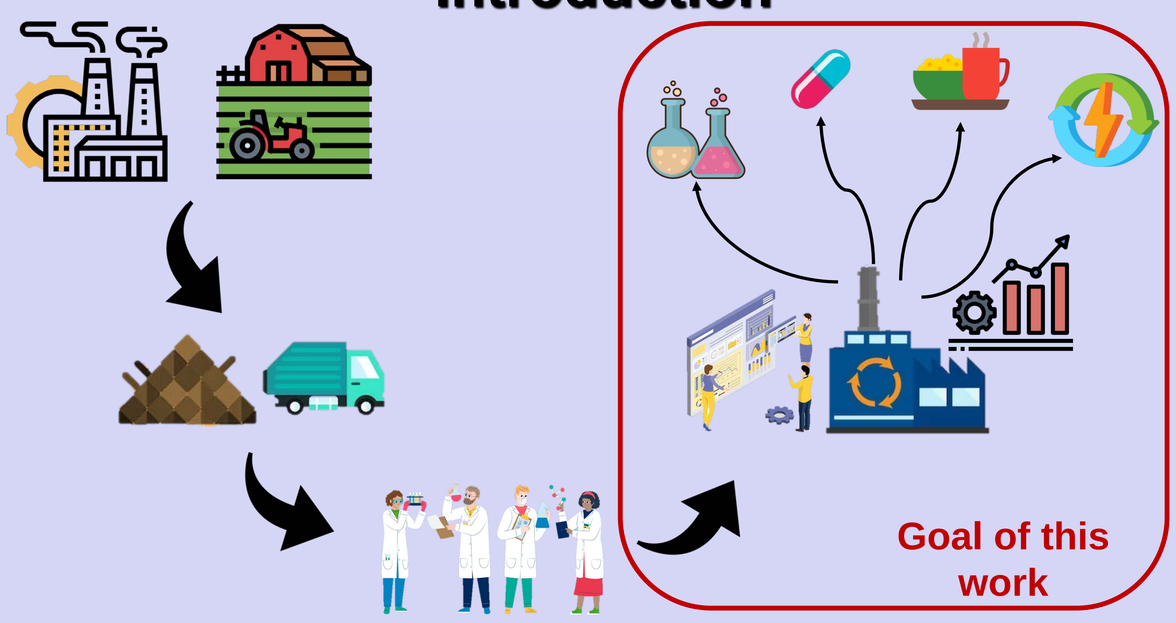
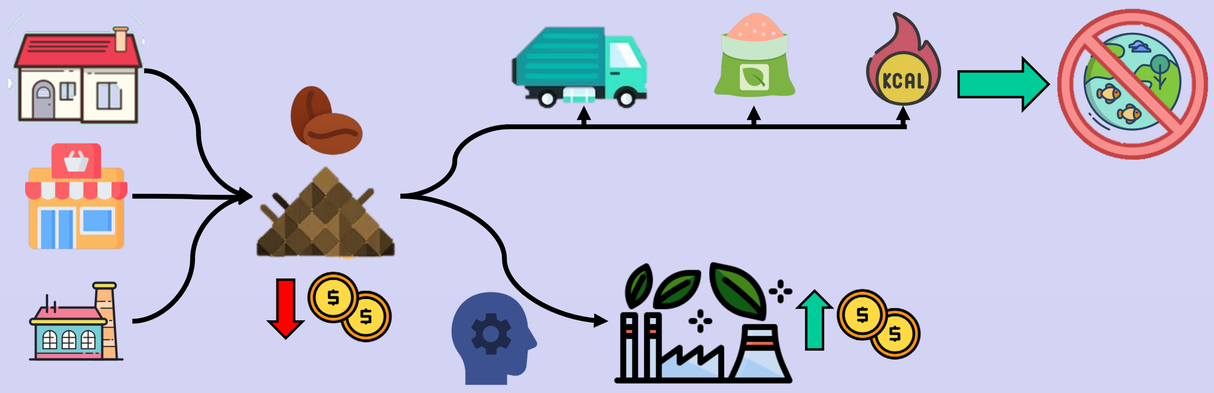
Introduction



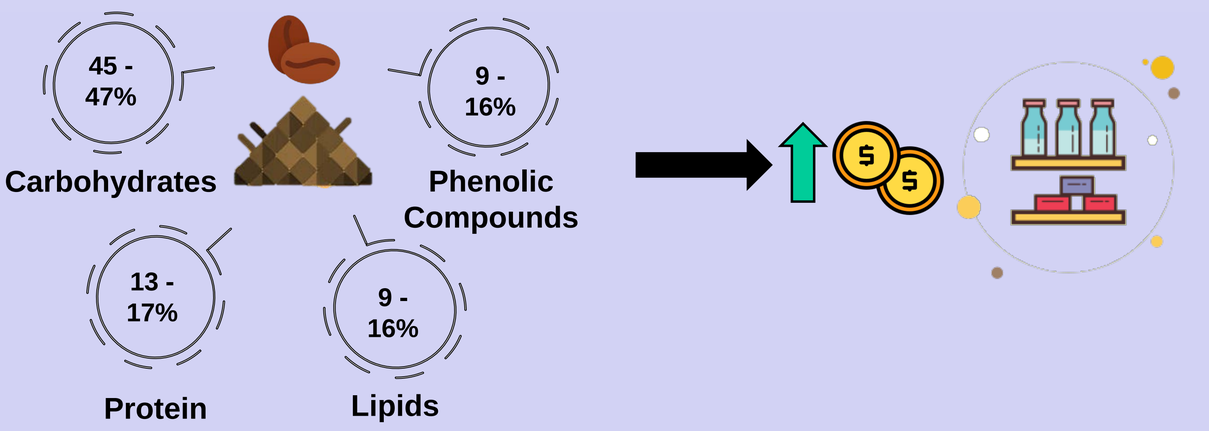
The Coffee Production Chain Issue

The coffee production chain deserves special attention in this discussion since world coffee production is estimated at 170.3 million bags of coffee beans in the 2022/23 harvest and for Brazil it is estimated a production of around of 55 million bags (1 bag = 60 kg) [1]. It is estimated that around 650 kg of spent coffee grounds are generated per ton of green coffee processed in the industry, and that for each kg of soluble coffee produced, 2 kg of grounds (moisture between 60 and 70 %) are generated [2]. Due to its high organic matter content and the presence of compounds such as caffeine, tannins, and polyphenols, which can have negative effects on the environment, disposal of SCG needs to be managed properly.



Spent Coffee Grounds (SCG) Composition and its Potential

Coffee, and coffee waste, in cultivation and in its processing, contain large amounts of valuable molecules with high added value, such as polyphenols, polysaccharides, peptides and proteins, among others, which justifies their valorization. Recent studies have demonstrated the viability of waste generated in the coffee chain to produce various products, such as enzymes, phenolic antioxidants, vermicompost, food additives, mushrooms, biogas, biofuels, bioadsorbents, activated carbons, sugars, organic acids, metabolites biologically active secondary compounds, among others, adding value to the product [3].



Spent Coffee Grounds (SCG) Valorization

The production of biofuels such as ethanol and biodiesel the use as a substrate for growing mushrooms and the use as an adsorbent for removing basic dyes or heavy metals from wastewater are some of the applications.

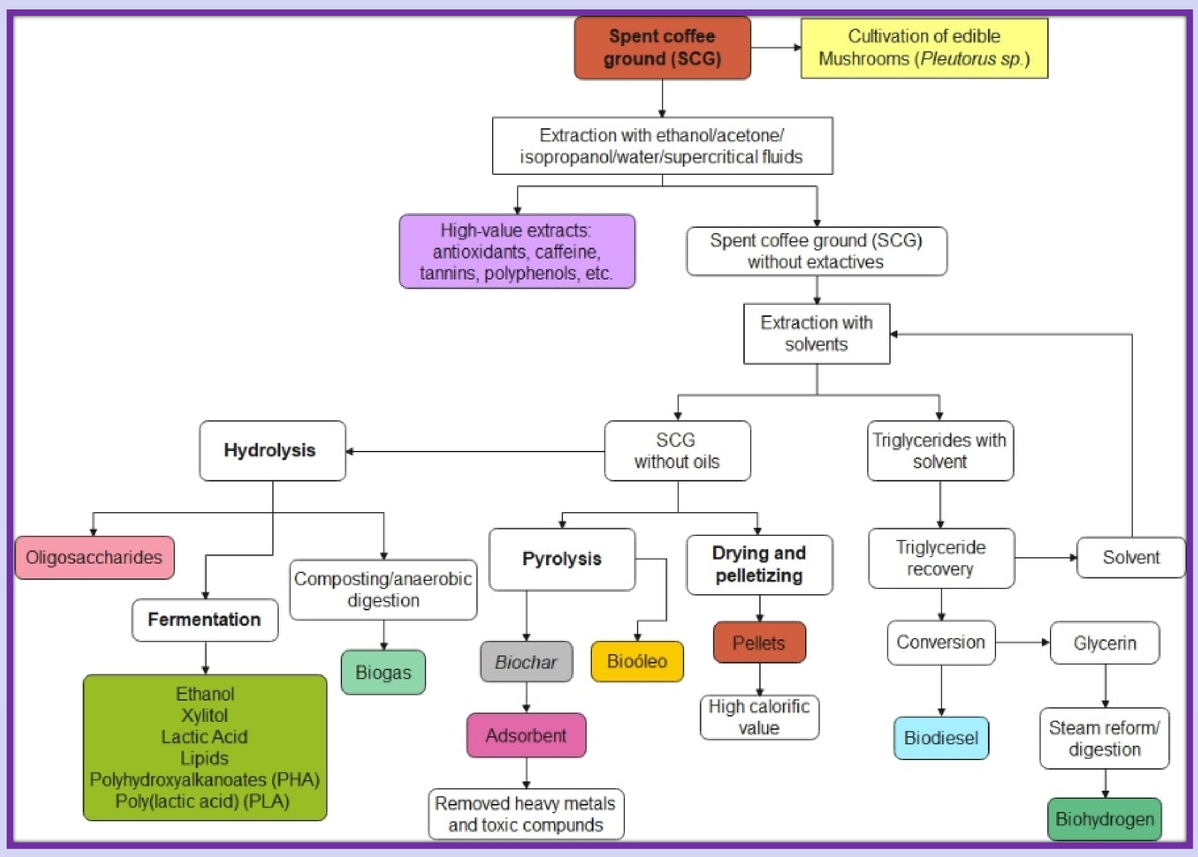
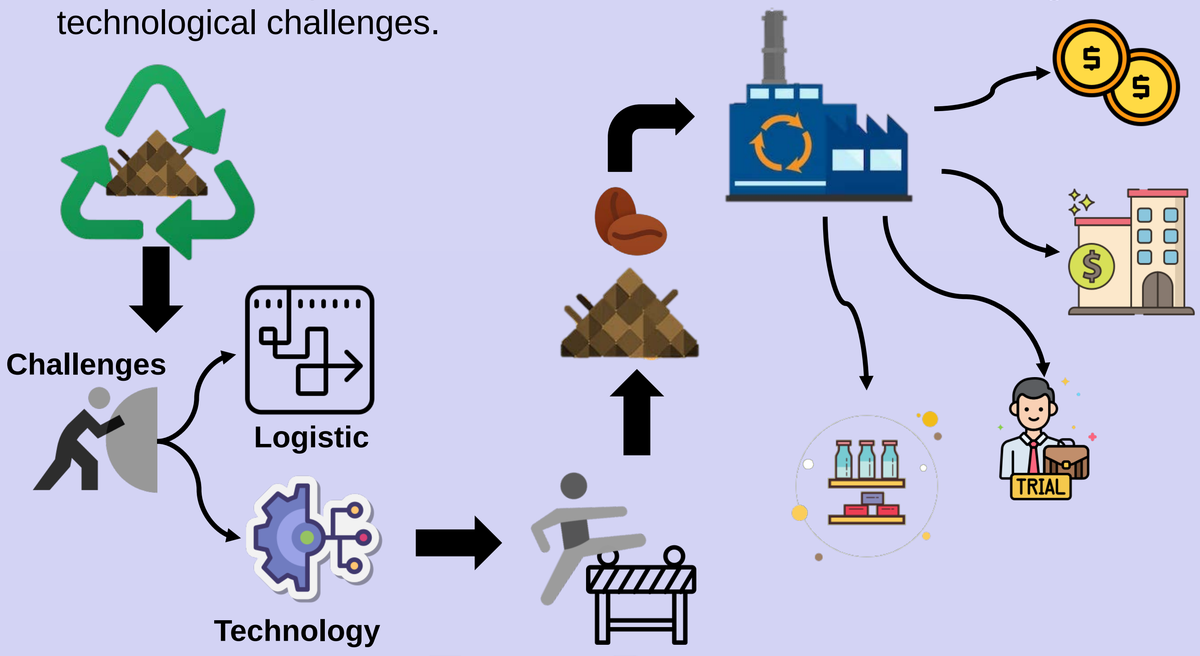


Figure 1: Valorization of the spent coffee grounds (SCG).

Another promising approach, but still little explored, is the use of SCG as a raw material for the extraction of functional compounds of potential interest for the food and pharmaceutical industries. However, there are logistical and technological challenges.



Future Prospects

Instead of SCG being discarded in the trash, all coffee waste generated by coffee shops and/or industry should be recycled and reintroduced into commerce as new sustainable products. And it converges with the trend of better use of co-products and by-products, mainly from the agroindustry, with the incorporation of bioproducts production with higher added value, expanding the variety of products in the portfolio, turning the current industries into biomass refineries. Finally, smart solutions should be implemented to minimize the generation of waste and pollutants and maximize energy efficiency, which will certainly bring about significant socio-environmental contributions.

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The authors are grateful to the São Paulo Research Foundation (FAPESP): grant numbers #2022/03000-0, #2023/03961-3, #2023/01752-8 and CAPES for financially supporting the current study.