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## Medium-scale biorefineries: A promising alternative for the sustainable production of biofuels, bioenergy and biochemicals at locally-based agro-industrial clusters

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Medium-scale biomass-based biorefineries have been identified as a promising route to the creation of local and regional agroindustrial clusters in Brazil. By delivering multiple products from starchy and lignocellulosic biomasses, a biorefinery constituted by integrated plants and processes can make feasible the economic exploitation of a myriad of low-value agricultural and industrial residues. In principle, different biomass components can be converted into sugars and other carbon-rich products, which in turn can be transformed into high-valued chemical products and high-volume biofuels, while generating electricity and process heat for self-consumption. In this scenario, the high-value products enhance profitability, the high-volume fuels contribute to support energy needs, and the power production reduces costs while avoiding greenhouse gas emissions. Hence, the biorefinery concept envisages the maximal value derived from the biomass feedstock at minimal impact to the environment. This paper describes biorefineries constituted by integrated plants that produce ethanol, active carbon, food-grade carbon dioxide and single-cell protein (SCP) extract. Agricultural residues such as sugarcane bagasse and straw, eucalyptus, rice shells and corncobs were used as major lignocellulosic feedstocks. The mentioned biorefinery concept has been built on two different biomass-to-products platforms. The "sugar platform" is based on chemical and biochemical conversion processes, particularly the fermentation of sugars extracted from cellulosics, while the "carbon platform" is based on thermochemical routes with emphasis on the carbonisation of the cellulignin fractions.

## Biography

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