

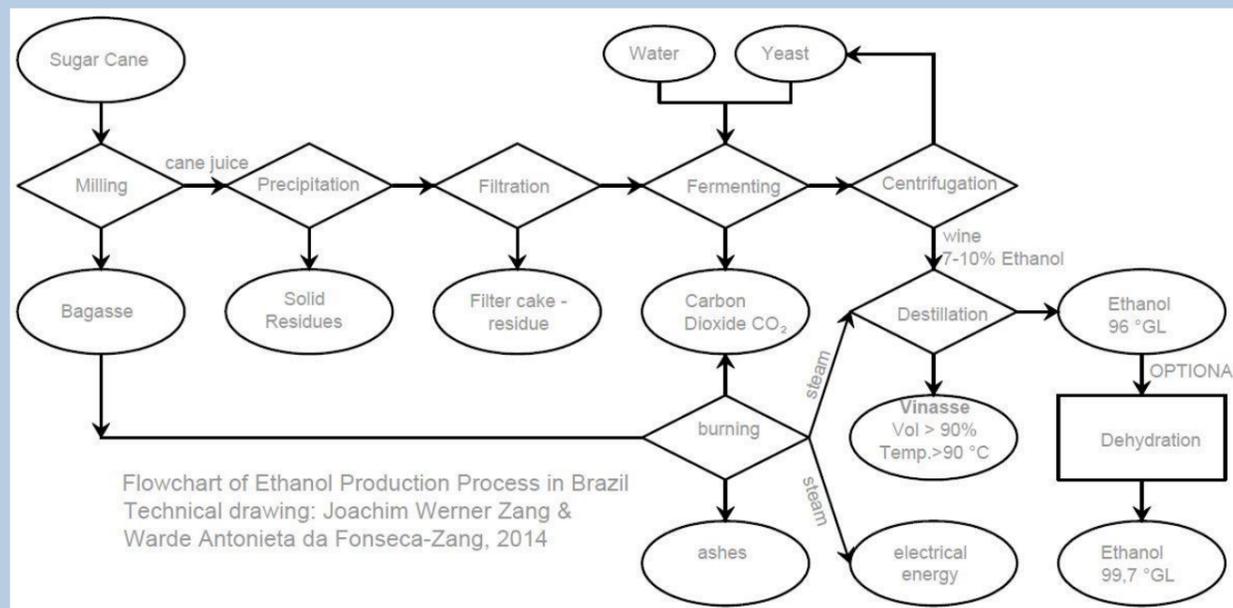
Sustainable use of byproducts of Brazilian sugar cane based ethanol industry

Brazil as the biggest producer of sugar cane worldwide transforms most of these 532 million tons of biomass to 1,362 billion liters of ethanol (UNICA, 2013). The productivity of sugar-cane based ethanol reaches 8000 liters per hectare, compared to 4000 liters per hectare of corn based ethanol in the USA, biggest producer and exporter of bio-ethanol.

This ethanol is used to supply the Brazilian car fuel market, where more than 95% of the cars are "flexible-fuel", i.e., they can run on any blend of ethanol and gasoline.

In the production process the mostly mechanically harvested sugarcane is crushed and milled, then the solids are removed by precipitation and filtration. After sterilization and conditioning of the juice, yeast is added to start the fermentation process. Next is the centrifugation of yeast, which prevails the distillation of the produced wine, raising the ethanol content from 7-10% up to 96%.

The process itself generates more than 94% (mass) of byproducts, which are partially applied to generate electric and thermal energy by burning the bagasse. The other residues are collected and transported to the fields to return nutrients and irrigate the plants during the dry season, when the harvest takes place.



No-Waste has initiated several international research projects to improve the sustainable use of the byproducts, e.g.:

1. **I-Nopa:** Sustainable bioeconomy in Brazil - Bioenergy from biogas using various types of waste substrates from the Brazilian bioethanol industry. Financed on the European side by German [DAAD](#) and [GIZ](#), and in Brazil by CAPES.
2. **PuresBio:** Process understanding and usage of residues for sustainable plant biomass production. Supported by German Ministry of Education and Research [BMBF](#) and

Brazilian Ministry of Science and Technology [MCT](#);

3. Participation at the **ProBiogas**-network. German-Brazilian Project for the energetic use of biogas in Brazil. Supported by: German Climate Technology Initiative [DKTI](#), the Brazilian Federal Ministry of the Cities [Ministério das Cidades](#) and the German Agency for Cooperation [GIZ](#)

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WP 1 Hydrogen and synthesis gas production from waste
University of Poitiers



WP 2 Valorisation of wastes from olive and argan production
University of Chouaib Doukkali



WP 3 Production of valuable chemicals from CO₂ and organic gases
University of Oulu



WP 4 R&D on the HTC technology to valorize industrial by-products and wastes,
Federal Institute of education, Science and Technology, Goiania



WP 5 Utilisation of methane originating from coal mining
Dalian Institute of Chemical Physics



WP 6 Research on the HTC process: Product design
Trier University of Applied Science