BIOETHANOL PRODUCTION CAPACITY FROM CANARY ISLAND BANANA RESIDUE AND IMPACT ON ITS CARBON FOOTPRINT

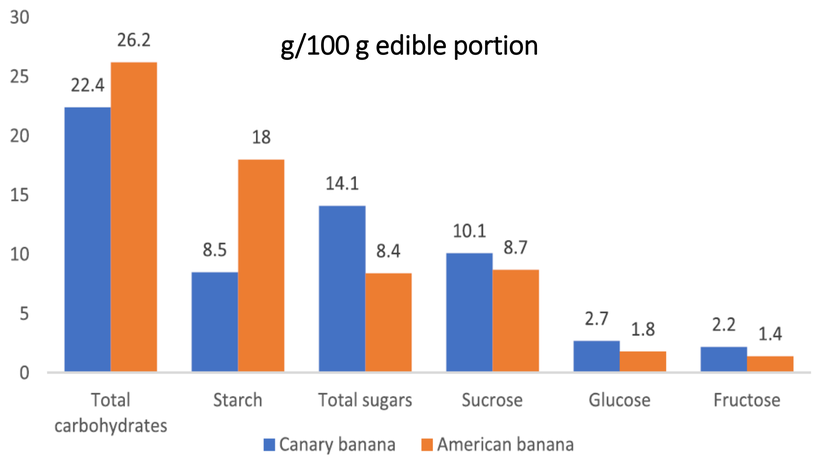
Juan Carlos Lozano-Medina[1], Vicente Henríquez Concepción[1] , Federico León Zerpa[1,3] , José Daniel Marcos del Cano[2] and Carlos Alberto Mendieta-Pino[1,3]

(1) Department of Process Engineering, Campus De Tafira 35017 · Las Palmas De Gran Canaria · Spain
+34 609153268 juancarlos.Lozano@ulpgc.es
(2) Department of Energy Engineering, National University of Distance Education 28040 - Madrid - Spain
(3) Institute of Environmental Studies and Natural Resources. University of Las Palmas de Gran Canaria – Spain

MITIMAC Project MAC 2/1.1a/263)

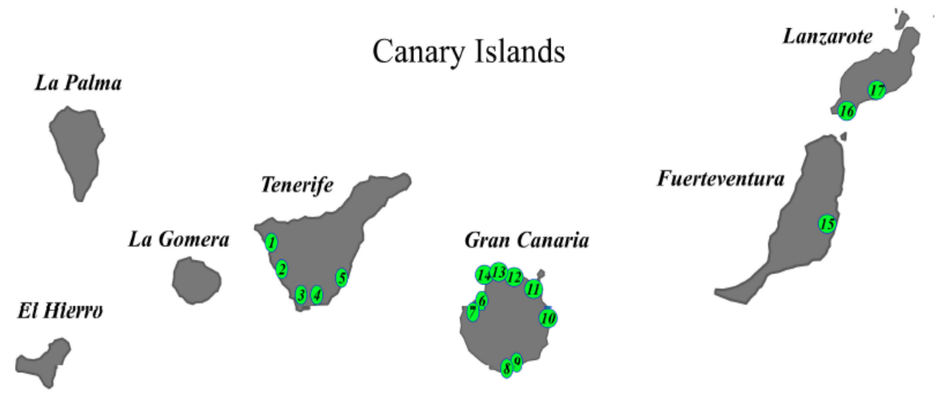
Abstract

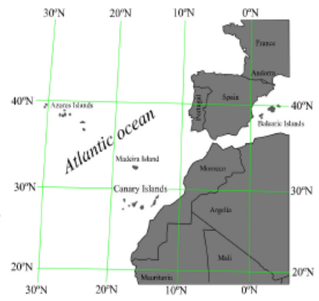
Energy sovereignty and carbon footprint mitigation are challenges faced by island electricity systems (IES), along with the promotion of renewable generation systems. One of the aspects that can improve this is the development of specific actions in the recovery of agricultural waste as biofuels. Among them, the banana residue stands out, as it is the majority in agricultural production in the Canary Islands. On the other hand, biofuels are alternatives to fossil fuels that contribute to reducing greenhouse gas emissions. This article studies the potential of waste, the transformation of the existing sugars in the fruit waste of the Canarian banana to transform it into a 100% renewable fuel, bioethanol and, therefore, the environmental impact that it has on banana production, its new carbon footprint.



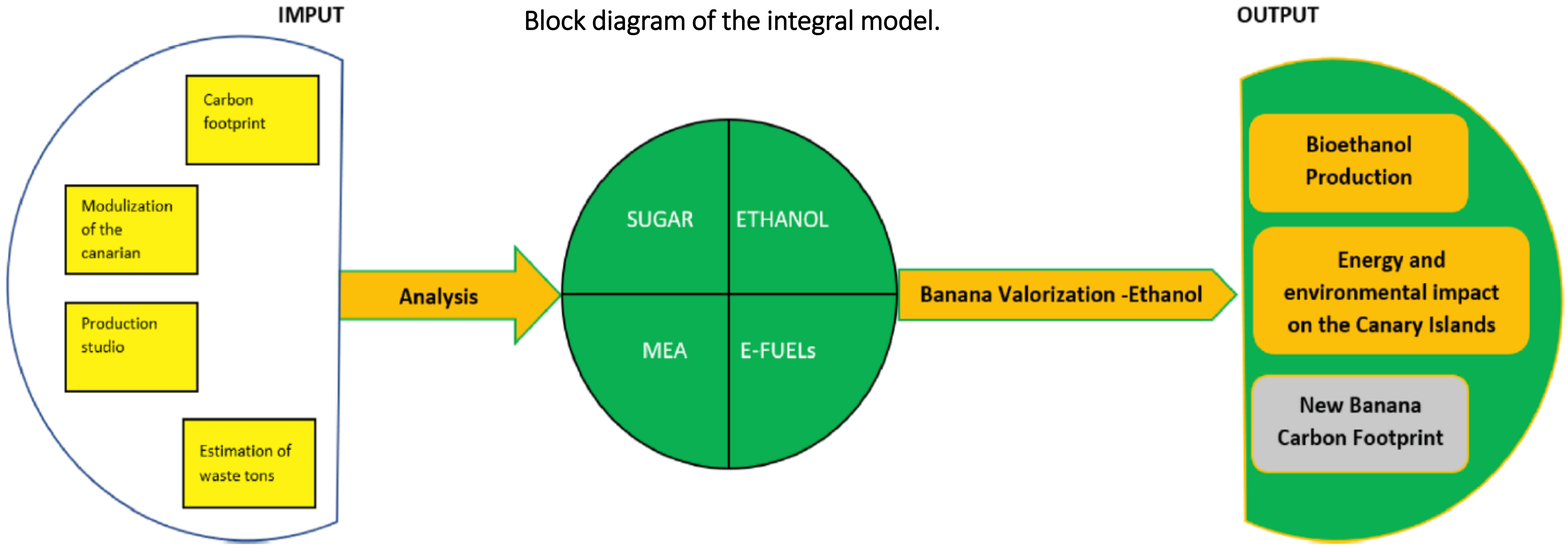
Objective

This work proposes to estimate the potential of transformation of the existing sugars in the waste of the Canarian banana to transform it into a 100 % renewable fuel, bioethanol, and it is also proposed to study because of the production of bioethanol, the environmental impact that its new carbon footprint has on banana production. The novel aspect is based on the inventory and potential for conversion of the discarded fruit part and its use into biofuel



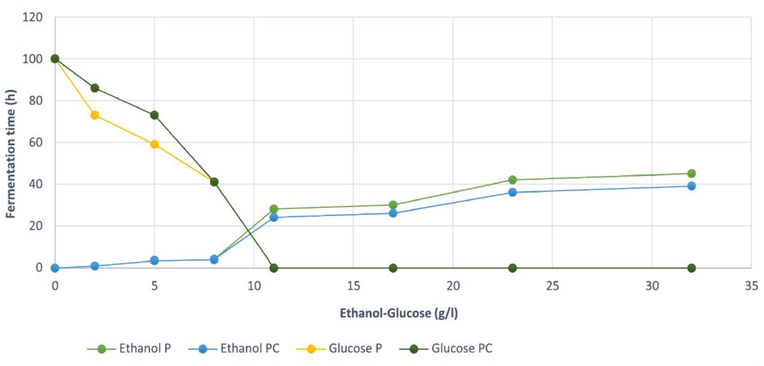


Methodology



Block diagram of the integral model.

Evolution of banana bioethanol production



Carbon footprint of bananas from the Canary Islands. (gCO_2/kg produced).

Year	2013	2016	2022	2022 with Valorization
Carbon Footprint	249.00	195.16	120.71	118.85

Results

The waste of the Canarian banana can and should be recovered due to its large amount of production, about 30,000.00 tons per year and its easy management. Such valorization would lead to direct improvements in banana production:

a) Improvement in the carbon footprint of bananas, reducing the footprint by 0.68 % from 120.71 gCO_2/kg produced to 118.85 gCO_2/kg produced.

b) Economic improvement in banana production. This economic improvement is directly in the production of bananas, due to the reduction in landfill costs, since these discharges decrease due to their use in recovery and an improvement due to the transport of landfills, which also decrease due to their reduction in waste in landfills and their use in recovery.

c) Economic improvement due to extraordinary income. This would be possible income from the sale of waste for recovery.

It also leads to improvements in the environment:

a) Decrease in emissions to the environment due to the decrease in the carbon footprint.
b) Reduction of discharges. About 30,000 tons per year

References

-Guerrero AB, Aguado PL, Sánchez J, Curt MD. GIS-Based Assessment of Banana Residual Biomass Potential for Ethanol Production and Power Generation: A Case Study. Waste Biomass Valorization 2016;7:405–15. https://doi.org/10.1007/ s12649-015-9455-3.
-Tan JS, Phapugrangkul P, Lee CK, Lai Z-W, Abu Bakar MH, Murugan P. Banana frond juice as novel fermentation substrate for bioethanol production by Saccharomyces cerevisiae. Biocatal Agricultural Biotechnology 2019;21:101293. https://doi.org/10.1016/j.bcab.2019.101293.
- Pathak PD, Mandavgane SA, Kulkarni BD. Valorization of banana peel: a biorefinery approach 2016;32:651–66. https://doi.org/10.1515/revce-2015-0063. .