

Bioconversion process of barley crop residues into biogas: energetic-environmental potential in Spain

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Abstract-

Barley fields reach 1.7 million hectares in Spain, of which 320,000 are used to produce malt, generating 450,000 tons of crop residue from barley intended for malt production. One way to treat this waste in an environmentally sound, energy-sustainable and economically cost-effective manner is anaerobic digestion. The biogas generated can be used as fuel and as a renewable source of energy (providing a solution to the energy supply problem from an environmental point of view). It has been shown that, when treated along with sludge from a Upflow Anaerobic Sludge Blanket (UASB) reactor, the crop malt residue produces about 1604 NmL of biogas per 100 g; with a content in methane of 27.486%. The development of the process has been studied with a novel indicator, hydrogen generation, and it has been determined that the process takes place in two phases. It has been demonstrated that this solution is beginning to be energy-efficient and therefore to produce energy for external uses in regions that have at least 6000 hectares of planted barley. At best, it can be considered, in a given region, the equivalent of a 115 MW power plant. It could supply energy to 10 thousand homes per year. Therefore, it is considered an energy-efficient solution that complies with the Sustainable Development Goals #1, #7, #10, #12 and #13. It guarantees access to energy in isolated areas or with supply problems, and results in a 55.4% reduction in emissions of equivalent-CO₂ (which equals 38,060 tons of equivalent-CO₂ in Spain).

Index Terms- barley crop residue; biochemical methane potential; material degradability; anaerobic indicators; biogas feasibility; biogas emissions

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