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Optimizing low cost C1/C2 compound production and fermentation from biomass solid waste

In order to maintain our current global energy demand, including our transport systems, we must find alternatives since natural resources are exhausting rapidly and raising environmental problems. One solution to these problems is the development of sustainable and renewable biofuels to take over from fossil fuels and power our cities and transport networks. Much research is currently taking place in an effort to develop renewable fuels that are cheap and effective. One of the approaches is to use lignocellulosic feedstock for energy generation. However, its recalcitrant nature needs costly pre-treatment processes before fermentative biofuel production. Thus, another innovative approach is to produce C1/C2 (including gases CH4 and CO2) compounds from this biomass using natural microbial consortia that can be used to produce liquid biofuel by C1/C2 fermentation. There are a number of bacterial strains capable of performing this task. Production of C1/C2 compounds from lignocellulosic biomass is far better than direct liquid biofuel production. Our project aims to investigate the potential of a two-stage digestion process in the production of C1/C2 compounds. We aim to optimise the process to achieve maximum conversion of biomass to C1/C2 compounds using natural and artificial microbial consortia by providing optimum conditions to grow and work efficiently. That will help to understand how stage separation improves C1/C2 production from low cost biomass waste. A full techno-economic assessment will be carried out to assess the economies of scale to understand the potential economic competiveness of the proposed biofuel production process against conventional biofuel technologies.