BIOMASS AND BIOENERGY SUPPLY FROM MOZAMBIQUE

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Abstract

Modern biofuels are a promising long-term renewable energy source which has potential to address both environmental impacts and security concerns posed by current dependence on fossil fuels. Energy crops represent the largest potential source of bioenergy feedstocks but land availability is a crucial precondition for this. On the basis of global bioenergy production potential assessments, Mozambique was identified as one of the promising biomass production regions in tropical Africa. It has capacity to produce up to 6.7 EJ (all energy values for fuels in HHV) of bioenergy annually with moderate introduction of agricultural technology and using strict sustainability criteria (i.e., protecting forests and meeting growing food demand). Essential for realising this potential is rationalisation in agriculture and livestock-raising, and potential increases of up to 7 times current productivities can be achieved with moderate technology introduction. Efficient logistics are also essential to ensure competitive biomass supply to the international market. Using six regions of Mozambique as potential sites of biomass production, this study analysed and compared the cost and energy use of supplying pellets, pyrolysis oil and Fischer-Tropsch (FT) fuels to the international market.

Production costs of eucalyptus vary from 0.6 to 1.15 Euro/GJ for biomass productivities ranging between 7 and 25 tdm/ha/yr for arid to productive regions. Using Rotterdam harbour as an international destination for biofuels, the lowest delivered biofuel costs are 2.6 Euro/GJ for pellets, 3.2 Euro/GJ for pyrolysis oil and 6.8 Euro/GJ for FT fuels produced via circulating fluidised bed gasification (all originating from Sofala province). Lower costs are achieved for early conversion to pellets and pyrolysis close to biomass plantation sites, in contrast with FT fuels, for which costs are lower with centralised production. Comparison of the three biofuels using FT fuel as a reference (by further conversion of pellets and pyrolysis oil to FT fuels via entrained flow gasification) shows that it is more attractive to densify into and distribute pellets and pyrolysis oil early in the supply chain. FT fuels derived from pellets and pyrolysis oil result in lower fuel costs of 4.5 and 4.8 Euro/GJ respectively. Where biomass feedstock is not limited, large-scale conversion (GWth,in) directly to FT fuels using entrained flow gasification may result in much lower fuel cost.

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