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# BioEnergy Feasibility in South Africa

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The BioEnergy Atlas for South Africa is the result of a project funded by the South African Department of Science and Technology, and executed by SAEON/ NRF with the assistance of a number of collaborators in academia, research institutions, and government. Now nearing completion, the Atlas provides an important input to policy and decision support in the country, significantly strengthens the availability of information resources on the topic, and provides a platform whereby current and future contributions on the subject can be managed, preserved, and disseminated.

Bioenergy assessments have been characterized in the past by poor availability and quality of data, an over-emphasis on potentials and availability studies instead of feasibility assessment, and lack of comprehensive evaluation in competition with alternatives – both in respect of competing bioenergy resources and other renewable and non-renewable options. The BioEnergy Atlas in its current edition addresses some of these deficiencies, and identifies specific areas of interest where future research and effort can be directed.

One can qualify the potentials and feasible options for BioEnergy exploitation in South Africa as follows:

(1) Availability is not a fixed quantum. Availability of biomass and resulting energy products are sensitive to both the exclusionary measures one applies (food security, environmental, social and economic impacts) and the price at which final products will be competitive.

(2) Availability is low. Even without allowing for feasibility and final product costs, the availability of biomass is low: biomass productivity in South Africa is not high by global standards due to rainfall constraints, and most arable land is used productively for food and agribusiness-related activities. This constrains the feasibility of purposely cultivated bioenergy crops.

(3) Waste streams are important. There are significant waste streams from domestic solid waste and sewage, some agricultural production, and commercial forestry. The issues include the dispersed nature of some of the waste (increasing costs of transport and reducing economy of scale), and the fact that some of these are already applied in energy generation.

(4) Rural firewood use is problematic. This is a significant resource, plays a large role in the energy budget of poor and rural households, and current use means that it will have little impact on the GHG emissions balance. Data availability and quality is poor, and needs improvement.

(5) Process technologies are not all mature: We have investigated 52 different process technologies in respect of costs, economy of scale, energy efficiency, greenhouse gas emission and job creation impacts, and maturity of technology. Many attractive options are not mature, and unlikely to be commercially useful in the next decade – essentially excluding them from consideration for medium-term implementation.

(6) Solutions are probably ‘packages’. One has to balance the diversity of available resource streams and processing technologies against the need to focus resources on development of critical mass (workforce skills, support industries, expertise). Combining feedstocks and aligning with other government initiatives or subsidies can achieve such critical mass more easily.

(7) Solutions must be robust in future too. Feasibility studies that focus on the current situation only ignore the fact that future sustainability is strongly dependent on assumptions on relative economic growth (influences household and industrial energy consumption, and the limiting cost for energy), cost of capital and inflation (affects choices of labour- or capital-intensive industries), exchange rates and fossil fuel prices (huge

effect on selection of alternatives).

(8) The most promising biomass source is medium-term mining and eradication of invasive alien plants, but this source is limited in time and, if exploited as proposed, will not be available after about 20 years.

The paper discusses methodology, availability of biomass and potentials, and the feasibility results of four case studies in respect of biomass application: (1) co-firing of woody biomass for electricity generation; (2) use of sugar-producing crops for the production of fuel alcohol, (3) applications for organic components of domestic solid waste and wastewater; and (4) use of woody biomass as a feedstock for an existing GTL refinery.