Technology has been a primary factor contributing to increases in agricultural productivity in South Africa over the past half-century. It has resulted in increased generation of solid waste, placing increasing pressure on waste management. The traditional methods of dumping the waste has caused land-use space to be increasingly scarce and thus the urgent need for waste diversion through recycling, separation and re-use.

![Diagram of carbon-recycling process for agro-waste](image)

**Figure 2: Carbon-recycling process for agro-waste**

**Feedstock and handling**
Feedstock addresses the main agricultural residue and waste properties which affect the long-term technical and economic success of a thermochromic conversion process.

Typical parameters analysed include: moisture content, fixed carbon and volatile content, carbonisation, and ash content. Analytical high-moisture and ash content reduces the convenient fraction of delivered feedstock. To maximise gasification system efficiencies and produce require dry and low-ash residues and wastes.

Gasification
Agricultural residue and waste gasification is a complex thermochromatic process that begins with the devolatilisation of the solid feedstock, forming fuel gas in the presence of an agent such as air or oxygen (if used as a gasification agent or primary oxygen). The composition and quality of the primary gas stream from the gasification process are used in the design of reactor and inclusion in existing and waste conversion, reactor, type agents or techniques are evolved into temperature, pressure, and the presence or absence of catalysts.

Gas catalysis
Catalyst synthesis
Catalytic synthesis is the process of generation of chemical-grade syngas into final renewable products. The renewable products are further fractionated into transportation fuel and chemicals. The main focus for the process is on carbon footprint and greenhouse gas emissions reduction. Common fuels such as biogas, biodiesel and Dimethyl ether are produced from the catalytic synthesis of syngas.

There is a need for an expedient use of low-carbon feedstock in third-world countries. The country needs more technical-economic analyses, but there is not yet sufficient evidence to attract adequate funding.

Our view as an agricultural research institute is that in order to accelerate adoption of agricultural residues as an alternative feedstock for fuels and renewable chemicals, and fully exploit the benefits thereof, policy makers urgently need to identify and develop enabling and efficient policies. Second, private and public partnerships must be established and involved in research and technology development to an absolute must. The production of energy and renewable chemicals is a viable solution to climate change and it increases the sustainability of farm enterprises that are increasing financial pressures in a struggling economy.

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