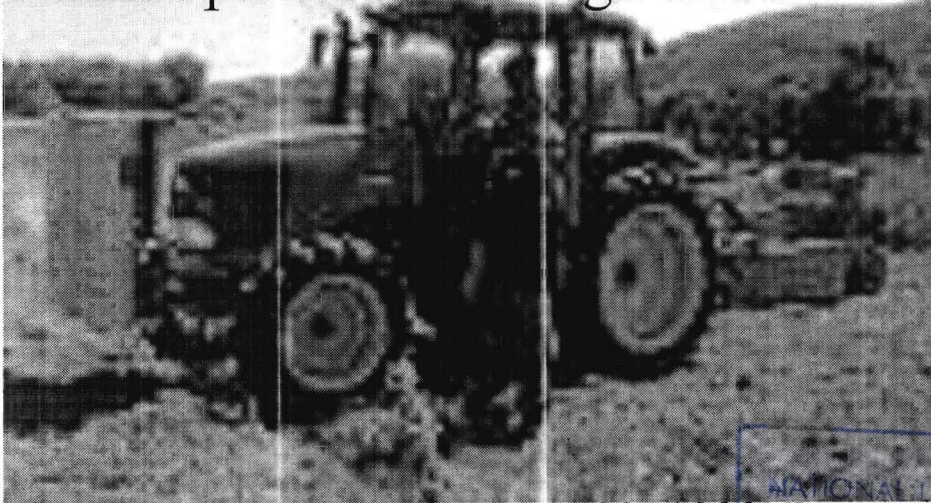


NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

Design modifications to compression
ignition engines for biogas power with
ethanol pilot fuel for high altitude tropics



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ABSTRACT

The study set out to establish the maximum compression ratio at which biogas could be used in high altitude tropics. It also sought to investigate the use of ethanol as a pilot fuel for the biogas to help solve motor fuel problems. It was found that all commercial compression engines could have at least 47% of their diesel substituted with biogas and a maximum of 90% without danger of engine knock resulting from the biogas. Apart from the usual addition of a venture carburettor and a gas metering device, no engine modifications were required. Multi fuel operation was also investigated. The injectors are expected to suffice under normal conditions but to deliver 70% of the fuel if an engine was running on ethanol pilot fuel without the biogas.

Fuel self sufficiency for a one hactre lot in biogas, biodiesel and ethanol were proven. The possibility of using up to 95% ethanol was inconclusive without actual trials. The cost appraisal showed that the cost of biogas was negative when offset by the value of fertiliser in the first three years.