Renewable Energy Recovery Generation for Security and Safety in Global Agriculture: Justifications and Outlook

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Introduction and Objective

Waste is problematic in agriculture, production and remote locations. Remote power generation cost is high due to diesel fuelled gensets. With high premium on food-energy security and safety, the 330 kWe ERK® ReGen container-power-plant improves waste management and lowers electricity prices at these locations. Standardized components installed in multiple containers enables high quality, simple transport and rapid installation. The objective of this study is to present this renewable energy recovery generation (ReGen) design concept from evaluated resource-energy use of some remote areas of the world.

Figure 1: Map Africa indicating the European Colonial Masters

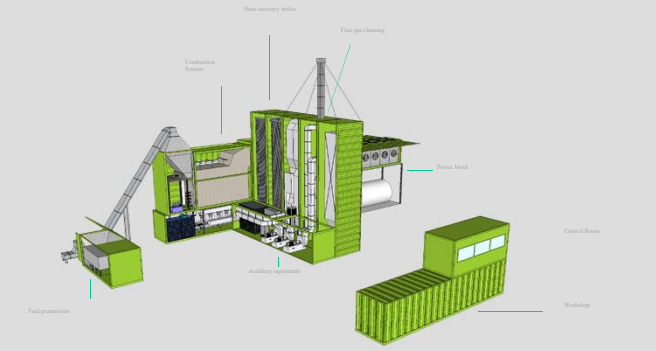
A novel technique that combines resources and energy surveys with socio-economic-analyses was adopted in the technology properties and waste to identify and justify factors for the promotion and development of such techniques.

Figures 2 & 3: Some Waste Sites for Renewable Energy Generation>>

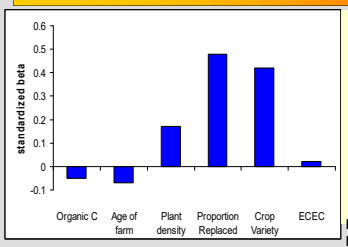
Results

Renewable Energy Generation (ReGen) Plant - Arrangement

Figure 5: ReGen Container Power Plant Arrangement



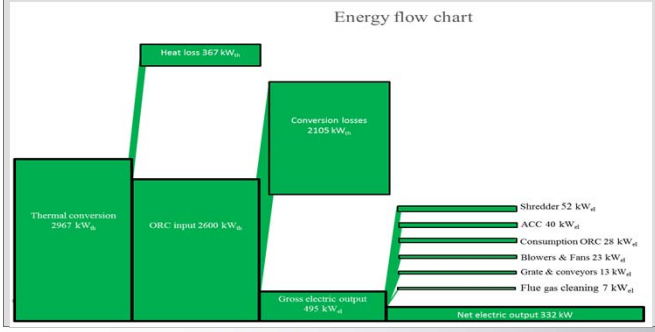
Effects of Biophysical and Management Variables on Crop yield



- Organic C & Farm Age are negatively related to yield
- At (p>0.05) soil variables are not significant,but at (p<0.1) management variables are significant
- All variables explain 97% of yield variability. Model can predicts yield at 99% confidence level

Figure 6: Relative Important Variables in the Multiple Regression Model

ReGen Container Power Plant – Energy Balance (Figure 7)



ReGen „Container Power Plant“ Waste-to-Energy (WtE) Concept

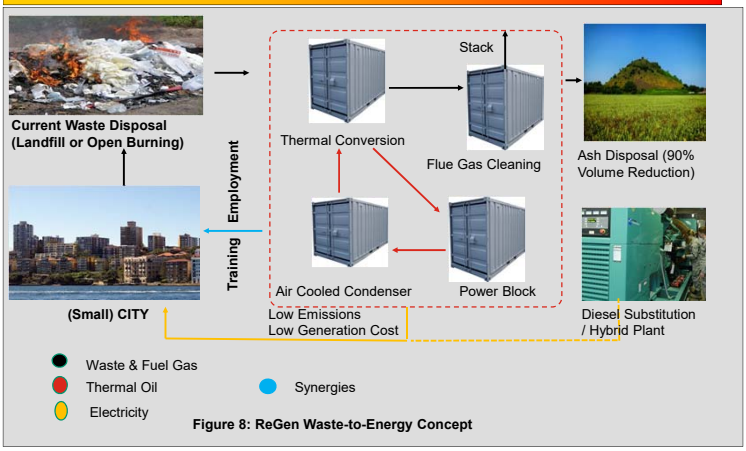


Figure 8: ReGen Waste-to-Energy Concept

Source: Figures 2 - 10: ERK / Own Computation; Figures 1: IITA Nigeria / Internet

ReGen Waste-to-Energy: Key Parameter & Advantages

- ❑ **FUEL:** Biomass to MSW
- ❑ **FUEL THROUGHPUT:** Up to 980 kg/h
- ❑ **OPERATING PRESSURE:** 5 Bar
- ❑ **NET ELECTRIC CAPACITY:** 330 KW
- ❑ **WtE PLANT EFFICIENCY:** 19%
- ❑ **APPLICATION:** Off-Grid Power Supply

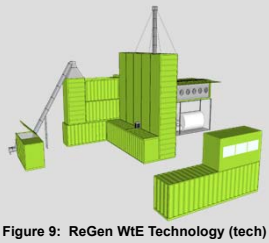


Figure 9: ReGen WtE Technology (tech)

- **Economic:** Independent of fluctuating fossil fuel price (energy independence)
- **Flexible:** Reliable base load supply with possibility of hybridization for peak demand
- **Recycling:** Simultaneously solving problems of waste, pollution and electricity generation
- **Low C Footprint:** Petrol / Diesel fuel substitution reduces CO_2 emissions
- **Sustainable:** Thermal waste disposal avoids (ground) water/soil contamination
- **User Friendly:** Plug & Play System minimises installation time and relocation

Materials and Methods

Socioeconomic Survey, Energy STAT, Soil Sampling & Analyses:

- Nigeria, Some African Countries and Remote Locations of the World were selected for the survey and comparatively studied for renewable energy generation & uses
- Socioeconomic survey covered resources quality and constraints to production
- Random selection and interviews were done using standardized questionnaires to elicit the required food and energy production information
- Key-Persons interviews, official statistics and other secondary data served as additional background information. Energy statistics (STAT) was used for analysis
- Biophysical data was obtained by analysis of soil samples taken from cocoa farms.
- Soils were analyzed for chemical analyses to assess contribution of soil to yield.
- The soils were analyzed for basic cations (determined in 1N NH4OAc), total N (Kjedahl method), available P (Bray P method), Organic C (Walkey-Black Wet Oxidation method) and pH (0.1M $CaCl_2$).

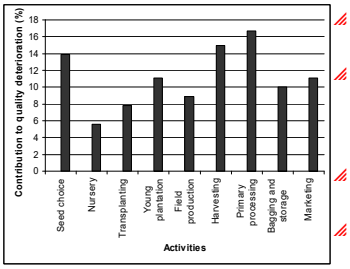


Figure 10: Agri-Value Chain for Agricultural Production

Conclusions

- **Waste is an inevitable product of the society, and the challenge is to manage it sustainably e.g. via WtE tech**
- **It is recommended that emphasis should be placed on resource and energy management techniques that conserve the environment, foster food-energy security and safety**
- **With policies that protect our oceans and lands through sustainable resources and energy use emphasized**
- **Sustainable food and energy production is a daunting challenge to global agriculture, industry and society: needs to be addressed in Africa and remote locations**