ZERA

ZIMBABWE ENERGY REGULATORY AUTHORITY

Use of Renewable Energy as an Alternative Source of Energy in the Farming Sector

18 August 2015, Crowne Plaza

FARMERS INDABA WORKSHOP

Presentation Structure

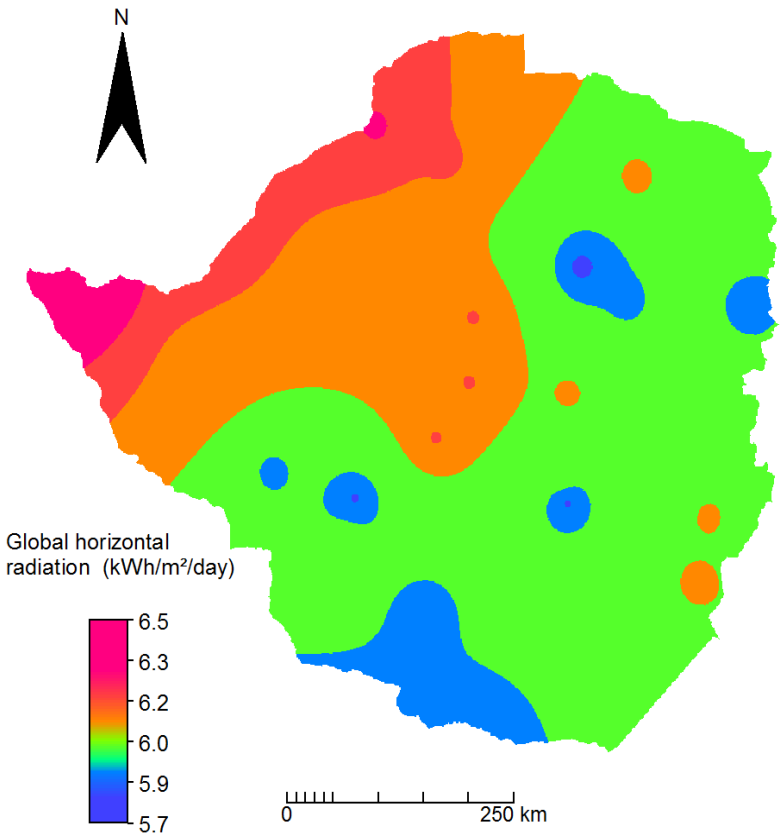
1) Renewable Energy Technologies for use by Farmers
   i. Solar(PV and thermal)
   ii. Biogas (animal & plant waste converted to energy)
   iii. Biomass (bagasse, timber waste, gasification)
   iv. Wind (Water pumping and electricity)
2) Conclusion

RE TECHNOLOGIES FOR USE BY FARMERS

SOLAR ENERGY

Solar Radiation

- Solar energy potential of Zimbabwe is relatively high, with an average radiation of 2,100kWh/m^2 per year and 3,000 hours of sunshine per year
- Farmers can harness this abundant resource for use in irrigation, pumping water for livestock and households use.
- Solar PV can also be used to electrify farm houses



EXAMPLES OF SOLAR ENERGY USES IN ZIMBABWE

a) A 0.96kWp Solar Powered Irrigation Scheme at a Selous farm

- 0.75hp solar pump
- One acre of vegetables under irrigation
- 10,000 litres of water per day & 2000 litres storage tank

b) Solar water irrigation at Chivi

Solar panels and guard room

- A 2.4 kW Solar panel generator
- 1.5 hp pump set
- 3 kW power conditioning unit
- 30m^3 water storage

Storage and drip irrigation pipes

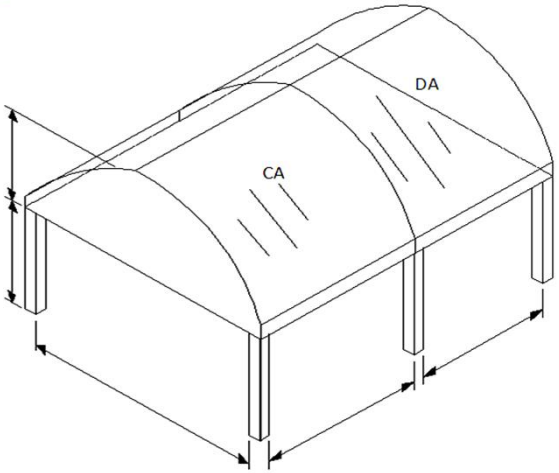
c) Solar PV powered farm house in Ruwa

4.68kW$_p$ Solar PV System able to power:

- refrigeration, ironing, lighting , borehole water pumping, as well as powering a washing and drying machine

-project has potential for net-metering

d) Solar Driers

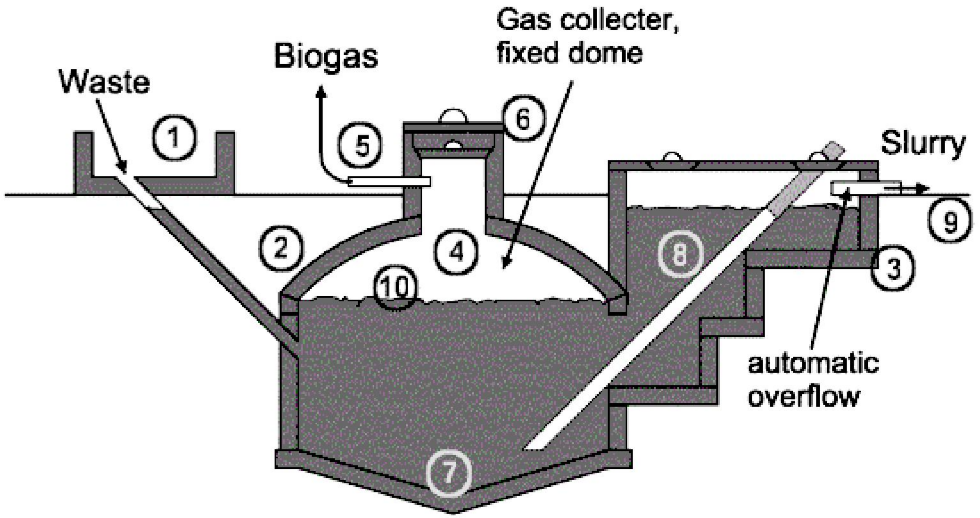


Solar Drier

Dried tomatoes

- **Solar thermal energy can be used for drying fruits and vegetables as well as the curing of tobacco. ZERA is working with Harare Institute of Technology (HIT) on solar tobacco drying research.**
- **This demonstrates a cheaper, energy efficient and hygienic method for conserving fruits and vegetables.**

BIOGAS ENERGY



20m^3 Biogas Digester construction at Chibhero

BIOGAS ENERGY Cont'd

- Animal and plant waste can be converted in a biogas digester to produce "Biogas" a clean gas that is rich in methane
- This gas is used for cooking, lighting, heating e.g. provision of warmth to piglets and chicks
- Biogas digesters are good for waste management (e.g. Mbare Musika vegetable waste)
- Biogas can also be converted to electricity by the use of combustion engines.
- Biogas can be refined, compressed and stored in containers and be used just like LPG

BIOGAS YIELDS

- Most common feedstock for biogas production is the abundant animal waste.
- Biogas calculation from animal waste – 1.28 m^3 biogas from 32kg of dung in a 4m^3per digester per day. The figures increase progressively with larger digesters. Dung from 2-4 cows (or 5 – 10 pigs) produces enough gas for a family's cooking and lighting.
- The animals must be penned as only fresh dung can be used for gas generation.
- Therefore the potential for biogas production is greater with dairy cows and pigs which are generally penned.
- Other requirements - easy access to water and the right temperatures – therefore yields can be expected to differ between hot Chiredzi and cool Nyanga.
- Most common types of digesters are Indian (floating gas holder) and Chinese (fixed dome) types.

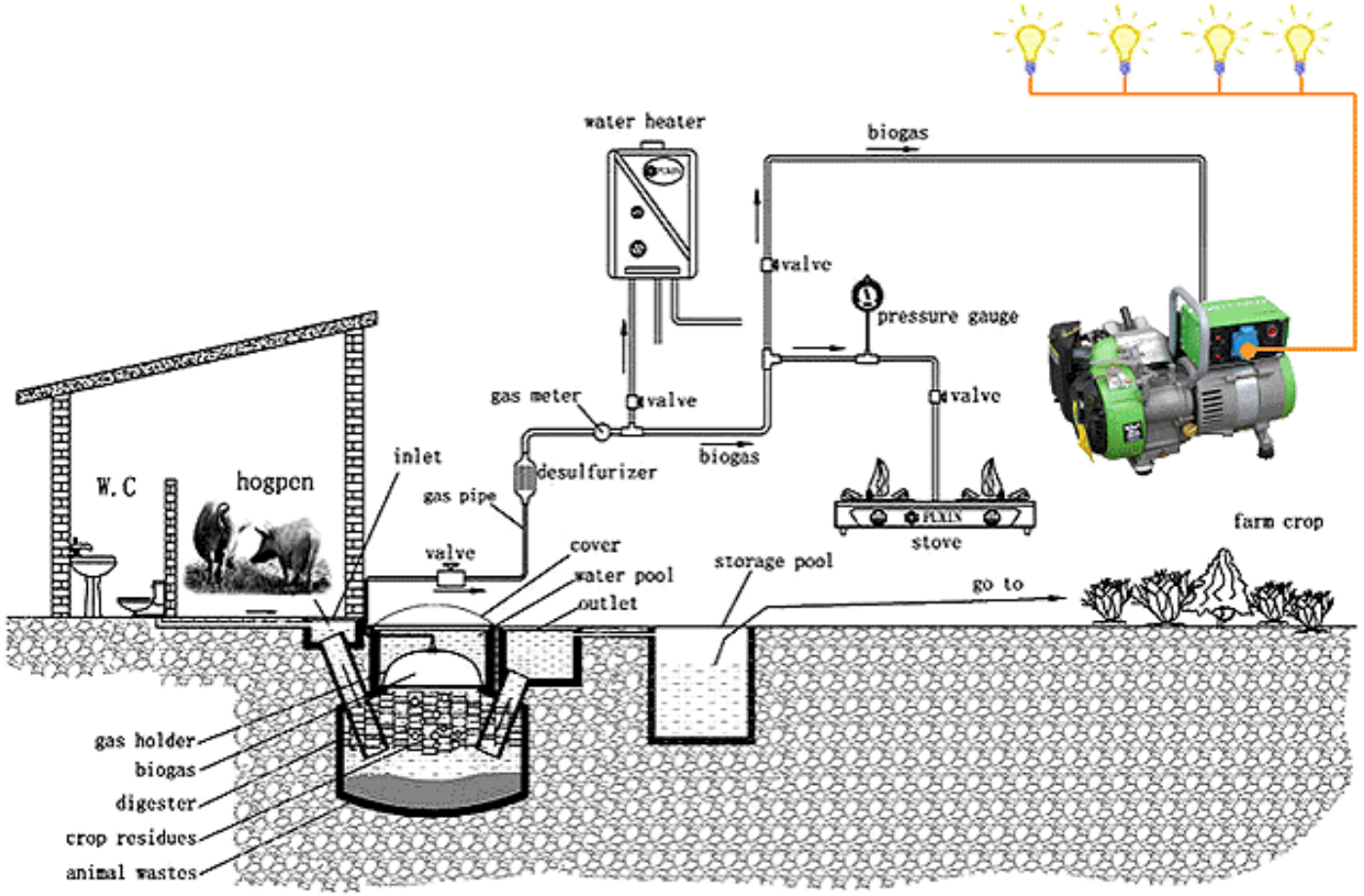
BIOGAS YIELDS (cntd)

The country has an estimated biogas potential of 2.1x107 MJ from animal waste. This is equivalent to 5.83 GWh of electrical energy per annum.

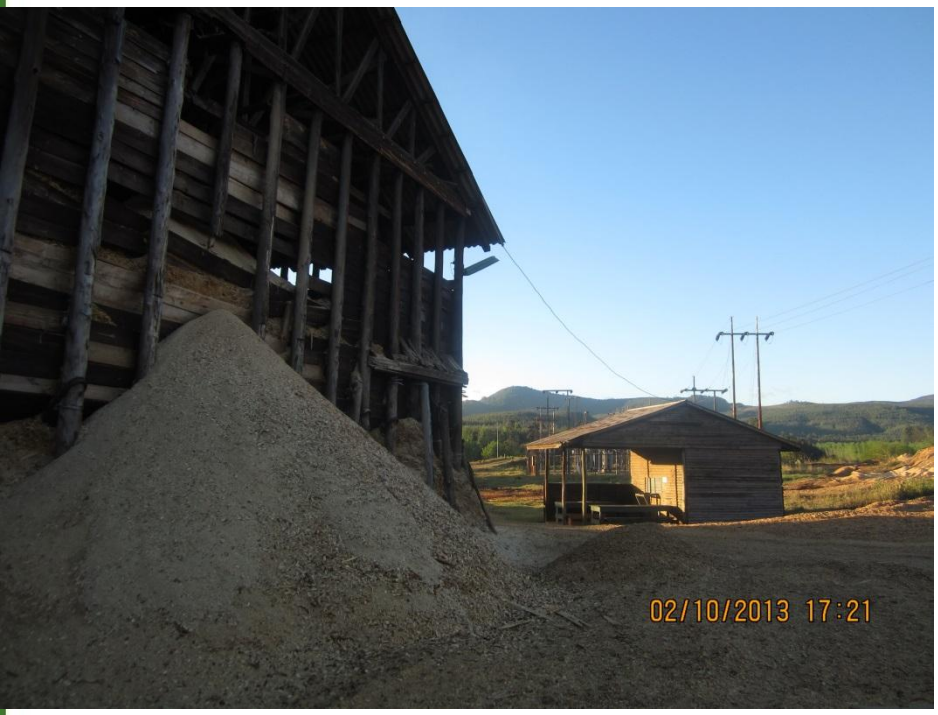
Electricity saved through the use of biogas can then be redirected to other key sectors of the economy.

Biogas is a clean and reliable energy source.

Schematic of a biogas plant used for power generation



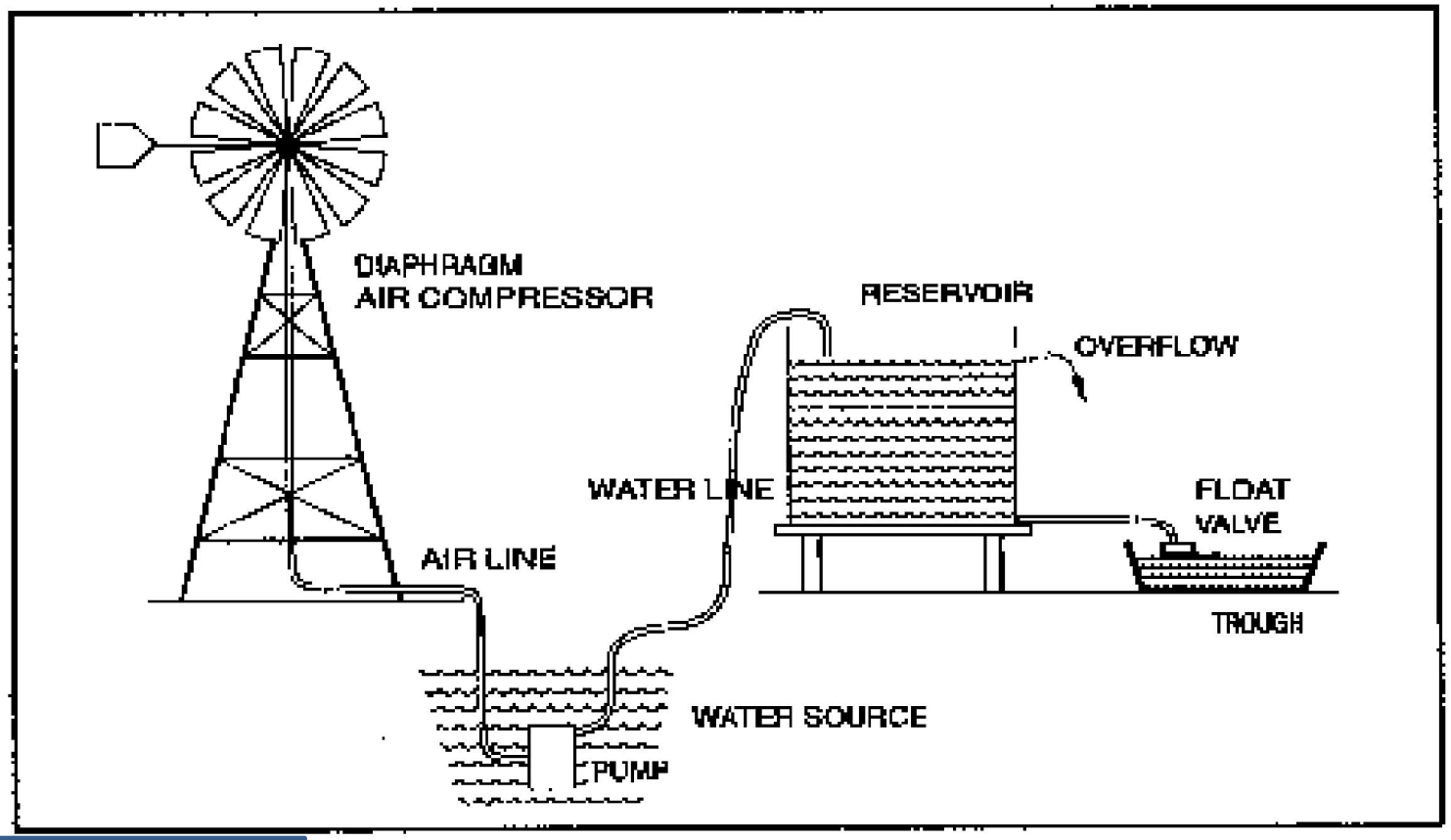
BIOMASS ENERGY



BIOMASS ENERGY Cont'd

- Sugarcane residue bagasse is used for electricity generation as well as the timber sawmill waste e.g. border timbers 0.5MW
- Chisumbanje (18MW), Triangle(33MW) and Hippo valley (45MW) are producing electricity for their own consumption using bagasse
- Biomass can also be used to produce gas through the gasification process.
- Biomass waste can also be used directly in tobacco curing

WIND ENERGY

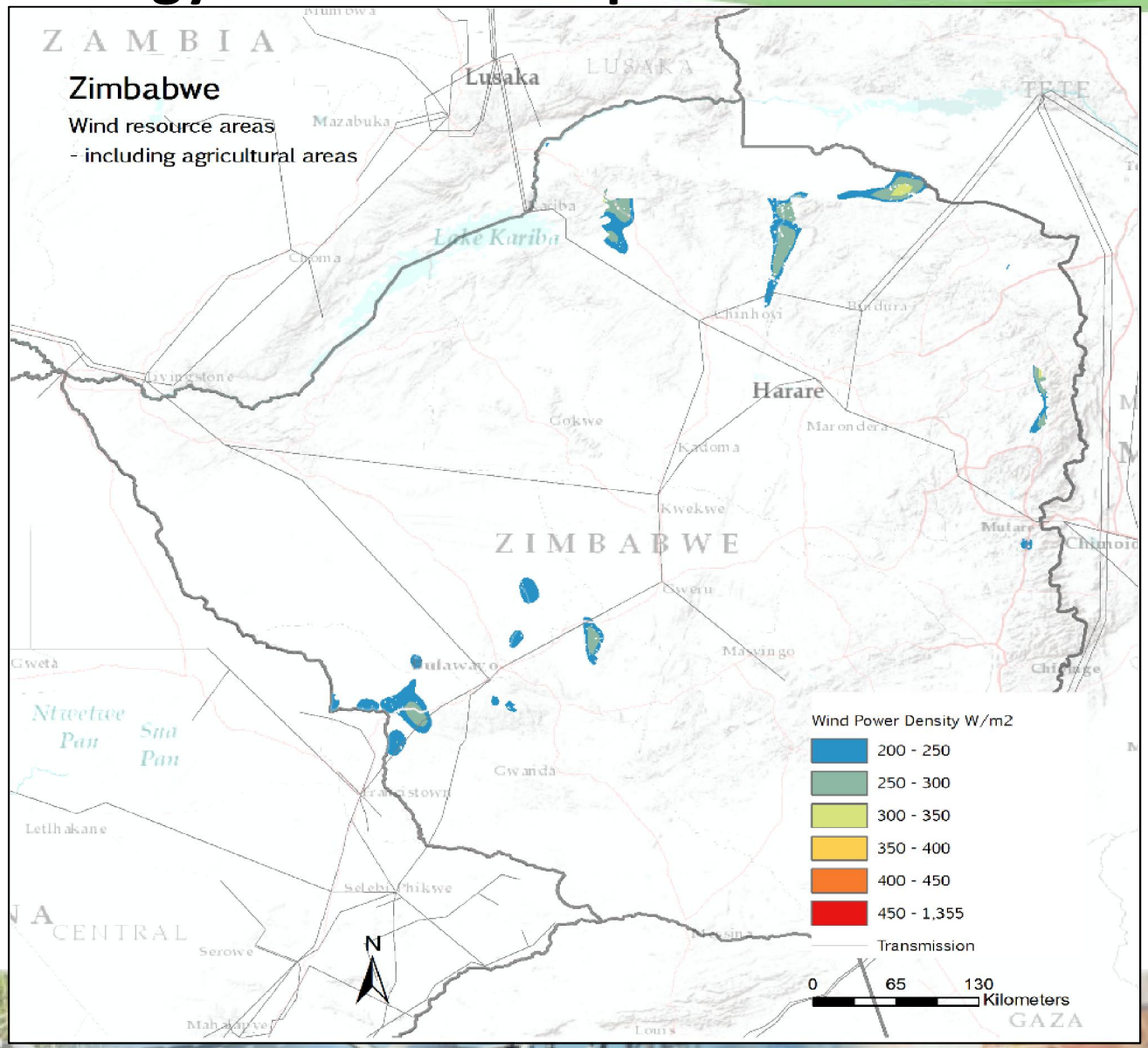


Wind powered (air-activated) pump layout.

WIND ENERGY USE

- Wind energy is used for water pumping to meet all farm requirements by use of windmills.
- Zimbabwe has also potential to generate electricity using wind at a hub height of 80m. This is confirmed by an IRENA study conducted last year

Wind Energy Resources Map for Zimbabwe- IRENA



CONCLUSION

- Farmers should exploit the abundant RE resources in Zimbabwe in a bid to have an energy and food secure country
- Use of RE resources e.g. as solar, biomass, biogas, mini-hydropower and wind are alternatives to the main grid electricity (ZESA supply)
- Farmers are encouraged to embrace RE technologies and move away from solely relying on ZETDC power to ensure food security
- ZERA to introduce net-metering which will benefit farmers who generate electricity using rooftop solar PV generators

Thank You

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