

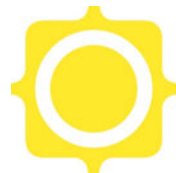
QUBE
renewables

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Rice Straw to Biogas



dryQUBE

QUBE Renewables Ltd design and build small scale local embedded biogas energy generating systems

*QUBE views biodegradable wastes **not** as a problem but as a **valuable resource***



 **bioQUBE**



 **quickQUBE**



 **powerQUBE**



 **lagoonQUBE**



Our History

- 2011 MOD requested a solution for Forward Operating Bases in Afghanistan
- Fuel costs over \$200 per litre



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Our History

- 16 systems built to date and operating from Canada to Cambodia



The Problem

- Rice is the world's number one food crop - 200 million small scale rice farmers worldwide
- Each year globally 300 million tonnes of rice straw are burnt as waste or left to rot in the field producing around 8.4 giga tonnes of carbon a year.
- A wasted resource – rice straw has massive GHG emissions and burning it causes chronic pollution



- Could we make biogas (energy) from Rice Straw to reduce the problem of rice straw burning?
- Could we increase the value of Rice Straw through processing?
- Could we make this a viable business?
- Farmers in the Haryana region are now able to turn their problematic rice crop residue into electricity and cooking gas.
- Scaling this up in partnership with Haryana Agricultural University should help combat Delhi's annual air quality crisis





The dryQUBE system

- Harvest both the straw and the rice, bringing them back centrally
- Very quick to install onsite (less than 2 weeks)
- Modular and cost effective fabric digesters
- Add value to the biogas by making various products for cooking, running generators or upgrading as a fuel for vehicles
- Create a fertiliser with the spent rice straw and use that for the next rice crop



Once filled and sealed the rice straw will start to produce biogas. A liquid fraction containing the methane producing bacteria is circulated through the rice straw.



The biogas production process can be speeded up and the efficiency increased by the addition of liquid manures or by 'seeding' the digester with leachate from another digester.



From 150 tonnes of rice straw in a 'batch', expected biogas production will be about 11m³ per hour with a total of around 30,240m³ from each batch.



The Business Potential

- Create a market selling raw or upgraded biogas - Value & Service Proposition
- Potential to subsidise the costs of fuel up to 30% by trading the Carbon Credits, associated with clean fuels and reducing fugitive emissions
- Roll out a large number of these simple digesters as a social enterprise - local energy and fertiliser

QUBE Dry Qube Gas Estimator

Digester size	1,000 m3
Feedstock Density	150 kg/m3
Tonnes	150 tonnes
Theoretical Biogas Yield	336 m3 per tonne
Total Theoretical Biogas Yield	50,400 m3
Dry digestion factor	60% factor
Biogas Production	30,240 m3
Days in digester	120 days
Biogas per day	252 m3/day
Biogas per hour	11 m3/hr
Capital	£66,116
	160,272 energy as kWh as heat
	350,705 equivalent to hours of cooking at 1.5kW
	48,082 OR as kWh of power at 30% efficiency
	15,120 m3 Methane in the biogas
	9,919 Kg of methane
	247,968 As a GHG saving on CO2e terms

150 tonnes of rice straw processed per 'batch'

Control panel and Hi Rate digester

Additional high rate system to increase biogas production

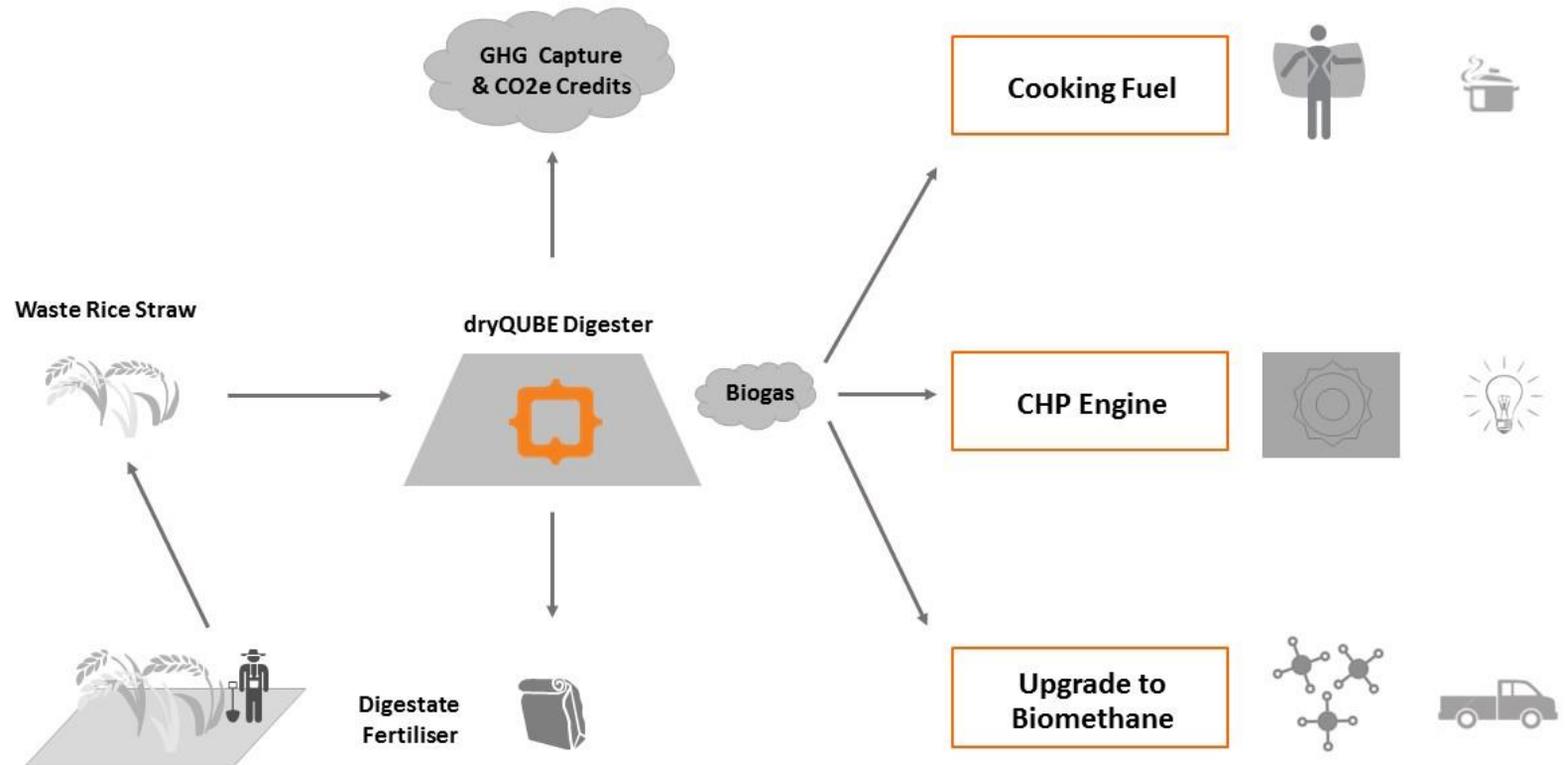


Batch system to enable filling and emptying of digesters to coincide with harvest cycle

20m x 20m diameter* = 1000m³ capacity

Biogas and biomethane upgraded for vehicle fuel
~30,240m³/batch

*digesters available in various sizes



Thank you



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