Use of Solid Agro residue as fuel

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Energy has been a pivot of economic and industrial development in countries.

- There is a strong correlation between national economies development and energy consumption.
- Energy is important in achieving food security and sustainable developing goals.
- ➤In this millennium, however, the type of energy is very important. It must be renewable and reduces greenhouse gases.



- Bioenergy is promoted as a means of improving energy security, food security and mitigating climate change.
- ➤It offers new opportunities such as investment in agriculture, new market opportunities, job creation, economic growth, rural development.
- The efficient utilisation of bioenergy has the potential to reduce GHG emissions.
- In Ghana, bioenergy is known to provide over 60% of energy for cooking and heating.



> Biofuel can be gaseous, liquid or solid.

- > Most biofuels consumed in Ghana are solid biofuel.
- Solid biofuel are convenient and affordable, require no special energy conversion equipment.
- Unfortunately, mostly of the solid biofuel consumed are forest derived woody biomass.
- The Biomass can come from a variety of biomass can also be woody, herbaceous, and agriculture residue.



Promoting Solid fuel usage from agro-residue will ensure availability of cheap and sustainable energy.

- ➤It will also reduce pollution from open field burning of this residue and time spent by women and children in search of fuelwood.
- Reduce greenhouse gases emissions and improve the health of our forest.
- ➤To utilise agricultural biomass: Technology is require to convert mostly loose agro-waste into solid biofuel.



Agriculture residue

> In Ghana, agriculture sector is largely subsistence.

- >About 80% crop production, 10% percent livestock, poultry and fishery and 10% forestry.
- \succ Some of the crops are:
 - Tree crops: cocoa, oil palm, coconut, coffee, sheanut.
 Cash crops: cassava, yam, rice, maize, sorghum.
- Due to the diverse nature of agro-residue in Ghana, technology to utilise the residue from all these crops must be versatile.

export.gov/usoffices, gipcghana.com



Biomass Properties

➤Fuel properties is important and forms the basis for selection of appropriate conversion technology.

- Rejection or acceptance of a biomass depends on the fuel properties.
- Some important fuel properties of biomass are:
 - ➢Proximate composition.
 - ≻Ultimate elemental.
 - ▷Presence of sulphur and chlorine.
 - ≻Higher and Lower Heating Values.
 - ≻Ash elemental composition.
 - ≻ Presence of PAH, PCB, PCDD.
 - ≻Trace element.



Availability

Biomass	Type of Residue	Availability (Mt/yr)
Maize	stalk	2.70
	Husk	0.34
	Cobs	0.49
Rice	Stalk	0.77
	Husk	0.12
Oil Palm	Shell	0.13
	Fibre	0.28
	Bunches	0.33
Coconut	Shell	0.12
	Husk	0.075
Сосоа	Pods	0.84

Kemausuor et al, 2014



Feedstock: Maize(Stalk, Cobs, Shell), Coconut (Shell, Husks), Rice (Stalk, Shell), Oil Palm (Bunches, Fiber, Shell), Cocoa (Pod), Prekese, Noni.





Solid Agro-residue Biofuel

- Unprocessed, Pellet or Briquette (Carbonised or Uncarbonised)
- Densification is the process of increasing the density of loose biomass under high pressure and temperature.
- > It is use to produce pellet and briquette.
- Densification increases the energy per unit volume, decrease transportation and storage cost of the biomass.
- Residues with high lignin content can be densified at high pressure with no binder.



Processed Solid Biofuel: Pellet ¹¹



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Processed Solid Biofuel: Briquette ¹²



mwampamba et. 2013



Processed Solid Biofuel



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mwampamba et. 2013

Proximate Composition



Oil Palm and Rice residue



Energy Properties

Sample	Sulphur Content (%)	Calorific Value (MJ/Kg)
RICE HUSK	0.306	15.85 - 16.11
RICE STRAW	0.206	14.50 - 16.16
OP - BUNCHES	0.331	15.10 - 16.14
OP - FIBRE	0.491	14-28 - 16.15
OP - SHELL	0.467	15.96 - 17.20
Monkey Bread	0.020	24-50 - 26.61
Noni Fruit	0.230	17.20 - 19.6





- Agricultural Industry Commercial Product Limited (AICPL) is a biofuel production company located at Bamang near Bonwire in the Kwabre East Municipal of Ashanti Region.
- > It was commission under the government 1D1F project.
- **Raw material**: Rice husk and Sawdust
- Equipment: Rotary Carboniser, Miller, Mixer, Briquette marker.
- > **Products**: Briquette and Biochar.
- Install capacity: 20 tons of char per day



AICPL Briquette

TEST CONDUCTED	UNIT	RESULTS
CALORIFIC VALUE	MJ/kg	26.43
MOISTURE CONTENT	%	7.18
ASH CONTENT	%	29.73
VOLATILE MATTER	%	14.91
FIXED CARBON	%	48.18
SULPHUR CONTENT	%	0.37
DENSITY	g/ml	0.33



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THANK YOU



