

#### COP 23, IRENA SIDE EVENT, Bonn Zone, Germany



#### RENEWABLE ENERGY SOLUTIONS FOR FOREST CONSERVATION AND REDD+ IN GHANA - Various Biogas & Cookstoves Options Booming in Ghana







#### **Presented by:**

Lovans Owusu-Takyi



#### Director

- Institute for Sustainable Energy and Environmental Solutions (I-SEES)
- College of Tropical Agriculture KITA Executive Board Member
- Global Ecovillage Network Ghana Vice President
- Biogas Association of Ghana, (Executive Member)
- Ghana Alliance for Clean Cookstoves (GHACCO) Executive Member
- Ecosystem Based Food Security Assembly Energy Focal Point
- Youth Volunteers for the Environment YVE Ghana Exec. Member
- African Youth Initiative on Climate Change Ghana Member



### **Brief Introduction of the Institute**



- The Institute for Sustainable Energy and Environmental Solutions (I-SEES) is
- research, training and development oriented institution based in Ghana

Mission:

- identifying (through research),
- **promoting** (awareness creation and training) and
- **deploying** (market deployment) of
- innovative solutions and technologies in
- Renewable energy, climate change, environment, water and sanitation for improving the livelihoods of households and small enterprises in Ghana and Africa.
- Website <u>www.iseesghana.org</u>



# **Thematic Areas of Operation**

#### Renewable Energy & Energy Efficiency

#### Natural Resources – Forestry, Fisheries and Agriculture – REDD+,

Environment -Climate Change and Biodiversity Conservation

WASH – Water, Sanitation and Hygiene

### Objectives we strive to achieve

- **Reducing energy expenditure** for vulnerable communities through efficient solutions
- Reducing exposure to air pollution from traditional heating and lighting by Improving the health and livelihoods of vulnerable women through promotion of climate smart technologies – promoting clean Cookstoves and solar lighting solutions
- Empowering young people with entrepreneurial skills and innovative ideas to reach their potential through training and business incubation
- Enhancing biodiversity conservation and sustainable utilization of natural resources of vulnerable communities through participatory approaches
- Improving Sanitation and Hygeine through sustainable waste to energy technologies, recycling and reuse for improved health and environment of households and communities
- Contributing to food security and poverty reduction through conservation agriculture in attainment of the sustainable development goals and climate change mitigation



# How we do it

### Training

Technical, Vocational and Entreprise-based skills training (seminars, short courses, academic courses, workshops)

### Research and Policy Advocacy

Evidence based research for policy advocacy and market intelligence advisory

### Consultancy

 Professional Advisory Services, research, market study, feasibility analysis,

### **Community Development**

Technology Deployment & Marketing

- Outreach, awareness, education and behavioral change communication, livelihood empowerment
- Market Development of innovative products and technologies through inclusive business models

**Business Development** 

Support for SMEs, business incubation, financial management, marketing, records, Bss plan dev't

#### **TECHNOLOGY DEPLOYMENT & MARKETING UNIT**

Center for Renewable **Energy and** Energy Efficiency

Center for **Biodiversity** Conservation and Natural **Resources** 

Center for Sanitation **Research and** Technology Development







Solar Home System



Solar Home Lighting



Solar Home Lighting



Prime Cook Stoves & Fuels



Water Filters



**Tree Planting, Aforestation** & Improved Charcoal Kilns



Affordable Solar Lanterns



Improved Household Charcoal Cook Stoves

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Cook stoves for food processing (Gari roasting & Fish smoking)



Coconst oil, Palm kernel & Groundaut







Institutional Gook Stoves

tivitles:	Training, Consultancy, Research, Community Development & Technology Deployment	
tors:	Renewable Energy, Climate Change, Environment, Natural Resources, Water Sanitation And Hygiene (WASH)	
ations:	Accra - Madina Estates, Near UPS, Rawlings Circle Kumasi - Domeabra-apromase, Near Knust, Off Oduom Junction	

Email: info@isecsonlinc.org Website: www.isecsonlinc.org Tel: 0264108268 / 0268193856

### I-SEES PART OF AN ACCREDITED COLLEGE OF TROPICAL AGRICULTURE



#### **Focused** on

- Renewable Energy and Energy Efficiency,
  - Climate Smart Solutions,
- Environmental Conservation, biodiversity and Natural Resources Development
- Water, Sanitation and Hygeine



#### Focused on

- Agriculture and Food Security
- Competency based training of youth in Technical Vocational Agriculture to Diploma Level
- Extension Services to farmers on conservation agriculture and improved farming practices

### **ISEES is prominent in with various national**

### networks in Ghana

- Ghana Alliance for Clean Cookstoves GHACCO to drive adoption of clean Cookstoves and fuels in Ghana www.ghacco.org
- Biogas Association of Ghana to promote biogas technologies as solution for sanitation and waste management and energy and agric. www.biogasassociationgh.org
- Ecosystem Based Food Security Assembly Enhancing ecologically sustainable approaches to food security and renewable energy and environmental sustainability www.ebafosa.org
- Ecovillage Network Ghana– Ensuring sustainable community development through wholistic and participatory approaches involving socio-economic, ecological and workview models towards climate change adaptation www.ecovillage.org
- Permaculture Network Ghana promoting ecologically sustainable practices towards forest conservation, food and energy security and strengthening vulnerable communities www.permacultureghana.wordpress.com
- Youth Volunteers for the Environment YVE Ghana building capacity of youth through innovative volunteerism to be involved in green economy, environment and climate policy decision making and sustainable development www.jve-international.org – school clubs education on energy and environment among others.











### Rich in culture and natural resources, and





- Ghana is rich in Culture and resources
- Rich in ecological zones
- Various species of animals, birds, elephants, monkeys, waterfalls etc.
- Many ethnic groups
- An ethnic group
- Matrilineal and patrilineal forms of inheritance
- 70 % of Ghana's ethnic groups are matrilineal
- Women are responsible for the women so they own the land

### Ghana's Renewable Energy Resources Potential



Wind energy (along coast) 5.0 m/s at 60 metres height

#### Entire land cover has potential for energy crop / biofuel cultivation.

- Municipal waste is
   2 million tonnes/annum;
- Wood residue is 2 million tonnes/annum

#### HYDRO POWER SITES IN GHANA



#### Hydro (≤100MW) 700MW

POLICY is to increase RE contribution for power generation by 10% by 2020

### Ghana, Investment ready

- Sound policies creating the enabling environment for renewable energy uptake
- Active private sector with skilled labour and businesses – ready for cooperation
- Gateway to Africa strategic business location to serve most West African and African countries.
- Favorable conditions and peaceful nation supporting private sector investment





National Energy Policy and Action Plan Renewable Energy Act

> Sustainable Energy for All Action Plan Renewable Energy Master Plan

Enabling policy Environment for Renewable Energy Solutions

Major bottleneck with Policy (Energy Trilema Index of WEC - 96 out of 125 countries in policy implementation) **Draft Bioenergy Policy** 

Forest Plantations Policies -

Ghana Nationally Determined Contribution to climate change

Prioritize Clean Cookstoves , Solar and Biogas solutions as critical to climate mitigation

Implementation Challenges - Institutional capacity, Financing and Investment, technical expertise

### **Enabling policies**

Policy	Key issues related to RE, Environment and Industry	
Constitution of Ghana, 1992	<ul> <li>Parliament to pass all laws on the environment</li> <li>State to promote the development of agriculture and industry</li> <li>Citizens to protect and safeguard the environment</li> </ul>	
Environmental Sanitation Policy, 2010	<ul> <li>Promote waste reduction, re-use, recycling and recovery</li> <li>Ensure that sites for treatment and disposal of waste (landfills, composting facilities, waste stabilization ponds, trickling filters, septage treatment plants, etc.) are safe and hygienic</li> </ul>	
Local Government Act, 462, 1993	<ul> <li>Places waste management under MMDA responsibility</li> <li>Encourages private sector involvement in waste management</li> <li>MMDAs to ensure drainage and sanitation in buildings</li> </ul>	
National Water Policy, 2007	<ul> <li>Seeks to minimize the pollution of water sources from poor environmental sanitation services</li> <li>Ensures the provision of water and sanitation services</li> </ul>	
National Urban Policy, 2012	<ul> <li>Recognizes poor sanitation in poor neighborhoods</li> <li>Acknowledges that environmental deterioration arises from unsatisfactory waste collection, disposal and treatment</li> </ul>	
National Energy Policy	<ul> <li>Encourages investments in renewable enegy</li> <li>Bioenergy policy calls for recycling of waste to energy</li> </ul>	
RE Master Plan + SE4ALL Strategy	- Prioritized investments in biogas, cookstoves and bioenergy solutions	

# Why Ghana?

- Population about 26 million people with a growth rate of 2.2% per annum
- This demonstrates a big market for business growth.
- Robust SE4all action plan that encourages private sector partnership
- 10.6% labour force
- 14.1% growth rate with industry contributing to about 41.1%
- 84% of population still requires energy



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### **COUNTRY PROFILE.- PROBLEM STATEMENT**



### State of Cookstove & Biomass Fuels Sector

- 70% reduction of forest cover largely via unstainable woodfuel collection and Charcoal Burning.
- 84% households use solid fuels.
- 21% impacted by Indoor Air Pollution.
- 17,000 deaths every year with 50% being children (WHO - 2017)
- 30% low awareness of health, economic, and environmental impacts.
- LPG penetration rate is 26% lower than expected target of 50% to be achieved by 2020.
- Media campaign/ education on sector issues very minimal



### **Biogas Industry Status**

- About 400 biogas systems built in Ghana still a long way to go!
- About 20 companies so far recorded involved.
- Sound Government policies with programs to built about 200 institutional biogas systems for high schools, prisons and hospitals
- Growing association of practitioners
- Sound sanitation policies influencing district assemblies to adopt biogas systems
- Large feedstock suitable for biogas
- **Common Types of Biogas include:** fixed-dome, floating drum and Puxin technologies.

### Industry status and Types of biogas in Ghana

#### » Fixed Dome



#### » Anaerobic Baffled Reactor (ABR)







#### » Floating Drum



# **Biogas Association of Ghana**

- A multi-stakeholder platform of practitioners, promoters, researchers, institutions, development partners who are coming together
- to promote the development of biogas in Ghana,
- enhance standardization and quality improvement in the sector
- Build capacity of members
- Attract investment in the sector
- Enhance information sharing

# **Membership of BAG**

- **1.** Biogas Construction companies
- 2. Biogas Equipment suppliers
- 3. Consultants
- 4. Researchers
- 5. Educational and Training Institutions
- 6. Investment partners
- 7. Development Partners
- 8. Financial institutions

### **Biogas Market Potential and Demand**

- Sanitation sector requires
- Households 5 million households in Ghana
- Educational institutions
- Animal farmers piggery, cattle, about 2.7 million household operate a farm or keeps livestock.



### **Biogas Market Potential and Demand**

- Small agro-processing enterprises Palm oil producing industries, shea butter processing industries etc.
- Estates, Residential and commercial
- District and Municipal sanitation and waste treatment
- Biogas bottling and distribution
- Bio-fertilizer production and distribution for agriculture





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# Challenges in the sector

Many not functioning well or not at all, due to:

- Low level of technical expertise of biogas company
- 'Improper' design
- Usage of low quality materials
- High cost of biogas to end-users
- Lack of maintenance
- Improper usage

These issues can be properly addressed in a programmatic approach



# Investment opportunities

- Improved technology
- Biogas service companies for maintenance and trouble shooting
- Equipment supply gas generators, de-sulphurizers, gas holders,
- Joint project development
- Training and Capacity building

# A Section of Projects in the Biogas

### Sector

• There are a number of demo projects that also gives us lessons on improvements needed for scale up of biogas in Ghana



B-Bovid Oil Mills



B-Bovid Palm Oil Mill



Palm Oil Sludge on B-Bovid Mill



Oil Palm Fibre Waste on B-Bovid Farm



# HPW Fresh and Dry Biogas Plant

- HPW Fresh and Dry Biogas Plant
- HPW is a fruit processing company located at Adeiso, in the Eastern Region.
- Two 450m3 concrete biogas digesters and three 100m3 gas holding balloons.
- Averagely 500m3 of gas is produced daily from the plant.
- Effluent re-circulated to the farm

# HPW BIOGAS COMPONENTS









#### Safi Sana Biogas Plant



- Digester capacity 2500 m3
  - 100 kW biogas generator to generate electricity.
- Faecal matter, slaughter waste and organic waste from the market is sourced for feeding
  The treated plant effluent used as bio fertiliser for growing seedlings
- PPA with ECG for offtake of electricity generated

Ghana Oil Palm Development Corporation (GOPDC) Biogas Plant

- GOPDC extracts and refines crude palm oil and palm kernel oil at Kwae in the Eastern region of Ghana.
- It has about 22500 hectares of oil palm plantations at its Kwae and Okumaning estates.
- The processing plant produces an average of 210,000 tonnes of oil per year.
- The palm oil mill effluent (wastewater) is harnessed for biogas production.





Effluent from the Mill being disposed and channeled into the biogas reactor

### Ghana Oil Palm Development Corporation (GOPDC) Biogas Plant

- Two 1000m3 biogas plants produces about 18000m3/day biogas for heat and steam generation for the refinery plant processes.
- Displaced the 615,000 litres of diesel that was previously consumed by the plant per year.
- The Plant cost 4.5million euros with a payback period of 11 years.
- This is a huge investment for many Palm Oil Mills – need for financial support





Slurry is treated in a pond before used as fertilizer for plantation.

### Municipal Waste Management - Kumasi

### Landfill and sewerage treatment



Landfill Sited at Dompoase

#### Dompoase Landfill Site

- 100-acre landfill project with modern waste management facilities
- Project funded by the World Bank
- The landfill site is managed by the Kumasi Metropolitan Assembly (KMA)
- J Stanley-Owusu (JSO) operates the engineered landfill and sewerage treatment plant under a contract with the KMA
- The site is designed for a period of 15 years with three phases and has been used for 11 years
- Nine ponds at the site for treatment of sewage waste after which it is channeled into a nearby river body
- The tapped gas was being flared after testing on site at the time of visit
- KMA plans to use the landfill gas for power generation for Guinness Ghana Ltd. in Kumasi
- The site will be used for a recreational site when the landfill is exhausted. 32

### **Biogas Plants for Hotels – Ntiamoah Hotel**





- 10m<sup>3</sup> biogas facility with effluent storage
- Constructed in 2007 by Beta Construction Engineers Limited
- The gas produced is used for cooking in the kitchen on a biogas stove
- The spent sludge is pumped from the effluent storage for watering the hotel garden
- No gasholder. Excess biogas is released to the atmosphere to prevent excessive pressure build up.

### Biogas for Shea Waste Processing in Northern Ghana CRIG Biogas, Bole



- 50m<sup>3</sup> and is capable of generating 12m<sup>3</sup> of biogas daily.
- Shea butter processing effluent used as feedstock for the digester
- Biogas used as fuel in roasting shea kernels
- Biogas is also used to power the shea kernel grinding mill
- Major challenge is the pungent smell of the biogas due to the absence of a H<sub>2</sub>S scrapper. 34

#### Key Findings: Initiatives by Educational Institutions

### Kumasi Institute of Tropical Agriculture (KITA), Biogas

**Institutional Biogas Facility** 



KITA Biogas facility

- First facility under the institutional biogas project sponsored by SNV
- Implemented by the Centre for Energy, Environment and Sustainable Development (CEESD)
- The biogas facility cost C70, 000
- Constructed in May 2015.
- 9-seater toilet, 40m<sup>3</sup> fixed dome digester with a gas holder and effluent storage
- 15 kVA biogas generator is used to generate power for lighting on campus
- The major challenge is the low pressure of the biogas
- Aimed at piloting the use of human waste for electricity generation.



#### FINAL ENERGY CONSUMPTION IN 2011 - (8135.9 ktoe)



Source: EC 2011Energy Statistics; Graph by: W.A. Togobo 2013

• More than 56% of final energy is used for cooking and heating.






Study of the Charcoal Value Chain and its implications on food-waste-energy and Environment nexus

98% of producers extract wood for fuel from natural sources



70 species reported by producers being extracted for fuel around Ghana

Most frequently extracted are native hard wood species

- with high calorific values
- Anogeissus, Ptericarpus; Mangroves, Celtis; Albizia,
- Vitellaria paradoxa, Khaya, Etc.





#### **RESOURCE GOVERNANCE** DECLINING STOCKS OF PREFERRED FUELWOOD SPECIES



- All year round production of fuelwood and charcoal
- Uncoordinated inter-sectoral efforts for forest resource management
- No standard management of fuelwood resources except natural regeneration





Hardly any effective policy to regulate exploitation, marketing and trade in fuelwood and charcoal

 Commercial producers – walk 5-20km to harvest wood for charcoal

# Charcoal Production has contributions to deforestation in some regions

- Majority of processors uses Traditional Kiln method-14% efficient
- Improved method 25% efficient but are least used
- Need for policies to regulate the sector requires improved carbonization methods for local people and feedstock development
  - Improved casamance kiln reduces the amount of wood used and yet ensures good quality charcoal is produced.







Metal Kiln (INBAR-Daboase)



### Woodfuels – Major Issues

#### • Energy Security.

- Growing imbalance in woodfuel (firewood & charcoal) consumption and yield.
- 1 Ton charcoal requires 5 Tons wood

### Climate Change Mitigation

 Environmental threat due to bush fires, land degradation among others

#### Health and Sanitation

 Smoke and indoor air pollution from inefficient woodfuel use





### Woodfuels – Major Issues & Challenges

- Employment and Social Welfare
  - Woodfuel (firewood and charcoal) production are the main source of income for the poor majority in the dry seasons.
  - It is also the main source of revenue for most deprived districts.
  - Policy to regulate and license this activity has direct impact on the social livelihood of the poor.







# Implications of fuelwood and charcoal consumption on deforestation and livelihoods of vulnerable communities

- High rate of deforestation in northern Ghana – due to charcoal production for urban consumption
- In northern Ghana, economic trees such as shea butter are now being used for fuelwood and charcoal production, by communities
- In Coastal areas High rate of mangrove depletion for use as firewood

Continued impact on Communities

• Threatening the livelihoods and **eco**system of rural households and people living in island communities

Right Pic - Shea trees being cut and transported for firewood



A mangrove fuelwood market at Anyanui – a coastal community in Keta, Ghana



Sustainable Solutions for Addressing Woodfuel Consumption for Forest Conservation in Ghana

- SUSTAINABLE WOODLOTS DEVELOPMENT
- SUSTAINABLE MANAGEMENT OF FOREST RESERVES
- USE OF TIMBER OFF-CUTS FOR CHARCOAL PRODUCTION
- AGRO-FORESTRY FAST GROWING MULTIPURPOSE TREES AND BAMBOO
- PROMOTION OF FOOD ENERGY CROPS WHOSE RESIDUE CAN BE USED FOR FUEL FOR COOKING
- BIOMASS & AGRO-WASTE UTILIZATION FOR CHARCOAL, BRIQUETTES AND PELLETS PRODUCTION
- USE OF IMPROVED CONVERSION TECHNOLOGIES
- PROMOTION OF END-USE DEVISES CLEAN COOKSTOVES



### NUTITIE DAS SEGENAMES ENERTY AND DATIONNEL SECURING

# Renewable Charcoal Development - Sustainable Fuels

- Charcoal Briquettes from Bamboo, Coconut waste, palm kernel
- Bamboo plantations as alternatives for fuel
- Improved Kilns Development for Charcoal Producers
- Charcoal from Feacal Sludge
- Charcoal briquettes from cocoa pods, cashew among others
- Global Bamboo Limited and Zaacoal Co. Limited examples.









# Sustainable Woodlot plantations and Agro-forestry







## Pellets and Briquettes from food-energy crops and biomass fuels in Ghana



**Coconut shells** 



Corn cobs



Coconut husk

Rice husk pellet







Sawdust





Sawdust pellet Rice straw Figure 3. Some Types of Fuels Used in Ghana

Wood chips

#### Crop Residue Generation from agricultural crops in 2011

Biomass type	Annual Decelustion	Field based	Processing	Theoretical
	(t)	residue	residue	residue (t)
Maize	1,699,134	Stalks		2,707,288
Maize	1,699,134		Husks	339,827
Maize	1,699,134		Cobs	486,802
Rice	465,967	Straw		771,641
Rice	465,967		Husks	119,986
Millet	183,922	Stalks		337,190
Sorghum	287,069	Straw		571,267
Groundnut	479,252		Husks/Shells	179,001
Groundnut	479,252		Straw	1,030,392
Cowpea	240,825		Shells	421,444
Soybean	164,511	Straw+pods		575,788
Cassava	14,368,535	Stems/stalk		890,849
Cassava	14,368,535		Peelings	3,592,134
Plantain	3,681,078	Trunks/Leaves		1,840,539
Yam	6,323,782	Straw		3,161,891
Cocoyam	1,345,149	Straw		672,575
Sweet Potato	43,834	Straw		21,917
Oil palm*	2,004,300		EFB	330,710
Oil palm*	2,004,300		Kernel shells	130,280
Oil palm*	2,004,300		Fibre	280,602
Coconut*	297,900		Husks	124,820
Coconut*	297,900		Shells	75,468
Sugarcane*	145,000	Leaves		16,554
Sugarcane*	145,000		Bagasse	25,375
Cotton*	26,500	Stalks		76,254
Cocoa beans*	903,646	Pods		835,873
TOTAL.				19,616,465

\*2010 Data

### Challenges in use of traditional Cookstoves: Household Cooking by 85% of rural and peri-urban communities















Alliance for





# SECTOR PICTURES: INNOVATION & TECHNOLOGY IN HOUSEHOLD COOKSTOVES.

**Improved Stoves and Fuels** 

Traditional Stoves



























### **Charcoal Stoves innovations in Ghana**



Jiko Stove Technology with clay liners – Predominant in Ghana Produced by 3 major companies – Toyola, Gyapa, Man and Man Enterprise and a number of artisans = Challenge is liners





Cookmate – metal stove Automated Production by Cookclean Ghana



Envirofit Stoves – assembled in Ghana



TOYOLA STOVES

# Firewood stoves technologies

- Jiko stove technology fuelwood stoves
- Clay and brick moulded stoves for households and institutions
- Fuelwood gasifier stoves Prime stoves, Elsa Stoves, Eco-safe stoves







# Pellet Based Stoves / Use of Agro-waste for cooking – Biomass Gasifiers

- Market under development but picking up
- Requires more investments in market development and awareness creation towards adoption
- Sector has grown since 2013 till 2017 and have potential to grow
- 3 companies producing pellets in Ghana



Prime Stoves, Elsa Biochar stoves, Abellon Pellets Stoves, Philips and ACE Stoves making entry

# **Bio-Ethanol Stoves**





- Introduced into Ghana 2014
- Market picking up in Ghana
- Requires the production of Bio ethanol in Ghana to drive adoption
- Currently stoves are imported from Nigeria and other countries
- Scale of sale about 100 a month

## LPG Stoves



- Lots of technologies
- Both households and industrial (food processing)
- Adoption rate high



### **Challenges**

- Safety of LPG challenges adoption by rural households
- Valve safety etc requires attention

ISEES promotes Improved stoves using agro-waste for households - with palm kernel shells and coconut husk



Renewable Energy Market Development Program - bringing RE solutions to the doorstep of grassroots -



# Promotional activities among women groups



## Exhibition at events and workshops



# Pop Up shops - to market RE technologies



# Initiatives to drive Adoption of

# clean Cookstoves in Ghana

- **Ghana Country Action plan** for clean cooking developed
- Vibrant Clean Cookstoves Sector Actors Ghana Alliance for Clean Cookstoves leading efforts towards adoption
- **Strong political will** for clean Cookstoves government agencies involved in driving adoption Min of Energy and Energy Commission
- Clean Cooking **integrated into national educational curriculum** to educate youth
- Need for supplier and end-user financing schemes to enhance the market – by increasing supply whiles driving demand
- New Standards and labelling framework being developed for Cookstoves in Ghana
- More sector support required for the Alliance to drive clean cooking in Ghana.

### **IMPACTS OF ACHIEVEMENTS IN A GLANCE**

Impacts in Ghana by 2017



**Adoption Goals** 

- 2.4m additional HH adopting efficient and clean cookstoves
- 5,700 lives saved
- 2,500 children's lives saved
- CO2eq reductions of 43m (mtCO2eq)
- 49k people employed by the sector
- 2.5% income saved





# Institutional Stoves for Productive Uses

- Very critical contributor to deforestation
- Uses larger volumes of fuelwood than household stoves
- Technologies being driven by donor projects
- Still requires a fair level of investment to drive adoption since it seems expensive for end-users
- However, its proven financially viable and combined with an innovative business model, adoption rate is high.

# Agro-Processing industries heavily dependent on forest resources as fuels

 Biomass Energy is required in all aspects of society to drive productivity

Most especially in the Agro-Processing Industry

- **Boiling** Palm Oil Processing, Palm Kernel Oil Processing, Mushroom Sterilization, Shea Butter Processing,
- **Roasting** Gari Processing, Groundnut roasting, Shea nuts roasting
- **Drying** Gari, Fish, Mushroom, Fruit Drying, Leaves drying, Vegetables,
- Smoking Fish



# Examples of interventions

### implemented and on-going

### Traditional Fish smoking technologies



Activity supported by the Canada Function Local initiatives

Activité réalisée avec l'appui du rds canadien d'initiatives loca es anada



### IMPROVED FISH SMOKING AND MANGROVES CONSERVATION







## **Baseline Technology**



Barrel Traditional oven	Chorkor Oven	Morrison Oven		
Efficiency; Baseline	Efficiency; Baseline	Efficiency; 37% over chorkor		
BaP 15; PAH4 72	BaP 22; PAH4 84	BaP 30; PAH4 110		
Where EU limit is BaP2: PAH 12				

Activity supported by the Canada Fund for Local Initiatives

Activité réalisée avec l'appui du Fonds canadien d'initiatives locales



## Improved Technology Overview

The Ahotor oven was designed by SNV, FRI,FC, Morrison Energy Services, Best Performance and Crispin Pemberton an international stove consultant.

- Reduced PAH deposit levels on smoked fish. (BaP 6;PAH 53)
- 32% more fuel efficient than Chorkor
- Similar to baseline design and user friendly
- A standard double unit costs about \$500.
- 30% discounted for early adopters.
- Users are trained on the use and maintenance of the oven.



#### Improved stoves for healthier Fish smoking - low PAH levels





# Improved Quality and health of

### smoked fish

## Fish smoked from Chorkor Oven

Quality of fish smoked from Ahotor Oven with low PAH levels for export and healthy local market.





Activity supported by the Canada Fund for Local Initiatives

Activité réalisée avec l'appui du Fonds canadien d'initiatives locales





# Women happy with the improved Ahotor

### **Oven**

EI CURENTIA Make

sauines on the

Firewood cost

about half or what I

previous y used for

the Chorkor oven ...

My family and I can now cook in the kitchen whilst smoking my fish without having to deal with a smoky environment".



### Approaches and lessons learnt



**Research & Baseline** 



Pilot new concept



Stakeholder involvement & Knowledge Sharing



Technology Development



Periodic monitoring


# **Gari Processing Stoves**

#### **Traditional Circular Gari Stoves**



Baseline is inefficient, unhealthy and 95% women run



#### Traditional Rectangular Gari Roasting



#### **Improved Rectangular GARI ROASTING Stoves**

**Chrisaach Stove** 

**Morrison Stove** 



## **Gari Production Project**

energising development



### WOMEN IN PALM OIL PROCESSING INDUSTRIES





Improved palm kernel oil stove using palm fibre constructed for some women groups with support from ECREEE and Austrian development Cooperation.

Other household stoves using palm kernel shells being explored (Prime Stoves, Elsa Stoves) in Ghana



INSTITUTIONAL STOVES FOR BOILING (LARGE POTS) – SCHOOLS FOOD VENDORS, AGRO-PROCESSING WOMEN GROUPS Cookclean Limited & Morrison Energy & Envirofit



Protecting and saving lives and our forests



# Financing and Sustainability SNV Model to Drive Adoption



Key factors for ICS Adoption

> Sustainable Business

Policy & Regulation

Promotion



**Approach – Facilitating Access to ICS through Sustainable Financial Products** 

## Challenges

High Stove Price

Use of existing pan in BA Reg. reduces stove price by 50%

Mini-Chrisaach now gives buying options Pitching on the Financial Viability of Gari Business

Competiting

demand of

FI's funds

Accessing Available Refinancing Options Supporting other ICS Entrepreneurs to develop products that meet acceptable efficiency, cost, user friendliness and health standards

Limited

options of

ICS

products

Peeling on Plastering (limited cases)

Avoiding the use of ordinary cement for plastering

Using treated local materials for plastering

**Risk Management Strategy** 



## **Gari Production (150kg bag)**

Quality **Product** 

#### Tropical Agriculture, ISEES/ CEESD awith funding from USADF Power Africa





## **Contact Us**

## Lovans Owusu-Takyi

Director Institute for Sustainable Energy and Environmental Solutions (ISEES) Box 658, University of Ghana Legon, Accra Kumasi office: Box 293, KNUST, Kumasi

> Tel: 0233-0244108268 Email: director@iseesghana.org lovanstakyi@gmail.com Website: www.iseesghana.org