EBAFOSA UGANDA BRIQUETTES REPORT

Affordable, Efficient domestic fuel Briquettes as alternatives to Charcoal and Firewood use to drive Climate Action implementation of Uganda

Introduction

Uganda has set timeline to achieve several Nationally Determined Contributions (NDC) actions sooner. Uganda seeks to mainstream climate resilience across sectors and develop early warning systems and robust monitoring systems by 2020, much earlier than originally planned[1]. Although Uganda's share of the total global GHG emissions is still insignificant, the country's sectors emission profile is growing with Agriculture as a leading source of GHG emissions and Land Use Change and Forestry (LUCF) as the second most significant source (Naturind 2020). However, the country is at risk of losing all its forests if deforestation in Uganda continues at its present rate there would be no forests left in 40 years (Josephat 2018). Under the growth and development scenario in 2015, Uganda's total emissions were projected at 77,381 Gg CO2 eq (77.3MtCO2eq/yr) also known as business as usual scenario. It is envisaged that implementation of prioritized measures in energy supply, forestry and wetlands will result into cumulative impact of approximately 22% reduction of overall national emissions in 2030[2]. It should be noted that in 2012, total emissions were estimated at 36.5 Mt CO2eq/yr in 2000 (Irish Aid 2018)

It is against this backdrop that EBAFOSA Uganda Leveraged EBA and clean energy to create climate action enterprises. This work has leveraged complementarity between EBA-driven agriculture with clean energy to unlock enterprises that scale both EBA and clean energy. In Uganda- Buganda Kingdom, cassava value chain is being enhanced by retooling[3] urban youths and rural women skills to make quality briquettes which are dried using solar dryers, which are more efficient and effective than open sun-drying. EBAFOSA Uganda has linked cassava famers mainly women to solar drying centers, where women use the waste from cassava and other agricultural waste to make quality briquette for their home use and commercial purposes. In particular, Sub-Sahara Africa and Uganda's energy sector is dominated by biomass, which contributes over 90% of the total expendable energy[4] and herein firewood and charcoal contribute more than 85%. The main use of biomass energy is cooking and or heating either as firewood or charcoal majorly by local households. EBAFOSA is promoting briquettes use and clean cook stove in Buganda Kingdom to help develop and drastically reduce people's dependence on firewood for cooking and provide employment to urban youth. This is scaling use of solar solutions and promoting climate action emprises as called for in Uganda NDCs but from an enterprise dimension that ensures durability.

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[1] GGGI Commits to support the Nationally Determined Contributions (NDC) Partnership Plan 2018 – 2020 for Uganda's Climate Action: https://gggi.org/gggi-commits-to-support-the-nationally-determined-contributions-ndc-partnership-plan-2018-2020-for-ugandas-climate-action/

[2] STOCK TAKE REPORT OF UGANDA'S NATIONALLY DETERMINED CONTRIBUTIONS (NDCs) AND NDC PARTNERSHIP PLAN IMPLEMENTATION: http://envalert.org/wp-content/uploads/2020/06/Uganda-NDC-Rapid-Situtational-Assessment_NDC-Implementation-Stocktake_May-2020_Final.pdf

[3] Structurally guiding and inspiring youth to improve, refine and adapt their skills, regardless of what they are, to provide clean energy and sustainable value-added solutions along the agro-value chain.

[4] FIREWOOD AND CHARCOAL PRODUCTION IN UGANDA: https://www.researchgate.net/publication/322854014_FIREWOOD_AND_CHARCOAL_PRODUCTION_IN_UGANDA

Uganda is at risk of losing all its forests if deforestation in Uganda continues at its present rate there would be no forests left in 40 years (Josephat 2018) due to deforestation Uganda experiences high rates of forest cover loss. Other reasons of deforestation include: poor rural electrification and costly electricity which makes 90% of Ugandans to use firewood and charcoal as the main sources of fuel to cook[5]. Large amounts of forests are also spent as trees are cut for timber and wood because the construction industry still greatly use timber rather than steel and other substitutes

Biomass is the predominant type of energy used in Uganda, accounting for 94% of the total energy consumption in the country[6]. Charcoal is mainly used in the urban areas while firewood, agro-residues and wood wastes are widely used in the rural areas. Firewood is used mainly on three-stone fires in rural households and in food preparation by commercial vendors in urban areas.

Through the waste recovery to domestic energy, this work is directly implementing Uganda's NDCs objectives. Specifically, those on reversing deforestation towards increasing forest cover to 21% and increasing cooing energy efficiency to 40% over traditional cooking. This is being achieved through the increased investment in fuel briquettes – a key source of efficient & sustainable biomass highlighted in the NDCs.

This work also enhances achievement of Uganda's Renewable Energy policy by providing affordable, efficient domestic fuel briquettes as alternatives to charcoal and firewood use. Specifically, the policy aims to reduce consumption of both wood and charcoal as strategic to combat both indoor pollution as well as deforestation.

Economically, waste recovery to briquettes not only taps into a ready market with over 80% to 90% of Uganda's population dependent on biomass, but stands to create up to 20,000 alternative jobs and over $60 million contribution to GDP by creative viable and affordable alternatives to charcoal and firewood. The briquettes made in a system thinking approach – where the waste feed-stock material is sourced directly from the by-product of cassava value addition, and final drying done efficiently using solar dryers, means reduced raw material costs and high quality briquettes at the end of the drying process. This coupled with local labour and expertise makes these briquettes cheaper or equivalent priced to charcoal. In addition, their longevity of burn, higher energy values and enhanced burning efficiency means less of the briquettes are used compared to charcoal and firewood for an equivalent cookery event.

The approach used to implement these actions was Innovative Volunteerism. Where actors of diverse skills were convened and guided to improve and refine their diverse skills and adapt them to collaborate mutually in developing the fuel briquettes among other solutions. They were then guided to deploy those skills by working directly with communities to ensure impact at the

[5] 90% of households use firewood, charcoal for cooking: https://www.newvision.co.ug/news/1462481/90-households-firewood-charcoal-cooking

[6] Ministry of Energy and Mineral Development, Strategic Investment Plan 2014/15 – 2018/19, page 101

community level. UNEP provided the overall technical backstopping from a knowledge dimension of also ensuring work aligns with Uganda national development and climate change priorities.

Intervention

- Youth Skills Retooling; this work trained youth to make charcoal briquettes[7]. 10 youth in Kayanja village were trained[8]. These trainings were undertaken under the EBAFOSA Uganda Innovations centre called the Africa Youth Agro industrialization Academy (AYAIAcademy). 21 women and 3 men in Nakisunga and Ggera farmers cluster in Kyaggwe county respectively received training[9]. This is critical towards substituting the use of three stone fuelwood stoves, currently at 90% in rural areas[10]. This work has managed to conduct mass awareness among women in villages. Manual machines were used to enable youth train properly and produce quality briquettes[11].

  "*We managed to train 10 youth in making briquettes using a manual commercial machine which produce 24 briquettes at ago, and 21 women and 3 men were trained to use a simple machine extruder which produces four briquettes at ago"* says Peter Ssekade EBAFOSA Technical advisor.

[7] Youth using machines to make briquettes:
https://drive.google.com/drive/folders/1pRkFCKrM5BviURfU5g9Xvs3mRFWIKUBn?usp=sharing
[8] Youth training in briquettes making:
https://drive.google.com/drive/folders/1pRkFCKrM5BviURfU5g9Xvs3mRFWIKUBn?usp=sharing
[9] Women receiving training on briquettes making:
https://drive.google.com/file/d/1aEvaU5rg6PNPNaACBtGkS7UQ1JwFfxo7/view?usp=sharing
[10] BIOMASS ENERGY STRATEGY (BEST) UGANDA:
https://www.undp.org/content/dam/uganda/docs/UNDPUg2014%20%20Biomass%20BEST%20Strategy(compressed).pdf

[11] Women and youth receiving briquettes training:
https://drive.google.com/drive/u/2/folders/1sSXofJYyis64o8Cve0F8TdfzBc20e2RN

Figure 1 Youth trained on making quality charcoal briquettes.

- Training youth to fabricate briquettes machines for both commercial and rural use[12]; this work managed to train youth to fabricate an extruder which can produce 200 briquettes at a go. This ongoing work is still investing in redesigning and innovating those machines and 10 simple briquettes machines for rural women have been innovated and fabricated for women to use[13], however the commercial excluder which produces 200 briquettes at once is still under development through Innovative Volunteerism.
  "This simple briquette machine is used by one person; it can produce approximately 500 briquettes in one day, it can be used by women and youth effectively" say peter Ssekade an Innovative Volunteerism actor who is the EBAFOSA Technical advisor.

[12] Simple machine fabricated by EBAFOSA Uganda: https://drive.google.com/drive/folders/1rrR-R-juNN1lik_Kls5f29FN5ol2h3G2?usp=sharing

[13] Peter Ssekade using a simple briquettes machine made by EBAFOSA innovation centre: https://drive.google.com/file/d/1rm8ct62pYYNTsIhb18Yb7zYw-KAA1IzZ/view?usp=sharing

Figure 2 A Simple briquettes machine fabricated by EBAFOSA Uganda to help rural women fasten briquettes making

- Training women groups to make Fuel briquettes[14]; this work has train two women groups consisting of 12 women in Nakisunga and 12 in Ggera farmers cluster[15] respectively to make quality briquettes using cassava waste[16], clay, ash, and cassava porridge[17]. This work has succeeded to link the briquettes to solar drying technology because briquettes are dried faster compared to open sun drying or any other method of drying in this area. For decades women in Kyaggwe county have been using firewood and three stone places of cooking. This work has mapped and created awareness to women to start using modern cook stove and EBA-briquettes which are non- smoking[18].

  "We use cassava waste chips but also we use the cassava waste to make fuel briquettes which are used for cooking. Group members are now using less firewood for cooking, thanks to EBAFOSA for the training". Oliver Namutebi trainee from Nakisunga sub county.

  "I was just throwing away the ash and cassava peelings at home but after this training by EBAFOSA Uganda I am going to start making fuel briquettes so that I earn some money." ~ Nakalema Allen trainee

[14] https://drive.google.com/drive/folders/1np_2Qq2qGCEehoZNax_1mX3cTp5Zkz8_?usp=sharing
[15] Women receiving briquettes training: https://drive.google.com/file/d/1qy6vQREwdtWpsgT20vPU2JOPxBtvIce4/view?usp=sharing
[16] Women trained on making briquettes raw material: https://drive.google.com/drive/folders/1sSXofJYyis64o8Cve0F8TdfzBc20e2RN?usp=sharing
[17] Ggera women trained to make charcoal briquettes: https://drive.google.com/drive/folders/1np_2Qq2qGCEehoZNax_1mX3cTp5Zkz8_?usp=sharing
[18] https://drive.google.com/drive/u/2/folders/1sSXofJYyis64o8Cve0F8TdfzBc20e2RN

Figure 3 Women from Nakisunga sub county trained to make briquettes and how to make raw materials using cassava waste and other agricultural waste. On the right are briquettes made by them on the first training.

- Using solar drying technology to fasten the drying of charcoal briquettes; this work trained the youth to fabricate solar dryers which are used to dry briquettes. Women in Nakisunga sub county farming cluster received training of making briquettes.
  "We no longer suffer to remove fuel briquettes during a rainy day, this technology introduced by EBAFOSA Uganda to our community has helped us to reduce the drying

period. Briquettes dried in direct sunshine takes 7 to 10 days of drying, but when it's in a solar dryer it takes 3 to 4 days. Because of solar dryers we can earn more money and because we produce at capacity. "says Annet Namubya from Nakisunga sub-county.

Figure 4 Youth drying fuel briquettes in a solar dryer made by EBAFOSA

Impacts

- Adoption of Fuel briquettes usage; trainees have started to use clean fuel briquettes for both domestic and commercial use. Since most rural areas are mushrooming into small urban centre, they no longer have firewood or it is expensive to prepare a meal, most of the families have resorted to use of charcoal briquettes for cooking and baking.
  Ms. Rose Namusoke a baker from Mukono district received a training from EBAFOSA Uganda and this has helped her save*." EBAFOSA Uganda has helped me to reduce costs in my baking business, I use 100% fuel briquette using oven saver and modern cooking stoves. Right now, I no longer use charcoal because it was expensive and dirty, those briquettes we learnt to make are clean and efficient to use."*

  "As a woman in this village, I have been using firewood and charcoal to cook food for decades, but thanks to EBAFOSA Uganda for the training on making charcoal briquettes. We can now use clean cooking stoves which don't produce smoke and preparing a meal for my family is cheaper and affordable". Edith Nambaziira from Ggera farming cluster

Figure 5 A Women holding charcoal briquettes made by herself after receiving a training from EBAFOSA Uganda

- User Acceptability: families have started using briquettes instead of firewood, right now briquettes are cheaper and durable when cooking. In Kayanja village- Mukono district families have restored to use of fuel briquettes to enable saving and good health because they produce no smoke when cooking.
  "Briquettes supplied by EBAFOSA are a good substitute for wood because they burn with a small flame and with less smoke, Clean and convenient to handle. They do not require chopping ". Andrew Katongole a resident of Kayanja village.

- Alternative source of fuel. Briquettes have substituted wood fuel in some of families we have sold to the EBA-Briquettes, families are now able to invest in clean energy willingly. Although almost Over 90% of the households in Uganda use wood fuel for cooking according to the 2016/2017 Uganda National Household Survey[19]

  "Right now, for the past two months ever since I received a training from EBAFOSA Uganda, my family of three members is using between 12 to 15 briquettes a day, we no longer spend

[19] 90% of households use firewood, charcoal for cooking: https://www.newvision.co.ug/news/1462481/90-households-firewood-charcoal-cooking

money on firewood and charcoal, life is now simple for me and my family." Phills Negesa from Mukono suburb Nakabago village.

- Employment opportunity for women and youth; this work trained youth and women during COVID-19 pandemic to make charcoal briquettes, to fabricate machines which are used in making briquettes awareness training on the importance of briquettes, why we should reduce using wood fuel to cook.

  "I have started producing briquettes using a simple briquettes machine, and each day I produce over 500 briquettes for sale, which takes 3 to 4 days to dry using a solar dryer. After drying I pack 10 briquettes in labeled bio-degradable bags for the market and I employ one person to do this work." says Amos Kasenge trainee Innovative Volunteerism actor of EBAFOSA.

  "We trained 20 youth at Kayanja village under the EBAFOSA Uganda Africa Youth Agro-industrialization Academy arrangement during COVID-19 months of April to June, youth who had lost employment gained from this training" say Peter Ssekadde EBAFOSA trainer.

Conclusion

Summarise the action and the impacts

Actions	Impacts
Youth skills retooling	Employment opportunity for women and youth
Training youth to fabricate briquettes machines for both commercial and rural use	Briquettes acting as an alternative source of fuel
Training women groups to make fuel briquettes	Adoption of fuel briquettes usage, and User Acceptability
Using solar drying technology to fasten the drying of charcoal briquettes	User Acceptability

Next steps

- This work had to involve external independent experts from Makerere University to conduct a test to know the right physical properties of briquettes in terms of density, elemental composition/carbon content, brittleness, ability to stain and contrast briquettes and charcoal and the calorific values, volatile matter content, heating value and ash content of briquettes and compare them with charcoal. This work is still innovating and developing techniques of get quality raw materials to produce quality briquettes which can pass all test for export and the report stated that the briquettes produced would be environmentally friendly due to the low sulphur (0.05%) contents.

- Embark on expanding this fuel briquettes production and decentralize this to households to replace the dependence on wood biomass.

- Start mapping out households, eateries, and supply chains of raw material for making briquettes. This mapping will be continuous process.

- Expand on the clean cooking value chain by venturing into clean cook stoves production. This will create further demand for the produced fuel briquettes as households can leverage these clean cookstoves to not only ensure efficiency in cooking but further reduce the indoor pollution which helps ensure achievement of other social aspects as health and cost savings which is an economic opportunity

- Scaling up the youth and women briquettes training to different counties in Buganda Kingdom.
- Increase awareness of indoor pollution and associated health risks related to use of traditional stoves especially in rural areas and drive to eliminate indoor pollution related health hazards through introduction of improved stoves.
- Applying for the Q-mark from Uganda National Bureau of Standards (UNBS) for the briquettes to be export to other countries.
- Promote end user training programmes. Increase awareness of benefits in the energy (including overall cost) savings related to fuel and appliance (stove and cooking appliance) choice in urban areas.
- Promote adoption of improved institutional kilns, oven, and stoves in all educational institutions, hospitals, and prisons
- Promotion and wider solar uptake of solar drying technology.
- Promote energy saving technologies in wood deficient areas and high population centres.
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