EBAPRENEUR SOLUTIONS UGANDA

Progress report

August, 2020

Production of Fuel Briquettes from Waste

Introduction

EBApreneur Solutions Uganda is a youth-driven climate action enterprise that is operating on Innovative volunteerism. It aims to drive implementation of Climate Action and the SDGs through market approaches by decentralising climate action solutions of turning waste to clean energy solutions of fuel briquettes to reduce charcoal dependency for cookeries and organic solutions of bio fertilizers to bring ecosystem based adaptation (EBA) solutions to scale across Uganda. According to Ministry of Energy and mineral development, Uganda has lost upto 63% of its forest cover due to among key reasons, tree cuttings for firewood, timber and charcoal in the past 25 years. This therefore necessitates first paced interventions to reverse this as uganda takes efforts to achieve its National Determined Contributios (NDCs).

EBApreneur Solutions Climate Action enterprise is premised on the philosophy that a skilled person is 15 times the value of natural capital and 4 times the value of produced capital. This is to say that the core resource that will be leveraged is skills competitiveness, driven through Innovative Volunteerism. Through Innovative Volunteerism, Youth skills are being retooled on production of fuel briquettes and biofertilizers.. It is on this bases that the team had to undertake training in fuel briquette and bio -fertiliser making to acquire practical skills and technicalities in manufacture of these two products. The training was undertaken by three members of the team where they undertook these trainings which were conducted by United Innovations Development centre and Benjoh Trusted company limited. These trainings gave a strong foundation for the youth to learn the dynamics of briquette making and bio fertilisers. Briquettes training covered two types of briquettes that is manual and electrical while Bio fertilizer making was made manually.

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Chapter 1: Fuel Briquette Making

1.1. Description of Activities

1.2. Training on Fuel Briquette Making

Fuel Briquette training was done at United Innovations development center. Three youths were trained and they acquired the necessary skills to execute the production of the product. These included the team leader, and other 2 Innovative Volunteer volunteers who are helping in the general implementation of the activities for business growth.

This training covered two methods of briquette manufacture and these are;

Manual briquette making; this involved use of manual methods to make briquettes. This includes use of hands to mold ball like briquettes and manual machine to mold cylindrical briquettes. Organic waste was carbonized, crushed and mixed with cassava flour/molasses before molding it into briquettes.

Molding of briquettes using hands

Molding of briquettes using manual presser machine

Electrical briquette making; this involved use of an electrical powered machine to make briquettes. The machine is fed with the carbonized material into the automated machine which compacts them and extrudes the briquettes. The end product from this particular machine is of good quality compared to the manually produced products.

Filling the electrical machine with material during the production process

1.3. Theory of briquette making

This is where different aspects like ratios in making briquettes, the factors that influence briquette quality, general market ecosystem of briquettes, the most appropriate raw materials and threats.

Step 1: Biomass carbonizing and mixing

This involved turning waste into carbon. Banana waste was used in the training, however other kinds of agricultural and biomass waste are also used following the same process. A challenge in carbonizing some material for example saw dust was cited. An assorted drum carbonize was used during the training and the whole procedure was well mastered.

Sorting of the material for carbonizing

Carbonising the material using a carbonising drum

Step 2: crushing the material

This involved making the material finer for easier use. This is especially done for the manual methods of making the briquettes. A manual crusher was used and the team had great experience with it. However, the crusher is not much needed for the electrical machine because crushing can be done simultaneously with compaction.

Crushing the carbonized material.

Step 3: Mixing with the binder and the filler

The carbonized material here is mixed with the binder and the filler. The binder helps in cohesion of carbon material and the filler enables elongation in burning of the material. The team learnt how to use two types of binder that is molasses and cassava flour and these were used for electrical and manual briquettes respectively.

Mixing of the carbonized material

1.4. Summary of the recipe proportions used

Method of production	Major ration	Procedure
Manual method of making briquettes (Using bear hands or manual pressing machine)	10kg of biomass :1kg of Cassava flour: 1kg of clay	Manually mixed together using a spade/ Mixer
Automated power driven machine	10kg of biomass: 2Kg of molasses: 1kg of clay: 3liters of water depending on the water content of biomass.	

Step 4: Production of briquettes

Production of briquettes was done with the guidance from the trainer. This covered all the standard operating procedures. Compaction and compression was emphasized to ensure high quality of briquettes produced and careful handling to avoid breaking.

A rigorous procedure of both manual and automatic production was followed using hands, manual and automated machine. Both methods had varying efficiency quality. The highest efficiency was seen with electrical machine. Briquettes were later were later placed on the drying racks and allowed to dry up. Under good sunny weather conditions, briquettes can take upto five days to dry up before they are packaged for sale.


Placing briquettes on the drying decks

1.5. Advantages of using a machine over bear hands

- Maximum compression and compaction achieved. Compression of briquettes is minimal when you are using hands hence less quality is produced. Quality of briquettes is too much dependent on this factor.
- Using a machine enables you to produce more briquettes per unit time as opposed to using hands. This enables meeting of production targets are met. For example it is possible to produce close to tonne of briquettes in 12 hours.
- Use of a machine helps to achieve production of standardized briquettes. Uniform size, quality and texture is assured which is not possible when you are using bare hands

1.6. Training gaps and remedies

The major training gap was in carbonizing sow dust. The trainer said it has been a big challenge for them so they neglected it. They also said they are not using other agricultural waste like peelings and other kitchen refuse.

1.7. Remedy

The team will design a prototype for an efficient carbonizer that can handle a wide range of materials in large quantities. This will be built on the conventional knowledge of traditional way of making charcoal through rapid experimentation to test if agricultural waste can be carbonized using the same traditional technique. A successful experiment will lead to designing a concrete/metal carbonizer which can carbonize large amounts of biomass and is user friendly compared to the existing carbonisers.

Step 5: Testing the briquette made

The briquettes I made were tested by burning on the stove. A good flammability and burning efficiency was witnessed.

Initial lighting and ignition done in open air

Briquettes burning indoors

1.8. Next steps taken after the briquette making training

Action	Percentage completion	Pending
Production of 234kg for market tests from the center of training for market testing.	100%	Nothing pending
Establishment of EBAPRENEUR SOLUTIONS Briquette and Bio fertiliser making workshop	98% complete, workshop in the ready for all operations with all facilities fixed.	Machine installation Fixing a gate
Commercial production of briquettes	40% complete, Raw materials secured already	Machine not yet ready
Laboratory tests on briquettes	50% complete, center for testing already identified, costs established.	Briquettes not yet produced

Market analysis of the briquettes	85% complete, first clients served and feedback captured	End product demand and raw material suppliers underway
Rapid experimentation of carbonizing saw agricultural waste using conventional carbonizing knowledge	10% complete, materials already secured	Waiting for the material to dry up completely.

Chapter 2

2.1. Bio fertilizer training

EbaPreneur solutions Uganda team also undertook training in bio fertilizer making. The objective of the training was to equip the team with skills in making as a need to establish bio fertilizer product line. The training took one day and it happened in kyanja-Kampala where three team members including the team leader undertook the training. The training was conducted by Benjoh Trusted Company limited, a local dealer in biofertiliser trainings in Kampala. In this training, the team managed to learn how to make a composite bio fertilizer with training covered two types of briquettes that is manual and electrical.

2.2. Theory of producing Bio-fertilizer

The trainer took the team through a number of processes to achieve preparation of the plant tea and then the biochar. Both elements are mixed together to get a final product that contains a wide range of nutrients in one package. This was done through manual methods.

2.3. Procedure

Step 1: Plant tea preparation

This is a liquid fertilizer prepared in which can even be applied alone. It is applied in liquid form to crops especially in the middle of their growth cycle.

Materials needed

100-liter drum

An old sack

Others	**Quantity**
Wondering jew	20kg
Tethonia	20kg
Ash	5kg
Bone meal	500g
Rabbit urine	2 jerrycans
Water	2 jerrycans

2.4. Procedures

- An old sack is pressed in a drum.
- Wondering Jew is put at the base plus tethonia.
- Ash and bone meal are added on top.
- Rabbit urine is poured to the combination.
- Water is also added on top.
- The sack is then tightly tied on top prohibiting any kind of air penetration.
- The set-up is left in cool air conditioned place (room / pit) without interruption.
- After a period of one week, a long stick is used to stir the mixture in every corner of the sack. This is done at intervals of three days for two weeks.
- In the third week, the preparation is left open overnight and the sack pulled out in the morning to remove the residues leaving the liquid solution (ready plant tea).

NB: Dilution has to be made in the ratio of one to one (1:1) before application.

The plant tea has two years life span undiluted and comprised of the three main nutrients; Nitrogen, Phosphorus and Potassium.

Basic ingredients for making bio-fertilizer

Step 2: Preparation of bio-char

Having acquired plant tea, it is then mixed with the other materials to make plant bio-char

Materials needed

- Plant tea
- Egg shells
- Carbon
- Bone meal
- Rabbit droppings
- Ash

Procedures

- Carbon is spread on a flat surface. It is used because it works as a sponge to hold the liquid nutrients for a longer time period and releases it slowly.
- Rabbit droppings are poured next with smashed egg shells. Charcoal dust and rabbit droppings are measured in the ratio of one to one (1:1) in terms of volume; 1 sack:1 sack.
- Five kilograms (5kg) of ash and five grams (5g) of bone meal are applied.
- The set-up is mixed thoroughly and 20 liters of plant tea applied in the course of mixing as presented.
- The mixture is packed in a protected bag (sack), tightly tied with no air penetration and kept in a cool place for a period of two weeks after which the bio-cha is ready for use / application.

Team actively taking part in mixing bio-fertilizer making ingredients

2.5. Nutrients incorporated with in the bio-char

Material	Nutrient
Charcoal-dust	Carbon
Rabbit droppings	Nitrogen
Egg shells	Calcium
Bone meal	Nitrogen and Phosphorus
Ash **Nutrients incorporated with in the bio-char**	Potassium

NB: The bio-cha has no date of expiry.

At the end of the training, the team was able to make 25kg of bio-fertiliser**.**

Sample of the biofertilser made after the training

2.6. Steps taken after the training

Action	Percentage completion	Pending
Engaging in commercial production of the bio fertilizer at Ebapreneur solutions center (To be established)	70%, sources of raw materials identified and some delivered at the site	Some raw materials have not yet been delivered.
Experimentation of the bio fertilizer to collect data on the efficiency of the bio fertilizer in comparison of other fertilizers.	70% completion, already have the bio-fertiliser to use, land identified and prepared for treatment.	Planting seedlings and applying treatment.
Testing the market and getting feedback of farmers about the fertilizer	30% completion, potential customers and suppliers of raw materials identified.	Producing sufficient amounts for putting to the market.

Conclusion:

The training on how to produce fuel briquettes and biofertilsiers helped us in retooling our skills to be able to produce these climate action solution inputs. We now fully understand how we can reduce the dependency of households on charcoal by offering a clean alternative fuel. We are now excited that we can produce bio-fertilisers which will help to reduce the dependency on chemicalised fertilisers which destroy and alter soil chemical properties and destroys the environment.

Next Step:

Aim with these retooled skills in coming up with climate action solutions to produce fuel briquettes and bio-fertilisers, we will work with other willing youth to retool their skills so we can together expand our work into climate action enterprise which creates incomes as we help drive the implementation of the Uganda NDCs. This is a great opportunity to drive climate action as drive creation of employment, wealth and the improvement of living conditions of youth.

The development of fuel briquette production activity will reduce deforestation, produce less polluting energy sources, at lower cost and also create direct and indirect jobs throughout the chain from manufacturing to distribution. The development of bio-fertilizers will help farmers

replace chemical fertilizers with organic fertilizers. This biofertilizer will be used together with the ash from briquettes to improve soil structure and water retention capacity. This bio-fertilisers will help nurture the soils as well as reduce the chemicalized inputs which alters soil functioning as well as contributes to unsafe food. These actions are crucial as they will help to drive the implementation of the Uganda Nationally determined contributions (NDCs) which focuses on clean energy and climate smaret agriculture. Over 90% of the households use wood fuel for cooking in Uganda. Devising Climate action solutions that might save the depletion of forests in Uganda is a timely intervention. Substituting fuel wood with climate resilient solutions – specifically waste recovery to fuel briquettes is timely. It offers opportunities for youth led climate action solutions as well as a wealth creating opportinity for the youth.

We will now embark on expanding this fuel briquettes production and engage households to replace the dependence on wood biomass across Uganda. We have already mapped out households, eateries, and other charcoal demand centres where we will start delivering our solution. This mapping exercise will be expanded to additional neighborhoods – households and eateries - in the city and across the country. We will also map supply chains of raw material for making briquettes. This approach will be applied for bio-ferlisers where we will map out farms to ensure they have access to nature based inputs of biofertilisers. We will also map out both supply chains of raw material and demand markets for biofertilizer. This mapping will be continuous process.

We will also expand on the clean cooking value chain by venturing into clean cook stoves production in the future. 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

ANNEX

Annex 1: Sample pictures of the team undertaking briquette training.

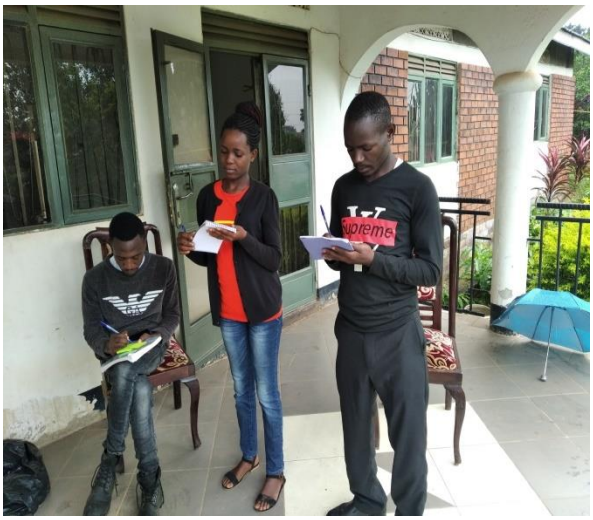
Team that undertook training of fuel briquettes

Team member arranging briquettes on the decks

Mixing of the material (adding binder and filler)

Actual production of briquettes

Annex 2: Bio fertilizer Training pictures



Team receiving introduction and theoretical background of Biochar

Team make a close observation of the materials for making biofertilizer

Annex 4: Excel sheet showing demand and supply (Double click to open)

Mapping of Clients and Suppliers_For Bri