CLIMATE SMART AGRICULTURE IN UGANDA

Selected stories from the field, reporting experiences of farmers implementing Climate Smart Agriculture Practices.

Uganda Forum for Agricultural Advisory Services

PREAMBLE

The Uganda Forum for Agricultural Advisory Services (UFAAS) received a sub-grant under the "Comprehensive Africa Agriculture Development Programme ex-pillar IV" (CAADP XP4) Project to implement a project titled "*Enhancing the scalability of CSA among AEAS actors in Uganda*." Coordinated by the African Forum for Agricultural Advisory services (AFAAS), one of the key activities of the project was to map out Climate Smart Agriculture (CSA) activities in Uganda.

Climate Smart Agriculture (CSA) brings together practices, policies and institutions that are not necessarily new but are applied in new contexts and ways to enable individuals and communities address the challenges of climate change. It offers an opportunity to revitalize efforts required for achieving sustainable agricultural development.

This publication presents a selection of stories from the field, reporting experiences of farmers implementing climate smart agriculture practices. These cases were collected from value chain actors implementing various projects by UFAAS member organizations and affiliates-Zirobwe Agaliawamu Agribusiness Training Association, Learn enterprises, Teso Tropical Fruit Co-operative Union LTD (TEFCU), Agribusiness Impact Initiative,

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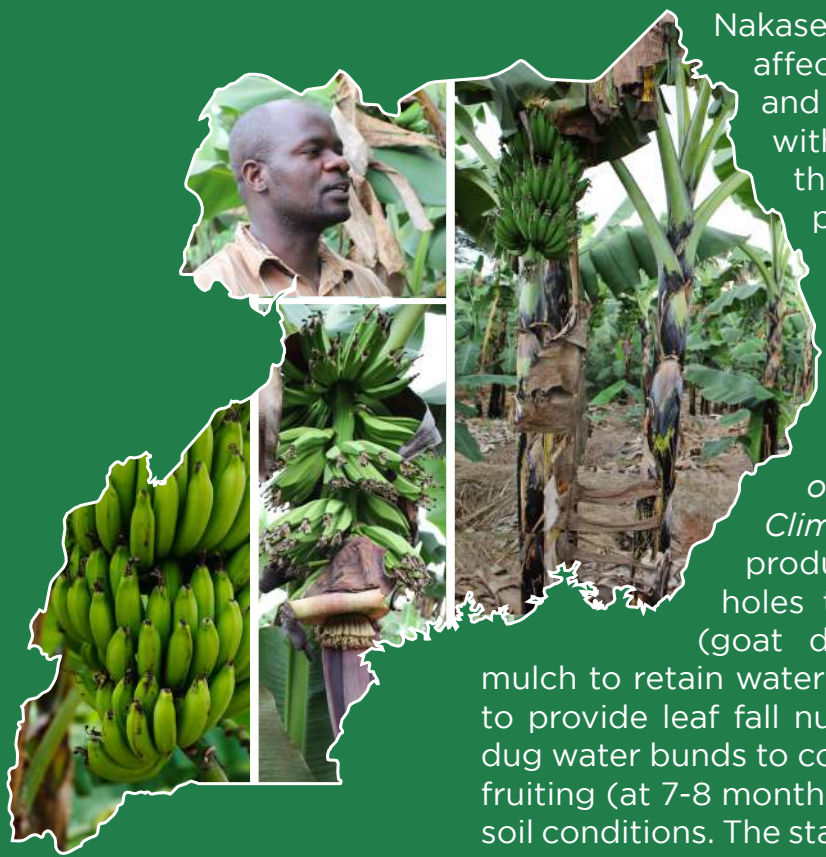
OUTSMARTING HARSH CLIMATE TO PRODUCE BANANAS

Mr Mbidde Elias lives with his wife and three children in Nakaseta village, Kyetume Parish, Zirobwe Sub-County, Luweero District in Central Uganda. A member of Zirobwe Agaliawamu Agribusiness Training Association (ZAABTA) a producer organization, Elias practices mixed farming with two cows, three goats, 3 hens. Like many farmers in Nakaseta, Elias's farming was severely affected by adverse weather conditions, and he lacked knowledge on how to deal with them. Most people thought the soil in the area was not conducive for banana production. Typically, the bunches were very small, the fruiting would take longer, stools would rise to the soil surface, and the plantations in the area would die out in less than 6 years.



Through a *farmer exchange visit organized by ZAABTA*, Elias learned *Climate Smart agriculture techniques* to produce bananas. .He dug deeper planting holes to protect the roots, applied manure (goat droppings) to improve fertility, used mulch to retain water in the soil, planted and reserved trees to provide leaf fall nutrients and act as wind breakers, and dug water bunds to collect runoff. These practices quickened fruiting (at 7-8 months), gave bigger bunches, and improved soil conditions. The status of his farm made him popular in the village and a model farmer, and has earned him social capital.

During the visit, Elias was happy to share his story and praise for the source of climate smart agriculture knowledge. “Everytime time I pray, I ask God to bless *Nehemiah* who was willing to share with me knowledge of producing bananas amidst harsh weather conditions, and ZAABTA which organized the visit. I am now a respected man in this village, and I even have rich friends who come to me requesting to visit my farm” remarked Elias

Read more, watch the video, and see more *pictures on the UFAAS website*

DIGGING DEEPER PLANTING HOLES

To protect the plant roots, and collect water

MULCHING

To retain water in the soil

APPLYING MANURE

To improve soil fertility

PLANTING AND PRESERVING TREES

To act as wind breakers

DIGGING WATER BUNDS

To collect runoff.

HORTICULTURE AMIDST BAD WEATHER

Nehemiah Kamya Buwule is a vegetable farmer like his parents Mr and Mrs Kiiza. The youthful man together with his brother Derrick Tumuhimbise Buwule apply Climate Smart practices in horticulture at their Farmacy farm.

Located in Bungo village, Kakakala parish, Zirobwe subcounty, Luwero District in Central Uganda, the farm is a one stop centre for vegetables of all kinds. With his small savings from a stationery shop, Nehemiah grows horticultural crops such as broccoli, lettuce, celery, eggplant, beetroots, and strawberries; bananas, and

rears bees.

Farming is not all rosy at Farmacy farm. Challenges encountered include:

weather changes especially the dry spell which reduces productivity by over 30%; high prices of National grid water which increase the cost of production, and low prices of some crops. In addition the market is far away from the farm in City centres which increases costs of transport.

Pests and diseases especially in the open field.

Uncertain weather conditions make farming difficult but the youthful brothers innovate to produce all year round

They use a combination of strategies

HORTICULTURE

> *Harvesting rainwater, they resorted to planting crops that fetch a higher price. Drip irrigation, greenhouse production, mulching of the garden and planting in phase, planting drought tolerant crops, early maturing plants such as baby marrow and leaf lettuce. In addition, according to Derrick, they adopted integrated Pest management. practices, and use a mix of both organic and inorganic fertilizers and pesticides.*

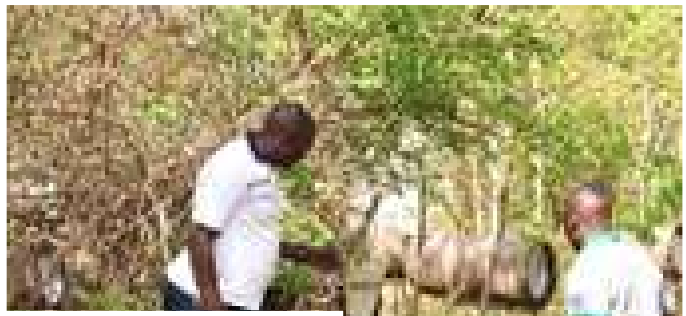
The practices have enhanced agricultural productivity, while improving resilience to climate change. According to Derrick, drip lines ensure that all the water fed to crops is utilized while the mulching prevents evaporation and drying of the soil surface

HARVESTING MONEY FROM HONEY

ANYII TOM OKELLO
started TAF ASSURED MIXED FARM
Located in Telela Village, Telela Parish, and Ngetta Sub County, Lira CityTelela of Northern Uganda, Tom has become popular. Initially, he was using traditional beehives to rear honey.

Tom got the innovation in apiary using the bee hive **(TAF ASSURED IMPROVED TOP BAR BEEHIVE.)** This hive is made of local material from the kind of tree called local palm (tugu in *Luo*). The beehive has got two chambers inside i.e. queen excluder and the store. A wire mesh is used to demarcate the chambers, and stops the queen from crossing to the store to mix eggs with the honey.

Before this, he was using the local bee hive made out of local palm but this had challenges of production and poor quality of honey, he improved on the local beehive to the new type in the above photo that has addressed the problems of poor quality honey and low production.



Through the innovation he is able to get at least 10kg of high quality honey per hive as compared to the 3 -5 kg of poor quality honey he use to get from local beehives. He is now harvesting honey after every three months.

Currently, Tom has more than 200 beehives that give honey every three months. He processes his honey from home and sells 1.5kg at UGX 25,000. He sells honey in Lira main market, Lira city

EMBRACING CLIMATE SMARTNESS IN URBAN FARMING - KYAKUWA FARM

Dr. Jolly Kabirizi has for several years practiced climate-smart agriculture and has become a model farmer within the community (Seguku village) and the whole country at large. She provides services for urban farmers and other commercial farmers who come to visit her farm. She formed youth groups and interested them in climate smart agriculture for them to earn a living.

She possessed with all what it takes (knowledge and skills) to train other interested farmers who always visit her and as a result CSA technologies have been taken up from her farm to the rest of the farmers in the whole country like the use of maize stovers, making of silage from the potato veins and among others.

She got in touch with one young man from the market who collects for her the '*garbage*' in the market in form of residues and she uses them to feed the diary animals, its climate smart in a way that instead of them being carried or dumped, they are collected and used in animal feeding. Together with a research team from International Potato Centre and NARO, we researched on the silage made from potatoes vines when mixed with maize bran which acts as -

a preservative and kept air tight in the silage bags for 20-30 days." Dr. Kabirizi said. The potato vines are chopped, wilted and mixed 10kg per 100kg of potato. Sweet potato vines are major source of livestock feed, though are highly perishable and about 600kg of vines per acre per season are wasted. In case of urban and peri-urban areas sweet potato residues create a disposal problem as they are dumped within the markets after sale of roots which causes an environmental hazard.

MAIZE STOVERS FOR ANIMAL FEEDING

The maize stovers are fermented with well processed poultry litter and molasses mixed with brewery yeast and can act as high quality feed for dairy cattle and goats. This innovation originated from kyakuwa farm.

HYDROPONICS GREEN MAIZE FODDER

This is maize grown in plastic trays and in 7-8 days they are ready to be fed to livestock. The technology was developed at Kyakuwa Farm and they use a simple and affordable hydroponic unit. Green fodder is essential to feed livestock but due to reduced availability of land and lack of water. It is becoming difficult to produce required quantity green fodder throughout the year also. Lack of quality fodder hampers growth production and reproduction of livestock and this made the farm to innovate a climate smart technology that can benefit farmers of livestock (Cattle, pigs, poultry, rabbits etc.)

Requires use of high quality maize as poor maize quality can affect the growth of the seeds

Hydroponic maize fodder is produced by growing clean untreated seeds without soil, and with very little water. Within 7-8 days the seedling provide a highly nutritious fodder

HYDROPONIC VEGETABLE PRODUCTION

Changing weather conditions is also a great challenge. It becomes hard to keep the animals most especially in the dry seasons, and this calls for the breed of the animal and number of cows being kept. So many people look at these huge animals and they are told they give 20-40 litres of milk yet in actual sense its less and they don't put in mind the how the animals will be affected by climate change.

SCALING CLIMATE SMART TECHNOLOGIES BEYOND THE KYAKUWA FARM

Dr. Jolly Kabirizi has for several years practiced climate-smart agriculture and has become a model farmer within the community (Seguku village) and the whole country at large. She provides services for urban farmers and other commercial farmers who come to visit her farm. She formed the youth groups and interested them in climate smart agriculture for them to earn a living.

Many farmers always do come to learn about urban farming and many people come back to testify after implementing what they have learnt from very many places (5 visitors books full). As it's always said that, "There is no way you can tell people to do what you're not doing especially in agriculture therefore I had to walk the walk," she said.

MARGARET EARNS BIG FROM COFFEE

For over 30 years, Margaret Kiiza has grown crops on the family land in the Zirobwe, Luweero District of Central Uganda, mostly for family food and income. Like most smallholder farmers in Africa, she grows a mix of crops, and uses little by way of external inputs.

Her struggles are also typical. Pests perpetually threaten her family's food security and the meager income she earns from selling vegetables, bananas, and coffee seedlings, and labour is hard to get by.

Her turning point was when Sasakawa Afrca Association announced her the winner of the Farming as a business model. She was awarded a production package of a knapsack sprayer, a solar panel, battery, and assorted pesticides. Her main business now is raising coffee seedlings in her compound and growing vegetables, while her husband works more on the far away fields and trades the farm produce in the city and urban centres. Margaret's story, like that of millions of other small African farmers, is the reason why so many people have concluded that transforming African agriculture is an urgent priority, one that will shape the continent's future-and perhaps humanity's as well.

Agriculture is and will continue to be the main economic driver in rural economies. Success in agriculture remains a route out of poverty for many rural people. Climate smart practices way to go. Even with various enterprises, a supportive spouse and grown up children, Margaret' Kizza's income wasn't always enough for her to meet her necessities.

To Margaret, not all farming has been rosy. There is a shortage of labor. "*even when you have the money, you can fail to get someone to work for you. What I do, I motivate the workers with gumboots and give them meals"*

TREE NURSERIES BRING HOPE TO OJOK

Mr. Ojok Patrick, 38 lives with his wife Angwaro Caroline and 5 children in Lwala village, Kamuk parish, Kaberamaido Sub-county Kaberamaido district of Northern Uganda. He is a beneficiary of the Youth in Climate Smart agriculture project implemented by UFAAS-TEFCU Before joining the project, life was challenging for Patrick. “It was hard and challenging since that time, I was still a youth who by then was new in marriage and just learning responsibility

This was majorly due to lack of proper and profitable business to engage in to generate income for the family. I did not have direction and focus not until I joined a youth farmer group that was formed by TEFCU which was implementing a Climate Smart fruit farming project in partnership with UFAAS” said Patrick Ojok. Together with 30 others, Patrick started the Climate Smart Agriculture project in 2017 and were trained on different technologies in regards to soil fertility enhancement, water

retention, nursery tree seedling production among other agronomic aspects. They raised tree seedlings for sale which generated for UGX 2,400,000 shillings during the first year. The members shared the revenue and the group disintegrated. With UGX 80,000 shillings, Patrick invested in the tree nursery seedlings and later made profits. He sells to both the local people and government entities as well as Non-Governmental organisations.
In 2019-2021, Patrick harvested on average UGX 20,000,000 (Twenty million shillings) annually from nursery business. In addition, he set up two tree plantations of 2,500 pine trees which are two and one year old respectively. he shares his achievements as below. "From the income realised from my business I have been able to put up a 3-bedroom permanent house which has so far cost me about UGX 18,000,000 up to the level in which it is now, am also now able to foot all my household expenses with ease. Not only have I gained in terms of money, but I have gained a lot from the project in terms of knowledge and among these include the following areas

I am now able to maintain my nursery and even make it expand

- It has enabled me win a bigger market share because I do produce quality fruits as well as quality seedlings needed by the consumers.
- The technology has made me known (famous) by many categories of people this is because the seedlings I produce are bought by local people, District Departments NGO's and sub-Counties
- I have also been elevated to a level of a trainer because of my expertise in the field of tree nursery management.
- The Technology has helped me attract a reliable source of water although expensive to maintain.

✔ Serious Commitment

✔ Planning and saving are a key.

✔ Partnering with Technical Officers from Sub-county and the District is

highly beneficial.

He encourages the youth to emulate his example and join him. He is ready to help them acquire skills.

However, there are a few challenges that usually affect his operations. These include, the high cost of production in terms of inputs especially planting material. "For example, pine seed are sold between 3million to 4m a kg. Eucalyptus seed cost 1.5m per kg, Potting materials cost 8,000 per kg. and transportation of the rock soil which is quite expensive because the rock is a bit distant from the farm" decried Patrick.

Besides the achievements and challenges, Patrick has a vision of becoming a prospective commercial farmer with the biggest farm running his project sustainably. In his words, he thanked TEFCU and UFAAS for the support. I extend my sincere apprecation to TEFCU and UFAAS for the support rendered to me which has made me what I am today.

Key message to fellow farmers.

"I would like to encourage other people who have dreams of becoming commercial tree seedling producers that it only takes careful planning, commitment and patience to succeed" remarked Patrick.

RABBITRY:
A PROMISING LIVELIHOOD AND CLIMATE SMART AGRICULTURE VENTURE

Mrs Beatrice Luzobe demonstrating how to hold a rabbit at her rabbit farm in Kisaasi, Kampala

The RabFarm is a family venture of Dr. Sam Luzobe-PhD (a Veterinary Doctor and Human Resource Expert) and Ms. Beatrice Luzobe (an animal scientist and agricultural extension worker). Both have built their expertise over the years in rabbitry, through rabbit farming and training of other farmers. They have been keeping rabbits since 1990, having started it as a small initiative to provide mainly meat for the family.

In 2000's, they ventured into commercial rabbit farming, training and mobilization of other farmers to take up the enterprise from an informed point of view.

According to Beatrice, they started it as serious enterprise of meat production in 2010. The practice has been adopted by a number of people in the Uganda and they have trained over 250 rabbit farmers at their demonstration farm in Kisaasi, who are now rearing rabbits focused on both food and income.

Rabbits are small animals and can be used as daily food compared to the big animals like goats and cows, which may not be slaughtered just for home consumption. Rabbits and chicken one can easily get one a meal.

BENEFITS

Rabbits were introduced in Uganda in the 1970's by the missionaries and by then people used to have them as just pets at home, the children took over and they were just rearing them for fun, not yet until of recent that people have picked it up as a good enterprise. The problem solved by their rabbitry innovation is food and income insecurity for small holder farmers in rural and urban setting, while preserving the environment. Beatrice states that rabbit rearing is an enterprise with a lot of benefits to youth, women and others interested in the enterprise because they are small animals, occupying a small space, thus requiring less land to raise".

Lukefahr (1998) noted that rabbits can benefit many families, nutritionally and economically in less time than other livestock projects and at lower investment costs, but if only a sound project plan is implemented. According to Moreki (2007), rabbits are ideal for small livestock projects for peri-urban or rural areas, especially in developing countries with a significant proportion of citizenry living below the poverty datum line.

HIGH PRODUCTIVITY:

Rabbits mature quickly and reproduce rapidly, attaining a sexual maturity at 4-6 months depending on the breed. They are also prolific in terms of offspring (kg/year/doe) and will breed all year round if well-managed. A doe (female rabbit) that weighs 5kg can produce 30 offsprings equivalent to about 30 kg of meat in a year on minimal space. A hundred (100) breeding rabbits can be raised on one acre required by one cow (about 400kg) to produce 300kg of meat in 2-3 years. Rabbits will produce 3kg of meat on the same feed and water as a cow will produce ½ kg of meat on the same feed and water. With proper management, a doe kindled intensively, can easily give 30 or more offspring's per year. Rabbits also have a short fattening period (2 months from weaning). Given an efficient feed conversion ratio (FCR), young rabbits are ready for market at 1.8 to 2.2 kg. At the Rab Farm, the average litter size is 6 kits per kindle and with 40 breeding does kindling 6 times a year, they get an average annual yield of over 1200 fryers. The carcass: live weight of fryers at 4 months, the family expects 800kgs of

rabbit meat a year for food and income generation. The family is assured of at least a kilogram of rabbit meat on a weekly basis and the rest is packed for sale to individuals at their agricultural product shop or supermarkets and restaurants, at UGX 25,000 per kilograms.

HIGH NUTRITIONAL VALUE: :

Rabbit meat is highly nutritious, palatable and healthy because it is white, fine-grained, high in protein with low fat and low in cholesterol. A study on Nutrient Content of Rabbit Meat as Compared to Chicken, Beef and Pork Meat (Rabbit Tracks, 2011) found rabbitmeattobericherincalcium(21.4mg/100g) and phosphorus (347 mg/100 g) than other types of meat and lower in fat (9.2 g/100 g) and cholesterol(56.4mg/100g).Beefhadthehighest cholesterol content (114.5 mg/100 g), almost double the rabbit meat, while pork was rich in fat (28.2 g/100 g). The conclusion was that rabbit meat is healthier over other meats frequently used in human nutrition, high in protein and low in fat. In addition, rabbit carcasses have more meat because they are only 20% bone. This makes rabbit meat an important source of food, suitable for nutrition security among children, the sick and elderly. Rabbitry also provides an excellent option to people who are conscious about health dieting and are avoiding high fat / high cholesterol foods. Beatrice urges that the nutrition values of rabbit meat makes it favorable in this generation where people are getting conscious about eating red meat.

NUTRITIONAL VALUE OF RABBIT COMPARED TO OTHER MEAT PRODUCTS

	ANIMAL PROTEIN (%)	FAT (%)	MOISTURE (%)	CAL./LB
Rabbit	20.8	10.2	67.9	795
Chicken	20.0	11.0	67.6	810
Turkey	20.1	20.2	58.3	1190
Veal	18.8	12.0	68.0	840
Beef	16.3	28.0	55.0	1440
Pork	11.9	45.0	42.0	2050
Lamb	15.7	27.7	55.8	1420

MINIMAL IMPACT ON CLIMATE CHANGES:

Their characteristics also make them to be environmentally friendly because they have a very low water consumption (100 ml/day), use small space (90 cm x 70 cm), and utilize waste for feed avoiding overgrazing. Borter and Mwanza (2011) assert that experts incriminate many livestock species as contributing to climate change with exceptions made for non-ruminants, which include rabbits. Rabbits being non-ruminant, their production of methane is negligible and with almost no impact on global warming. With escalating rain prices, rabbits are also the most suitable livestock species because of their lower demands on grain as compared to other livestock species. Rabbit manure is used to fertilize gardens, thus forming a profitable cycle and aiding the balance of nature. The urine and droppings of rabbits can be directly and immediately applied to crops without any scotching effect. The system of keeping rabbit at RabFarm allows easy collection of the urine and manure. The urine is kept in a big bucket to allow fermentation, while the droppings are deposited in a pit for later use on horticultural in their back yard in Kisaasi and large banana plantation in Mukono

EASY INTEGRATION WITH HORTICULTURE:

Ms. Beatrice explains that Horticulture is the best to integrate with rabbit farming. i; Normal soil is mixed with the droppings and decomposing wood shavings to create a soft fertile mixture suitable for vegetable growth. At a later stage of growth, rabbit urine can be applied as a foliar fertilizer and at the same time as pest repellents. This is climate smart in a way that instead of using chemicals which pollutes the environment and soil, rabbit waste sustains the environment and the soil. RabFarm is source of income and food to the family, as well as being a demonstration for other farmers who want to join the venture, to acquire the relevant knowledge. They organize monthly training and also allow individual farmer to visit the farm and consult. The farm has inspired more people who always visit the place and later implement what they have learned or observed..

Beatrice at the Learn green shop-a one stop centre for rabbit meat, vegetable seedlings and agricultural related advisory services

CHALLENGES OF RUNNING RABBITRY FARM

Due to the current Climate changes, at times it becomes hard for the farmers who depend on sole forage feeding, to take care of the animals and also expand, especially during the dry season. For the peri-urban farmers with less access to forage, feed costs are high due to expensive pellets with irregular supply. There is also the knowledge gap caused by few extension workers (including Veterinary Doctors), with the expertise in rabbitry, Many farmers who depend farmer -to -farmer information, which at times tend to be wrong. The other challenge is the lack of a technical breeding center that has resulted in many farmers, with no technical know-how selling breeding stock. This is resulting into effects of inbreeding for many rabbit farmers.

ADVICE TO FELLOW FARMERS

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Also see *Video* and *Photos.*

GREEN DIAMONDS IMPROVE YOUTH LIVELIHOODS IN LWEZA, WAKISO DISTRICT IN UGANDA

SUMMARY

Briquette business referred to as a “Green Diamonds” has improved the livelihoods of the youth while contributing to the reduction of negative environmental impact. With the current crisis due to climate change and the degradation of natural resources, coupled with effects of COVID 19 on the country’s economy, there is increasing unemployment of youth, hence the need to urgently create environmentally, economically and socially sustainable enterprises.

An alternative fuel to charcoal, and at the same time an income generating enterprise that promotes environmental conservation, creates jobs and provides quick cash especially amongst the youth. This write up is relevant to individuals and organizations addressing the current environmental crises and those interested in providing sustainable business solutions towards providing employment especially for the youth. It is also geared towards stimulating minds especially of the youth towards developing innovative low resourced and environmentally friendly sustainable businesses.

MEET JOEL

Joel Kiguli aged 22 years is a resident of Lweza Zone A, orphaned at the age of seven, dropped out of school in senior three having realized that there was no future ahead of him due to the struggles he went through in search of school fees. In 2012, Joel joined Humura Investments Limited (HIL) as one of the employees to support the construction of cook stoves, with an aim of increasing access of durable, affordable and convenient cooking systems that reduce the rate of environmental degradation . In 2017, with minimal capital of about UShs 100,000 at his disposal, Joel started briquette production the when the prices of charcoal had increased from UShs 60,000 to UShs 80,000 per 100 Kg bag at the same time the government was grappling with finding solutions for the high rate (2.54%) of youth unemployment now at 2.48 % (UBOS, 2019). His initial press machine was a simple one producing only 1 sack of 70 Kg bag (worth UShs 50,000) per day and using raw materials within the surrounding homes and markets. To date the business has upgraded to an electric powered press machine that produces 10 sacks of 70 Kg bag per day (worth UShs 500,000) of briquettes and collects the bio waste from collection points in Kampala and Wakiso districts and payment made at the collection point. The improved technology of the press

machine has made briquette production faster and less tedious and the phone has also improved the business operations for raw material collection; he has also been able identify women and youth who collect bio waste at different pick-up points as raw materials. To date briquette sales have increased from 10 sacks of 70 Kg bag of briquettes at the end of the month to 100 sacks of 70 Kg bag of briquettes per month (Ushs 5,000,000) with an expanded client base including restaurants, schools, chicken brooding shelters, market sellers and households. This has also prompted Joel to recruit staff (to date five youth) to support the operations of the business. Joel says "My target is to get an upgraded press machine that produces 50 sacks of 70Kg bag briquettes per day and an improved solar drier of higher capacity of more than 50 sacks of 70 Kg bag". Joel's dream is to be like the briquette giants for example the Nairobi-based company Chardust in the market which sells roughly 200 tonnes of briquettes a month. He is determined to continue with the production of green diamonds for cash and to inspire many youth to join or start their own businesses.

ACHIEVEMENTS

As an individual, Joel has improved his skills and knowledge in green businesses; communication, negotiation, marketing and record keeping skills. Joel is able to earn UShs 150,000 per month for himself as well as employ fellow youth in the business. As a business, there is significant growth of the business due to the benefits accrued by the clients in expenditure

reduction of charcoal from 2 sacks of 100Kg of charcoal per month worth UShs 226,000 to use of 1 sack of 70Kg of briquettes per month worth Ushs 50,000, saving a monthly revenue of about UShs 176,000 per month, stimulating a large demand due to significant savings in the long-run. There is creation of jobs and youths previously un employed get a monthly income of about UShs 150,000 and are provided with food, shelter and medical care as part of the employment package and women who used to throw away the bio waste are now collecting it for income. To date Joel has established 10 bio-waste collection centres in the districts of Wakiso and Kampala. Joel has improved his business operations from hawking briquettes to use of motorcycle (boda boda) and use of phone for connecting with the clients and suppliers. Apart from increasing his production capacity and sales, Joel has been able to grow a wide network of clients from 10 clients in Lweza to over 150 clients in surrounding areas of Buddo, Makindye, Zana, Katale, Seguku, Kajjansi, Kitende, Kawuku and Entebbe. These networks have also spilled over to purchase the cook stoves and ovens, growing the company's customer base.

Beyond the company, the use of briquettes has contributed tremendously to the reduction of use of charcoal nationally accounting for roughly 23% of the country's total population (down from 29.8% in 2016-17) this means some 10.7 million citizens in a country of 46.8 million rely on "black diamonds" to cook their meals. The valuable utilization of waste materials has also improved the sanitation of the areas especially on the road sides near homes and market places.

SHOW THE DIFFICULTIES

The journey to earning from the green diamonds has not been easy for Joel and his colleagues. The biggest challenge has been the low level of technology (not fully automated) therefore not able to satisfy the growing demand. The dependency on fluctuation power source and low capacity of only 50 sacks of 70 Kg bag for drying at any one time are some of the challenges faced during production. On the cash flow side, some of the clients extended with take about 3 or 4 months to honour their payments affecting the pace of re-investment of the business. The Post – COVID 19 effects have also affected the business most especially the closure of schools and yet these are the biggest clients for the briquettes.

IMPACT

Briquettes offer multiple ecological benefits and one of its benefits is the potential to preserve forests as a one of the mitigation measures of climate change because it reduces dependency on forest wood as the main source of energy contributing to the reduction of greenhouse gas emissions. In addition, Briquettes are eco-friendly biomass green technology that provide communities with affordable alternative fuel source hence supporting them to adapt to climate change effects.

Other benefits accrued by these interventions, not directly contributing to CSA objectives include, job opportunities and income especially among the youth. Briquettes also help transform waste to more sustainable bio resources hence contributing to waste management especially in the urban areas.

SUCCESS FACTORS

The success factors have been categorized as internal and external factors. The internal factors are the ones under the producers control and greatly determine how far the business can reach its full potential. Some of the internal factors include the availability of youth to provide labour and their knowledge and skills to meet the business demands and needs of the consumers. Secondly, the access to finance through perseverance and continuous saving to ensure that the capital grows over time. Lastly but very critical the motivation and commitment to grow the business amidst the COVID19 challenges.

The external factors are those outside the producer's control. One of the biggest external factors that contributed to the business success was the free working space and machinery provided by Humura Investments Limited, this coupled with the coaching on financial literacy and entrepreneurial skills building has been a great boost considering the low levels of education. In his words Joel is grateful for the support the company continues to offer without which he would never have started the business.

Other external factors that contributed to the business success were; the proximity, quantity and suitability of the raw materials that created a fertile niche for the business and the low operational costs of raw materials and proximity of consumers that have kept the price of the briquettes very low compared to the price of the charcoal hence creating a demand for the product. The business requires a handful of staff five workers which increases the profit margin of the business.

CONSTRAINTS

Joel mentions that his biggest constraint is the low capacity of the machinery and drying facility that limits their production capacity. He further asserts that in relation to government incentives and policies, there has been no incentive nor technical assistance offered to them despite the allocation of funds specifically to support the youth and green jobs. Changing of people's behavior from charcoal or firewood to briquettes takes time hence the need for continuous awareness raising and incentives such as free briquette samples as a promotional campaign.

SUSTAINABILITY

Robert, one of the briquette workers says that the future of the briquette industry is promising and the market is still virgin with almost no competition. He narrates that with the diversified customer uses of energy from chicken hatcheries, brooding houses, domestic cooking, tourist camps, restaurants and schools to mention a few the business is still not able to meet the demand. In addition, the energy used in the production and drying processes comes from electricity and solar energy respectively hence contributing to the reduction of global warming because of use of non-fossil fuels. Another critical concern especially in the urban areas is the challenge of waste management which with the briquette production is transformed to use thereby improving the health of the communities. No doubt because of the potential for job creation, income generation and affordability of fuels the briquette business stands a high chance of being a good sustainable enterprise especially for the youth and replicating the business to recruit more youth.

CONCLUSIONS & LESSONS

It is evident that with more businesses in the briquette marketplace and government's support in terms of upgrading the technology, access to financing and developing standards for this cleaner energy option has the potential to create jobs, generate income, reduce the pressure on forests and improve waste management systems hence creating a more sustainable environment. It is important therefore to note that a complete switch to briquettes in the near future may not be a feasible goal as behavioural change takes time.

It is therefore imperative that one can start with a small capital of as low as UShs 700,000 for the machinery and a few raw materials alongside education and effective communication for a successful business enterprise. However, Joel narrates that youths need to be very hard working, obedient and respectful to be able to achieve their dreams. He adds that the youth should seize every opportunity because this is what has propelled him to success.

IMPROVED FISH SMOKING REDUCES IMPACTS OF CLIMATE CHANGE

With the rapidly growing population with a high depends for fish proteins, smoking fish has been one of the key preservation methods used by many local fish processers. For many years fish processors in Uganda have been using local technologies for smoking fish, that consume a lot of firewood. local methods do not only use a lot of wood fuel but also produce toxic smoke that can lead to the development of cancers, limited control of heat distribution, exposure to dirt and dust, insect infestation, exposure to contaminates, and low capacity.

However the National Agricultural Research Organization (NARO) developed modern fish smoking kilns that reduce cancer-causing compounds in smoked fish, while increase the market value of smoked fish. On top of that it helps to conserve forests through reducing the usage of firewood for smoking fish. The kiln produces quality smoked fish suitable for both domestic and export markets.

Kiyindi Women Fish Processor Association (KWFPC) was one of the first beneficiaries to receive the kiln in 2018. The group that was started in 2010 and currently has 60 members, had been processing 30 to 40kg of fish per day, but with this smart technology over 500kg can be processed in a single day. This has not only empowered them and improved their livelihoods but also improved food security and the environment.

The kiln uses smaller quantities of firewood compared to the common systems of smoking and preserving fish, Fire is not applied directly to the fish hence less requirement of firewood and therefore reduced destruction of the environment especially tress, excess smoke is avoided in the smoking room by means of pipes (chimney on top of the smoking kiln) and hence putting it away from direct contact with the operators and reducing their chances of contracting respiratory diseases.

The fish colors remain natural after smoking making it more appealing to the consumers and at the same time doing away with the dark color that is associated with cancer-causing agents

The processed fish through the kiln has a longer shelf life since extra care and hygienic measures are taken during processing which includes; removal of intestines, washing, drying, cleaning and heating by applying low temperatures

NGABO LIVESTOCK FARM THRIVES IN THE DRY CORRIDOR

By Ambrose Owoesigire

Ngabo livestock production farm is located 12km away from Mbarara city in the Ankole-Masaka corridor in Western Uganda. Owned by Prof. Kenneth Kagame, the dairy farm animals are fed on silage.

He has both zero grazing diary animals and free range animals. Specifically, the zero grazing diary animals are fed on silage because the farm is in a peri-urban setting and due to the small grazing area. Also the during the dry spell, animals have less green fodder to eat so the technology of making silage becomes more important since it can stay for so long after preservation and each pit can feed the animals for two months.

Silage at this farm is made from maize and sweet Napier which is cut, wilted, chopped into small pieces, piled into a dug pit of about 3 by 5ft (small) and/or 4 by 10ft (big), molasses are added and compacted to exclude air from the mixture. Good silage is got after the mixture is fermented for a period of two weeks and it's rendered palatable for the animals only if it has a good sweet aroma. the free range animals are being grazed in a rotational system. The farm has 6 paddocks and cows stay in each paddock for 2-3weeks

The technology was adapted from the extension workers and fellow farmers in the area.

CHALLENGES OF THE TECHNOLOGY

The cost of production is high because the farm is currently using more maize than the sweet Napier. This is so because, every season they have to plant new maize while if the farm was using more of the
Napier, it would be cheap since it can sprout and grow again, labor intensive during the burring and
compaction process and also cases of free range
stepping on the pile and pieces the by its less the silage pile which allows air in and hence leading to moulding of silage.

CLIMATE SMART AGRICULTURE IN UGANDA

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