Climate Action Mechanical Solar Dryer Report

Nationally Determined Contributions (NDCs) implementation through enterprise actions for demand and market driven transitions to the low Emissions Development pathway in Nigeria.

Context

Nigeria is the 55th most vulnerable[1] country and the 22nd least ready country. It needs investment and innovations to improve readiness and a great urgency for climate action. Having ratified the Paris Climate Change Agreement, Nigeria's commitments and priorities in its Nationally Determined Contributions (NDCs) are structured in the context of actualising its socioeconomic aims as elaborated in the Economic Recovery & Growth Plan (ERGP). Among key aims being realising food security, enhancing competitive enterprise and value addition to create income and job opportunities for the youth and expand economic growth. The message in this mix of priorities is clear – Nigeria's efforts to combat climate change must align with accelerating socioeconomic growth to build resilience of populations.

Section 5 of the Paris Climate Change Agreement underscores the fact that to drive climate action implementation we need to bring on board both state and non-state actor and this is re-echoed in the Sustainable Development Goal 17 (SDG17) where inclusive partnership are crucial to drive the implementation of the SDGs and climate action. In Africa, and indeed Nigeria, the youth whose population exceeds 50% in both contexts, are the most significant non-state actor constituency in terms of numbers. This implies that they are a significant non-state actor to engage in driving climate action implementation in Africa and their role needs to be clearly defined. Through this work, climate action enterprise actions, borrowing lessons from Kenya and Uganda – has established to upscale specifically clean energy and Ecosystems Based Adaptation (EBA) driven agriculture priorities that are not only in Nigeria NDCs – but covered in up to 70% of NDC priorities across Africa. This work is demonstrating how climate action enterprise actions can reverse productivity and postharvest losses (PHLs) in tomato and cassava value chains among others food crops.

Through these interventions, key elements of a structure for NDCs implementation through enterprise actions have started to be established in Nigeria at the community levels where it matters most. Specifically, the complementary amalgamation of clean energy with EBA-driven agriculture as core of NDCs priorities that cover socioeconomic priorities; incubation of solar dryer solutions and decentralisation of the same to add value across agro-value chains; generation of data to inform policy – specifically market incentives policy structure; data to inform entrepreneurship education curriculum development to ensure integration of climate action as an investment and source of enterprise opportunities have been initiated.

[1] https://gain.nd.edu/our-work/country-index/rankings/

INTRODUCTION

Nigeria losses billions in PHLs. For example, while the country is the second largest producer of tomatoes in Africa, it loses up to 60% of what is produces, averaging over $70 million each year – largely because of inadequate processing. Up to $1billion each year is spent importing tomato and tomato paste – leading to market opportunities that would have created enterprises locally, being taken up by others. In 2017, Nigeria lost tomato valued at $15 billion. Tomato is not the only loss. In cassava, where Nigeria is the largest producer globally, up to $400 million is lost each year as PHLs. Importation of wheat, costs Nigeria an estimated $4billion in foreign exchange losses each year. While wheat is the major ingredient in bread, cassava flour offers a worthy substitute and complementor to not only make better tasting, more nutritious bread, but create local enterprise opportunities while saving Nigeria's economy billions that can be invested in driving the SDGs. The cassava bread policy provides a positive policy signal to leverage this massive opportunity for the SDGs.

Finding ways to convert these into much needed jobs and incomes is our fierce urgency of now. These challenges present a billion-dollar worth market opportunity to tap and devising climate action solutions can turn these challenges into opportunities and create jobs for the youth.

Why Drying is important

Drying is defined as a moisture removal process due to simultaneous heat and mass transfer. It is a traditional method of food preservation for agricultural products.

Drying rate depends on external parameters (solar radiations, ambient temperature, wind velocity and relative humidity) and internal parameters (initial moisture content, type of crop, crop absorptivity, and mass of product per unit exposed area). Drying under open sun using the solar radiations for food preservation is practiced since ancient times. Drying involves a heat and mass transfer phenomenon in which heat energy supplied to the product surface is utilized in two ways: (i) to increase the product surface temperature in the form of sensible heat and (ii) to vaporize the moisture present in product through the provision of the latent heat of vaporization. The removal of moisture from the interior of the product takes place due to induced vapor pressure difference between the product and surrounding medium. The moisture from the interior diffuses to the product surface to replenish the evaporated surrounding moisture.

Open sun drying is the oldest and most common traditional method to preserve agricultural products, grains, fruits, vegetables, fish etc. in which products are spread on ground directly exposed to solar radiations. The solar radiations falling on the surface is partly reflected and partly absorbed. The absorbed radiations and surrounding air heat up the surface. A part of this heat is utilized to evaporate the moisture from the surface to the surrounding air. The part of this heat is lost through long wave length radiations to the atmosphere and through the conduction to the ground.

However considerable losses may occur due to dirt, dust, insects and microorganism, animals, birds. Leveraging on climate action solutions that adds no emissions but address this challenge is crucial. With this mechanical solar dryer come into play. It is against this backdrop that this work set out to fabricate different times of mechanical solar dryers to address the challenges faced by the community in reversing the post-harvest losses that are plaguing them in high volumes. The advance techniques of mechanical solar dryers like greenhouse drying and many others have been harnessed to reduce the post-harvest losses and increase the product quality significantly as compared to traditional method of open sun drying. Whereas greenhouse is an enclosed structure having transparent walls and roofs, made up of glass, polyethylene film. The working

principle of our advanced solar drying is one in which the product is placed in trays receiving the solar radiations through the plastic cover and moisture is removed by natural convection or forced convection.

Cassava dried on concrete floor in Shabu, Nasarawa state Nigeria

ADVANTAGES OF SOLAR DRYERS

The advantages of using solar driers over sun drying of foods are listed below:

- Less spoilage or less wastage of dried products
- Different value creation possible since dried products have higher margins
- Higher durability and transparency over time (important for greenhouse effect)
- Ultraviolet (UV) protection of solar dryers maintains colors and nutrients of food (fruits and vegetables
- Better products quality(color, skin, taste)
- Better prices/market value of products (due to better quality), higher affordability level, better payback power of farmers
- High hygienic standards of food products (no dust, no pollution, no fungus, no animals, no foreign materials etc.)
- Productivity increase in terms of labor and energy cost saving

Interventions

Structural guidance for youth Skills Retooling in fabrication of solar dryers: with structural guidance from the UNEP-EBAFOSA secretariat, willing youths in Nigeria were registered as Innovative Volunteerism actors and

were inspired to take purpose driven action and leverage their skills in a collective way and tap opportunities inherent in Africa's challenges through the lens of clean energy powered agro-industrialization with the believe they already have what it takes.

To this end, twenty two (22) youths were trained[2] to fabricate various models of mechanical solar dryers using locally sourced materials obtainable within their immediate environment and communities to drive climate action, reduce post-harvest and improve productivity of farmers. These youths cut across various disciplines, notably amongst them is Folasade medical doctor and master degrees holder, Moses an accountant, Emmanuel a high school teacher with a graduate degree and Eme a serving corp member with the Nasarawa state University , amongst others. The Innovative Volunteerism actors were trained to fabricate two types of dryers; the natural convention solar dryer and the forced convention solar dryer.

Natural convection dryers: Solar dryers that use the natural vertical convection that occurs when air is heated. Generally, natural convection dryers are sized appropriately for on-farm use. The structure consists of three main components: a solar collector, a drying bin and some fitted with a solar chimney. Natural convention dryers that are smaller in scale are basically wooden boxes[3] with vents at the top and bottom. Food is placed on screened frames which slide into the boxes. A properly sized solar air heater with south-facing plastic glazing and a black metal absorber is connected to the bottom of the boxes. Air enters the bottom of the solar air heater and is heated by the black metal absorber. The warm air rises up past the food and out through the vents at the top. While operating, these dryers produce temperatures of 130–180° F (54–82° C), which is a desirable range for most food drying and for pasteurization.

Forced convection dryers: The convection is forced over the food through the use of a fan[4]. In the case of forced convection dryers, the structure can be relatively similar. However, the forced convection dryer requires a power source for the fans to provide the air flow. The forced convection dryer doesn't require an incline for the air flow however, the collector can be placed horizontally with the fan at one end and the drying bin at the other end. In addition, the forced convection dryer is less dependent on solar energy as it provides the air flow itself; this allows the design to work in weather conditions in which the natural convection dryer doesn't work. As inadequate ventilation is a primary cause of loss of food in solar food dryers, and is made worse by intermittent heating, it is essential to realize proper ventilation. Adding a forced convection flow, for instance provided through a PV- solar cell connected to a fan, will prevent the loss of food. With this new knowledge gained in the fabrication of solar dryers, the youths fabricated the box solar dryers as well as the Greenhouse solar dryer which is being used to dry cassava and tomato.

[2]Youth training on solar dryer fabrication
https://drive.google.com/folderview?id=1WEN3XL-vjoPu2qc1fehMxNuXN5ku9ExL

[3] natural convention solar dryer
https://drive.google.com/file/d/1fsaunqdoXNhPW_qAZcbsiJp0YEttC3mF/view?usp=drivesdk

[4] forced convection solar dryers
https://drive.google.com/file/d/1gRr9Qn-0UFG7v52 b845LvZmlsHK3pR- /view?usp=drivesdk


Youth Innovative volunteerism actors being trained to fabricate solar dryers

Tomato drying

Tomato quality increases when dehydrated to make it more concentrated, therefore for appropriate storage and off-season consumption in tropical climates like Nigeria, tomato should be dried to a minimum moisture content 0f 10%. To this end, we conducted a drying test at our drying Centre in Nasarawa to ascertain the drying rates, time and overall efficiency of the solar dryers with the result used as a tool to inform the use of solar dryers and set minimum requirement standard for dried tomatoes as per the Standard Organization of Nigeria (SON) requirement

Tomatoes drying in the Greenhouse Solar Dryer (GHSD)

TEST AND RESULTS

The drying test was conducted to determine the rate of efficiency of different driers and open sun drying so as to ascertain the time it takes to dry a product (tomato) to the required moisture content as approved by the Standard Organization of Nigeria (SON) for tomato.

Test tool

The test was conducted using the various solar models; Dryer with blower, Dryer without blower and using .Open sun drying

Method/procedure of drying[5]

The tomatoes were washed and sliced to various sizes. They were then weighed on a calibrated scale and recorded before being placed inside the various models of solar dryers and on the open sun.
At an interval of one (1) hour, the tomatoes were taken out of their dryers and weighed again with the new weight recorded to ascertain the drying rate for each driers and the moisture content of the tomatoes. This process was repeated for eight (8) hours, between 9:24am -5:24pm.
The temperature of Nasarawa as at the time of carrying out this test was between 47°C

[5] https://drive.google.com/folderview?id=1WH5269Xep1Trpm-kMvf2Hy59dyR7_4Oc
https://drive.google.com/file/d/1c7IwQMPccFVxHfpFFe3vmAap2xY9Hz8i/view?usp=drivesdk
https://drive.google.com/file/d/1bLwTPvpaeeOyxYqbHiF86ZT_peVJsEVi/view?usp=drivesdk

Data being collated by innovative volunteers to test the drying efficiency and moisture content

TABLE

Dryers	Initial weight (kg)	Weight after one hour (kg)	After two hours (kg)	After three hours (kg)	After four hours (kg)	After five hours (kg)	After six hours (kg)	After seven hours (kg)	After eight hours (kg)
dryer with blower	10	9.50	9.45	9.30	9.2	9	8.8	8.6	8.45
dryer without blower	10	9.65	9.5	9.4	89	8.8	8.7	8.65	8.5
Open sun drying	10	9.50	9.4	9.32	9.24	8.5	8.3	8.0	7.5

RESULTS

The formula for calculating the moisture content left in the product/expelled by the drier is given as:

$$Mc = \frac{(Mi-Md)}{Mi} \times 100\%$$

Where Mc = Wet basis or Moisture content
Mi = Mass of product after drying for one hour
Md = Mass of dry basis.

Moisture content expelled by the drier is gotten by subtracting Mc from 100% i.e. 100% - the value of Mc.

ANALYSIS OF THE MOISTURE CONTENT LEFT IN THE TOMATO PRODUCT AFTER DRYING[6]

DRIERS	PRODUCT	WEIGHT OF PRODUCT BEFORE DRYING	TIME OF DRYING (HOURS)	MOISTURE CONTENT IN PRODUCT AFTER DRYING (%)
Drier with blower	Tomato	10	8	14
Drier without blower	Tomato	10	8	18
Open sun drying	Tomato	10	8	21

ANALYSIS OF THE DRYING RATE OF THE TOMATO IN THE DIFFERENT DRIERS

To check for the drying rates of the tomato in the different driers, the formula is given as:

$$Rd = \frac{(Mi - Md)}{T}$$

Where Rd is the drying rates, Mi is the initial mass of the product in grams, Md is the final mass of the product in grams and T is the time taken for the product to dry in seconds.

1. DRYING RATE OF THE TOMATO IN THE METAL DRIER WITH BLOWER

Mi = 10kg (10,000g) Md =8.15kg (8,150g) and T = 8 hours (28800secs)
From the parameters given above,

$$Rd = \frac{10,000 - 8,150}{28800}$$ i.e. 1,850/28800

Rd = **0.06g/s**

2. DRYING RATE OF THE TOMATO IN THE METAL DRIER WITHOUT BLOWER

Mi = 10kg (10,000g) Md = 7.7kg (7,700g) and T = 8 hours (28800secs)
From the parameters given above,

$$Rd = \frac{10,000 - 7,700}{28800}$$ i.e. = 2,300/28800

Rd =**0.08g/s**

[6]moisture content analysis of tomatoes ,cassava and potato
https://drive.google.com/file/d/1hHI0Mw_HpunDT7BtDXSDzB8f-7PK-CZT/view?usp=drivesdk

3. DRYING RATE OF THE TOMATO IN OPEN SUN DRYING

Mi = 10kg (10,000g) Md = 7.5kg (7,500g) and T = 8 hours (28800)
From the parameters given above,

$$Rd = \frac{10{,}000 - 7{,}500}{28800} \quad \text{i.e.} = 2500/28800$$

Rd = **0.09g/s**

Results of the drying of the tomato products shows that the blower which allows for inlet of air in the drier to spread heat evenly inside the drier allows the tomato product to dry faster and attain the moisture content as approved by the Standard Organization of Nigeria (SON). While the drier with the blower dried the tomato at 0.06g/s, the tomato dried under the open sun was dried at a rate of 0.09g/s. At the end of the drying process, the tomato in the driers (with and without blower) were more desirable in terms of color and aroma than the ones under the open sun drying which lost their color and were contaminated with microorganisms and insects perching on them and direct exposure to the ultraviolet rays of the sun. Therefore, solar driers can be an alternative and sustainable means of driers in food substance to prevent post-harvest losses by farmers and also preserve the shelf life of food products as seen in the case of this report, tomato.

Partnership with traditional governance structures to drive Climate Action

A large percentage of food and agricultural product consumed in Nigeria are cultivated in the rural areas, thus it is imperative we collaborate with traditional institutions that are closer to the people to help coordinate the local farmers to key into the amalgamation of clean energy with EBA driven agro-industrialization. Against this backdrop, we partnered with the emir of Nasarawa and the Shaganliku of Shabu as well as their elders in council across both emirates to drive climate action. Over 90% of people in Nasarawa engage in agriculture, including cassava farming and this leaves no doubt that the value addition in the cassava value chain is where Nasarawa's comparative advantage lays and the willingness of the emir who is very pro climate action solutions driven by the youth made this our seat of operation to test this climate action transformation solutions. This collaboration made it easy for the farmers to work together in a cooperative philosophy under the guidance of EBApreneur solutions Nigeria which is a Youth Innovative Volunteerism climate action enterprise and backstopped by UNEP EBAFOSA.

Innovative volunteerism actors with the emir of Shabu at his palace

Linking different value chains to solar dryers; the climate action drive of the youths under EBApreneur solutions Nigeria which is a Youth Innovative Volunteerism climate action enterprise structurally guided by UNEP-EBAFOSA has augmented innovative spirit of the youth who have now engage themselves in other value chains like potato, yam, melon and tomato by using solar dryers to increase its value by drying in a way that increases the shelf life, enhances quality and hygiene.

Tomatoes dried in the box cabinet solar dryer

Decentralization of Solar dryers

Nasarawa Drying Centre

Fabrication of eleven (11) box driers and a Giant Greenhouse community solar dryers at the emir of Nasarawa farm to help farmers dry their product to the required moisture content. The centre afford farmers in the area who cannot afford to buy solar dryers for individual use the opportunity to dry their produce in a safe and convenient way to get the best quality.

Cross section of Innovative volunteerism actors posing for a photo after completion of a greenhouse solar dryer

Innovative volunteers inside the giant solar dryer at the Nasarawa drying centre

Innovative volunteer drying cassava with the Box solar dryer for HQCF

Shabu Drying Centre

As a means of driving Nigeria's NDCs implementation through EBApreneur solutions Youth Innovative Volunteerism climate action enterprise by amalgamation of clean energy with EBA-driven agriculture as core of NDCs priorities that cover socioeconomic priorities; incubation of solar dryer solutions and decentralisation to add value to the cassava value chain, we visited Shabu, a settlement barely three (3) kilometres to Lafia, the Nasarawa state capital where cassava[7] is massively produced in high quantities and dried openly by the road side.

The visit was aimed at engaging the farmers and identify the problems of the cassava farmers of the town. This will help the team proffer climate proof solutions to the farmers so as to add value to their cassava products and ensure a cleaner and sustainable environment. It should also be noted that this visit was made to the only drying center in Shabu town.

[7] https://drive.google.com/folderview?id=1WFkUOPH1pDy_aMSXj6nFxsELHJWgrhJu

Cassava processed and dried openly on bare ground

Challenges experienced by the farmers of Shabu town[8]

Some of the problems experienced by the farmers of Shabu town are highlighted but not limited to the following:

1. Increase in post-harvest losses of cassava due to lack of a proper drying center devoid of contamination by animals, birds, insects, dirt, dust and direct ultraviolet rays of the sun.
2. There is just a single drying center to carter for all the cassava farmers in the town, this makes it difficult for all the farmers to make use of the drying center when they harvest their cassava products. Therefore the farmers take turns to make use of the drying center (a farmer is given a two day window to dry his or her cassava irrespective of the weather condition of that window). This in turns reduces the shelf life of the cassava product.
3. Reduction in the quality and nutritional value of the processed cassava product due to lack of proper drying of the cassava product.
4. The cassava products are dried without adequate knowledge of the required moisture content as regulated by the Standard Organization of Nigeria (SON) required to be left in the cassava before processing.
5. It takes between 4-5 days for the cassava products to be properly dried.
6. Reduction in the market value of the cassava products due to the contamination by animals, birds, insects, dirt and dust. The cassava also loses its color and sometimes aroma to further reduce its value.

[8] challenges of drying cassava in Shabu town
https://drive.google.com/file/d/1ZKDOEy46dmg2Kc7OjSmxT9NaZivtMgIJ/view?usp=drivesdk
https://drive.google.com/file/d/1Z_QbYWLdohn_tFpF1aySZ_gn08TY6WvY/view?usp=drivesdk

After listening to and identifying the problems of the farmers, the team set out to proffer solutions by telling them about the innovative way of drying cassava products with the use of solar driers which most of the farmers have never heard of prior to the visit of the team.

SOLUTIONS TO THE PROBLEMS

From our visit, observation and engagement with traditional rulers, farmers and members of the community, we deduced that the best way to tackle the problems faced by the farmers of shabu town is the provision of communal solar dryers and setting up a solar drying center. We therefore have mapped out an area to set up three giant solar dryers measuring 10x50 metres in size, as was done in the Nasarawa drying centre. This solar dryers will combat all the issues raised by the farmers in the following ways:

1. Post-harvest losses will be greatly reduced.
2. Increase in the shelf life of the cassava products.
3. Nutritional value of the cassava product will be preserved
4. The solar dryers will take less time, approx. 8 hours to dry large quantities (about 1000kg) of cassava product and reduce their moisture content to between 10-12% as required by the Standard Organization of Nigeria. This also means that more farmers can dry their cassava products and get them ready for uptake.
5. The solar dryers protect the cassava products from contamination of foreign agents like dust, dirt, animals and bird infestation.
6. The dryers will also preserve the color and aroma of the cassava products thereby leading to an increase in the quality of the cassava and subsequently in the market value of the product.
7. The solar dryers also ensure a sustainable and cleaner environment and encourage the farmers to take climate action.

The problems faced by the farmers of shabu can be attributed to the lack of efficient and coordinated system of processing and preserving their produce to improve productivity. The continuous use of the traditional open sun drying method which exposes the cassava to dust, pest, rain, wind and other elements of weather affects the quality and quantity of their cassava product. Thus, the introduction of a communal solar dryers to the center will go a long way in not just providing solutions but providing climate proof solutions that will curb the problems faced by the farmers. Providing climate proof affordable solutions to this farmers will go a long way in improving the yields and profits of the farmers, as well as boosting the economy of the community, local government and by extension the state. More so, since these solar dryers can be fabricated from locally sourced materials, the farmers would be trained on the fabrication and maintenance of solar dryers to ensure sustainability of their products and to ensure environmental sustainability.

Impacts

Switch to solar drying technology among cassava farmers; the farmers of Shabu, Nasarawa and environs were basically using open sun drying to preserve their cassava. Cassava could be seen dried along motor ways and open surfaces exposed to contaminants and weather elements. The introduction of the solar dryer innovation have exposed these farmers to a climate proof system of enhancing their activities and they have

all keyed into this action as against drying on open ground that expose the cassava to aflatoxin and other contamination.

Data for policy: data Collated from our work was shared the Standards Organisation of Nigeria (SON) to inform improvements in application of their standards on safety and quality of dried / dehydrated tomato

Employment opportunity: the solar dryer fabrication training afforded most of the youth to gain new knowledge and others to retool their skills and now they can produce solar dryers which is sold to farmers and they gain income, they can also consult on solar dryers and clean energy agricultural processing and train other people. This now means they go from being unemployed to being their own boss and employers of labour.

Reduction in PHLs; the use of solar dryers in the drying[9] of grated cassava chips[10] cut down to a great extent the losses experienced by using open drying of dried cassava, also cassava dried using solar driers to the minimum moisture level of 12% has a longer shelf life and can be stored and sold as pure quality cassava flour and chips to the market as drying allows safe storage of cassava chips over a long period by reducing the biological degradation rate of raw cassava chips.

Conclusion

Drying is an important step in the food production process. The main argument for food drying is to preserve the food for longer periods of time. However, it is important to note that the process is not just concerned with the removal of moisture content from the food. Additional quality factors are influenced by the selection of drying conditions and equipment. Solar drying has proved to be technically and economically valuable for several crops. Protection against UV radiation, dust, insects, mold and other sources of contamination, as well as temperature and relative humidity control, are needed to improve the quality of agricultural products. Solar drying gives desirable product quality with minimal environmental impact. It is an effective, cheap and safe method of food preservation. It's also the opportunity to retool youth skills to create wealth opportunities for themselves as they solve community problems. Projections show that the solar drier applied to cassava, will preserve cassava to prevent losses in times of glut. These dryers as part of a system of cassava value addition in driving the Nigeria cassava bread policy implementation will create hundreds of thousands of employment opportunities – about 260,000[11] in cassava farming, over 40,000 in processing of high-quality cassava flour, and about 3000 in manufacturing equipment like the solar driers. These are reserved estimates – for flour only. If we consider the 300 diverse products that cassava can be processed into, and factoring in a multiplier effect of just 2, translates to over 600,000 jobs excluding in transportation and bread improvers value chains.

[9] https://www.dropbox.com/s/zv2t8c2g6s4l6h3/Effect%20of%20temperature%20and%20shape%20on%20drying%20performance%20of%20cassava.pdf?dl=0

[10] https://www.sciencedirect.com/science/article/pii/S2452316X16302617

[11] http://www.journalrepository.org/media/journals/AJAEES_25/2015/Apr/Ohimain632015AJAEES16670.pdf

Next steps

- Establishment of Village savings and Loans Association (VSLA) in Shabu and Nasarawa emirate council A very innovative approach has been employed and a formation of communal local structures to bring people together- farmers, women and youth for the common purpose to tap opportunities in the agro-value addition using climate action solutions. This is will help them to tap opportunities- which is that while they were cultivating their cassava, now they have an opportunity to have it dried hygienically and effectively to cut losses. And once they do so, the dried agro-produce will be bought off as they put something in their pocket and with this they will grow their savings together in a group, and using the saved resources for their own use as well as to also finance other opportunities along the agro-value addition chain that will come up.
- Consolidating the VSLA to function optimally in Shabu and Nasarawa
- Data collection to inform the SON Climate action Market incentive guidelines on Tomatoes and Cassava amongst others
- improvement of the solar dryers performance to reach required moisture content in lesser time and follow international best practice
- Work with the Nasarawa State University Centre for entrepreneurship to develop and share relevant data on our work to inform improvements in entrepreneurship curriculum towards integrating climate action entrepreneurship aspects.
- Collate and record more solar dryer development data and analyses for trends in efficiency, safety, quality and production cost.
- Expanding the program to other cassava growing areas in Nigeria
- Training of more youth innovative volunteers to fabricate solar dryers in rural areas.
- Expanding the Drying technology to more value chains to reduce post-harvest losses
- Increase the mobilization, access and utilization of innovative agricultural finance.
- Increase market access and competitiveness of agricultural products in domestic and international markets using the existing SON approved Standards Markets Compliance Guide
- Awareness and sensitization campaigns on the work we are doing.