ORGANIZATION FOR COMMUNITY ENGAGEMENT (OCE)

ANNUAL ACTIVITY REPORT FOR FINANCIAL YEAR 2020/2021

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Executive Director, OCE

SECTION 1:

1.0 INTRODUCTION

1.1 Background and context

The Organization for Community Engagement **(OCE)** in collaboration with Mpwapwa District Council has supported capacity building on implementation of climate change adaptation and mitigation measures such as efficient cooking stoves, charcoal production technologies biogas production, nursery establishment and tree planting to reduce pressures on forest resources) at Nghambi Ward in Mpwapwa District Council through the funding from the Government of United Republic of Tanzania (Tshs 8,015,250) towards the implementation of Ecosystem-Based Adaptation for Rural Resilience (EBARR) project. The activity was agreed to be implemented for 10 Months, which commenced on the 11th January to 30th November 2021 in all the four villages, namely, Nghambi, Mbugani, Kazania and Kiegea.

The activity focused on supporting rural communities to adopt sustainable innovations in adaptations to effects of climate change resilient for agriculture; establishing and strengthening of community based associations; facilitation of production and marketing skills in this particular case focusing entrepreneurship around energy saving cooking stoves and sustainable charcoal and documentation and monitoring of results, case studies and success stories. On top of direct work with the environmental committee in the villages, representative farmers and youth entrepreneurs, with multidisciplinary team of staff also offers consulting services to development organizations in areas of organizational development (OD), business skills, strategic planning that fits the level of the beneficiaries of the project.

This activity was a continuation of the previous awareness raising training conducted to 48 village environmental committee members (ECM) on causes, effects, adaptation and mitigation measures against climate change in four villages of Nghambi, Mbugani, Kazania and Kiegea which are forming Nghambi ward. The activity aimed at building capacity of 1200 villagers including ECMs, charcoal producers, tree nursery group members, improved cook stoves artisan and village leaders on climate change adaptation and mitigation measures. In particular the activity intended to impart practical skills on how to construct and use improved cook stoves and improved charcoal kilns as well as getting basic skills on biogas production, tree seedling production and planting.

1.2 Training objectives

The main objective of the training was to create awareness to 300 villagers in each of the four villages in Nng`ambi ward on the meaning, evidence, causes, effects, adaptation and mitigation measures to climate change and possible climate change mitigation and adaptation measures that could be implemented by villagers in each village.

1.3 Specific objectives

- To obtain feedback from villagers on local adaptation and mitigation measures they are implementing against effects of climate change and variability in the villages; causes of the changes, implications and how they have been involved in building sustainability.
- To raise awareness on meaning, importance, practical making of efficient cook stoves and how it can contribute in sustainable environment management.
- To raise awareness on meaning and importance of biogas and the theoretical knowledge on construction of biogas plant and its linkage to climate change adaptation and mitigation.
- To familiarize villagers on legal procedures for sustainable charcoal production and how the village would benefit through sustainable charcoal harvesting.
- To increase villagers understanding on how to reduce wood wastage in the entire industry of charcoal production as well as conserve trees and forests.
- To raise villagers understanding on increasing efficiency of charcoal production by adopting the Improved Basic Earth mound Kiln (IBEK).
- To increase villagers understanding on the meaning of tree nursery, importance, knowledge on tree nursery establishment and management as well as tree planting as one of the climate change mitigation and adaptation measures.

1.4 Project duration

The project took a total of 10 months starting from 11th January to 30th November 2021. Participants were provided with theoretical trainings in four training centres in each of the four villages (Nghambi, Mbugani, Kazania and Kiegea villages) in Nng`ambi ward followed by by practical training on sustainable charcoal production and continuation of making of efficient cook stoves at sub-village level.

1.5 Training participants

A total of 1198 people were involved in this training including 1183 villagers, 5 facilitators from OCE and 10 district staff. Diverse of 1183 people from various livelihood patterns such as environment committee members, charcoal producers, tree nursery group and efficient cook stoves artisans and other community members with ratio of male to female being 705 and 478 respectively. The youth participated in the training is 46%. The district staff from Mpwapwa District Council included District project coordinator, planning, agricultural engineer, District agriculture and livestock officer, agricultural extension officer, village and ward executive officers. The list of participants is annexed at the end of this report.

Table 1: PARTICIPANTS FOR THE TRAINING

VILLAGE	MALE	FEMALE	TOTAL	YOUTHS AMONGST PARTICIPANTS
NG'HAMBI	188	157	345	115
KAZANIA	75	69	144	51
KIEGEA	240	118	358	180
MBUGANI	202	134	336	198
TOTAL	**705**	**478**	**1183**	**544**
Amongst participants there are 10 Government staff, 5 Facilitator from Inades				
VEO	3	1	4	
Ward Extension Staffs	1	1	2	
WEO		1	1	
Staff from Districts (	3		3	
Facilitators	3	2	5	

2.0 THE GENERALTRAINING METHODOLOGY

2.1 Awareness raising against spread of the pandemic corona virus

Although the training was conducted in period where the government started to allow small gatherings due to a smaller number of Covid-19 pandemic cases in the country, safety of participants was still observed as a first priority. This was done by ensuring facilities in which the trainings were to be conducted are Covid-19 safe by adhering to measures and precautions as stipulated by health authorities in order to have low risk of the spread of the Covid-19 virus that would cause the fatal disease. Awareness raising for protective measures by communities was done during opening of each session and reminding them on the same measures during the closure of sessions.

To avoid overcrowding of the people which is one of the high risks for spreading the virus learning took place in an open environment. Also, participants were asked to sit at a distance of 2metres apart and using short sessions. Participants were washing hands using soaps and flowing water. The facilitator further sensitized and encouraged participants on the importance of adopting Covid-19 pandemic mitigation as their regular habit even beyond the training sessions.

2.2 Facilitation methodology and techniques

Adult learning principles require participatory methods to be employed so that participants are fully engaged and relish the learning process. Learner centered approach through participatory learning methods dominated the training. Energizers were given to participants to motivate and make them active to continue with learning.

2.2.1 Preparation of training materials

All the brainstorming, sharing, daily feedback and other exercises during discussion generate lots of valuable outputs that the participants most probably want to take home. However, typing up facts on flipcharts for use while concluding the different ideas generated by participants was done to enhance efficient use of time during the participatory training. Other materials prepared and used during the training are handouts, note books, pens, marker pens, masking tapes, training objectives and agenda prepared on a flipchart.

2.2.2 Selection and organization of the training venue

Although participatory training can be accommodated almost anywhere, it is good to understand certain basic requirements that can help it to run more smoothly and more comfortably for you and the participants. The most important feature is probably flexibility and convenient space. As the participants need free movement around the venue, the trainers selected a venue with sufficient space and movable chairs. Participants were arranged in 10 clusters each with at least 30 members in a "U" shape to encourage active participation.

2.2.3 Introduction and training setting

This was the first session of the training in each village where the following was conducted:

i. The Trainer invites the village chairperson to officially open the training event.

ii. The village chairperson welcomes the district project coordinator, other district staff and trainers for individual self-introduction.

iii. The Trainer asks participants to introduce in groups in term of their economic activities performed in the village which relates to the project implementation such efficient cook stoves artisans, tree nursery groups, environmental committee members and charcoal producers.

iv. The trainer led the participants for 10 minutes through the training objectives and topics to be covered by displaying the written flipcharts prepared by the trainer. Participants were given chance for questing and clarification until common agreements were reached.

v. The Trainers and project coordinators distributed materials (notebooks, pens and the training agenda) to the participants.

vi. The Trainer facilitated participants to establish the norms which were observed within the training course. The trainer wrote the proposed norms on a flipchart and guided participants to agree.

vii. The Trainer asked participants to volunteer to join the feedback team, service team or the social team by explaining responsibilities of the team which includes guiding the trainers during tea and lunch breaks and when energizer is needed.

viii. The Trainer explained briefly the main training approaches that was planned to be used in the training. The Trainer emphasized that the training might have been different from other training they have experienced in the past because participants would have more opportunities to share their views, thoughts, opinions and experiences so that the lessons learned from the course would be more practical and relevant to village context.

ix. The Trainer explained to participants that each session build on the previous sessions. As such it is important to attend all training sessions.

x. Finally Trainer concluded the session by encouraging participants to speak or express their views as much as possible

2.2.4 Questing and brainstorming

Participants were asked to brainstorm and share their understanding of different concepts covered during the training so that facilitators know the level of understanding of different participants before facilitating them to grasp the new knowledge.

2.2.5 Group discussions

In situation where participants lose attention on individual brainstorming each individual were asked to share his/her thinking with nearby partners, followed by sharing among cluster and

later to the whole class. This encouraged participants not to be bored throughout the training sessions.

2.2.6 Group forming for practical session of efficient cook stoves and sustainable charcoal making

The theoretical training in each village was followed by practical part where facilitators with assistance from improved cook stoves artisans led participants into two groups to practice making the firewood stoves. The demonstration was done in houses of two of the participants of the training. The selection of household where the demonstration stoves would be made was based on readiness of the household to provide the needed raw materials such as water and clay soil. Facilitators asked participants who are willing and ready to provide materials to raise hands and other participants were voting to reduce number of participants requesting to be given opportunity of making the demo stoves at their homes by selecting those who live very close to the training venue.

2.2.7 Language used during the training sessions

Facilitators and more than 90% of other participants were communicating in Swahili language throughout the training sessions. However, those who felt comfortable to communicate using the local language spoken in the village were free to communicating in the local language. Facilitators were following the conversation through translation done by fellow participants. This enabled good communication and comfortability throughout the training sessions.

3.0 CLIMATE CHANGE; ADAPTATION AND MITIGATION MEASURES

3.1 Introduction to Climate Change; Adaptation and Mitigation Measures

Climate change and variability is really happening in Tanzania and its impacts are already being felt in the socio-economic sectors, and have resulted in the decline of agricultural productivity and increased deforestation. Adoption of climate change adaptation and mitigation measures such as improved farming methods, improved livestock keeping, agro-forestry, tree plantation, sustainable charcoal, improved cook stoves and biogas are very crucial for improving farmer's resilience to climatic effects and reducing deforestation.

3.1.1 Meaning of Climate Change

Participants after brainstorming were able to give the correct meaning of climate change and therefore the facilitator just elaborated on the differences between climate change and climate variability.

Climate change is the permanent deviation of the statistical distribution of weather patterns that persist for an extended period of at least 30 years caused by anthropogenic activities and natural processes while climate variability refers to the fluctuation in climate on temporal and spatial scales below or above the long-term average value and beyond that of individual weather events.

Climate change is a long-term shift in the climate of a specific location, region or planet. The shift is measured by changes in features associated with average weather, such as temperature, wind patterns and precipitation.

3.1.2 Evidence of Climate Changes

Participants were able to give the local evidence on the felt effects due to climate change. These include increase in atmospheric temperature, strong sunshine, dry of water sources and change in rainfall patterns. Facilitator added other evidence of climate change as elaborated below:

Increased frequency of extreme weather events: Events such as droughts, severe storms and floods has occurred even in several areas in Tanzania including Dodoma and Manyara regions.

Mountain glaciers and snow cover have declined on average in both hemispheres. In Tanzania the glaciers and snows in the peak of mountains like Kilimanjaro is disappearing.

Global sea levels are rising at a rate of approximately 1.8 mm per year. Along the coastal area in Tanzania some islands have been submerged with oceanic water.

3.1.3 Effects of climate change

Some participants were limiting effects of climate change only on environmental degradation. Therefore, facilitators elaborated on different effects across sectors due to climate change from the immediate effects to end effects.

Poor production: Current assessments of the impact of climate change indicate that some regions are facing shortage of food due to decreased agricultural productivity due to unpredictable weather, reduced rainfall and increased temperatures.

Infectious diseases: Climate change and variability has resulted to favorable survival conditions for disease causing vaectors. For example: Malaria has increased in places where in previous years were not conducive for mosquitoes like Lushoto and Njombe.

Loss of lives and human property: Extreme events like floods, drought and storms lead to damage of crops, destruction of settlements and sometimes loss of life.

3.1.4 Causes of climate change

Majority of the participants were mixing causes with effects of climate change. Therefore, facilitator gave detailed explanation on the primary causes of climate change with the aid of drawing on flipcharts that illustrates the simple science of climate change. Facilitator emphasized that Climate change is mainly caused by human activities that release greenhouse gases into the atmosphere. These activities include:

Burning agricultural residues, burning of forests: Releases smoke or carbon dioxide which results to increased temperature and changes in system of rainfall formation, humidity etc.

Chemical fertilizers

Some chemical and fertilizers used to improve productivity release greenhouse gases during the manufacture of fertilizers and when applied in the field.

Emissions from industries and vehicles

Today there are a lot of industries and vehicles all over the world. Smoke produced by both industries, vehicles and other equipment using petroleum fuel contribute to climate change by releasing greenhouse gases such as carbon dioxide.

Charcoal burning

Burning trees while producing charcoal releases carbon dioxide into the atmosphere thereby contributing to climate change.

Deforestation for timber, mining and grazing

Cutting down trees for timber, poles, grazing or mining reduces forests ability to absorb greenhouse gases such as carbon dioxide.

Livestock

Cows and other livestock release methane, which is one the greenhouse gases in the atmosphere.

3.1.5 Climate change adaptation and mitigation measures

Generally, the major contributors for climate change in Tanzania is forest degradation and deforestation. In order for Tanzanian to contribute in reducing risk for future climate change, the must be committiment to prevent further emissions of greenhouse gases in the forest, energy and agricultural sectors. This can be done through continuing with socio-economic activities in a sustainable manner using improved technology and knowledge of adapting our operations to climate change effects. Some activities that can be implemented as adaptation and mitigation measures includes the following:

Developing and implementation of land use plans: This ensure sustainable land uses as each activity are implemented in a particular area using efficient methods.

Adoption of improved and climate resilient agricultural practices: This will improve food security while reducing forest degradation and deforestation.

Sustainable natural forest management and tree planting: This will result to sustainable supply of forest products and improve forest conditions. Healthy forest serves as carbon sinks.

Use of improved cook stoves and sustainable charcoal: This will reduce the amount of wood that would have been wasted in local cook stoves and traditional charcoal kiln.

Use of biogas: Energy from biogas reduces pressures to the forest for charcoal and firewood and therefore leave more forests for sequestering carbon dioxide.

Introduction of alternative Income generating activities (IGAs): To reduce vulnerability due to effects of climate change disasters such as total crop failure due to drought or damage from floods communities need to diversify their socio-economic activities. Communities need to implement projects like beekeeping, pond fishing, grocery etc for creating alternative livelihoods.

3.2 Sustainable Charcoal

3.2.1 Wood Carbonization/Sustainable charcoal production.

In making sure that villagers in four villages which are Ng'ambi, Mbugani, Kazania and Kiegea are using the forest resources in a sustainable way as a way of adaptive mechanism to climate change. Knowledge on how to produce charcoal in a sustainable way was imparted to 1183 participants in all four villages. This included theory of the whole concept of sustainable charcoal production starting from the legal procedures governing the utilization of forest products and the construction of the Improved Basic earth mound Kiln to producers found in the four villages. Producers were taught on how to convert wood into carbon by using the improved techniques.

The simplest way of upgrading the value of wood as fuel is to convert it into "carbon" (i.e. charcoal). The process of converting organic materials (like wood) into charcoal is called **carbonization**. The carbonization process can be broken down into four distinct phases or stages of combustion, dehydration, exothermic reaction, and cooling (Karch- and Boutette 1993). In this process, the organic material concerned undergoes destructive dry distillation by heating it to over 300 Celsius (Centigrade) in a limited supply of oxygen. During carbonization: water, combustible gases, methanol, ethanol, acetic acid and tars are driven off. At the end of pyrolysis, the black solid residue remaining behind is **charcoal**, which is composed mainly of **pure carbon** (75-85% by weight).

3.2.2 Tree harvesting techniques through sustainable harvesting guidelines

The participants in the four villages(1183participants) were also trained on harvesting techniques by using harvesting guidelines where according to the harvesting guideline, harvesting should not take place in the following areas:

- Within 60m of the banks of a permanently flowing river or permanent water source.
- Within 20m of a spring or the banks of any regularly flowing stream or 30m of the banks of any regularly flowing Small River as specified in the Management Plan.
- Within a buffer distance (from the banks) equal to the width of any gully formed by ephemeral wet season stream, e.g. not within 2m of the banks of a gully which is 2m wide.
- Steep slopes (to reduce the impact of harvesting on soil erosion). These areas qualify as Hazard Land as defined in the Village Land Act 1999 Part III.
- Areas that are considered as sacred and have religious significance to members of the community.
- Around reservoirs of water (permanent and temporary) that may be important to local fauna.
- Areas close to a temporary watercourse, where close is defined as being within a distance from the banks equal to the width of the gully.

Participants in the four villages which are Ng'ambi, Mbugani, Kazania and Kiegea were also taught on another important item of harvesting techniques using various cutting hand tools available. These include axes, pangas, sharpening files/stones, etc. Participants and mostly

producers in each village were also taught on how to select trees for felling (e.g. suitable diameters), locating direction of felling, cross cutting the felled down trees into logs and billets.

It was further urged that in order to allow proper regeneration of trees, mainly through coppicing, trees should be cut at height of at least 50cm. Training participants were advised not to use small trees for covering their kilns as these are future sources of raw materials for charcoal production. Participants were advised to cover the kilns with grasses instead. Training participants were also urged to be selective in cutting down the trees leaving back some tree species for other uses e.g. medicinal, timber, etc.

3.2.3 Raw material base

Charcoal producers were also taught that charcoal making can only be a successful industry where the wood raw material resources are properly managed to provide a sustainable supply. The main sources of wood for charcoal production in Tanzania are the natural miombo/Savannah woodlands, tropical rain (moist) forests, fuel wood plantations and individual trees on farmlands. However, the natural stands are not yet properly managed to sustain supply, they are always over-exploited, thus needing some intensified management practices.

3.2.4 Kilns for charcoal production

In Mpwapwa Districts just like in other places in Tanzania, almost all charcoal is produced by using traditional earth mound / earth pit kilns. These temporary earth-kiln structures have stood the test of time and have proved to be an appropriate method for charcoal production to date. The major advantage of employing them is that they require minimum capital investment, comprising a few hand tools. These hand tools (axes, machetes, hoes, rakes, shovels, digging forks) are also commonly shared in other daily industrial and agricultural activities of the rural population.

For quite a long time, charcoal making has been carried out without widespread and substantial improvements on the traditional methods. This malpractice has led the charcoal producers to wasteful utilization of the forest resources which contributes to climate change.

In addressing this situation, Producers in the four villages were taught on the improved, affordable, easy-to-use and environmentally friendly technologies in charcoal production. Great efforts have been applied to producers so as to promote these technologies for the improvements of forest-resource management, charcoal production practices, and building up of institutional capabilities through training of trainers.

The kiln design commonly used at four villages in Mpwapwa District is the traditional earth mound kiln with varying degrees of production efficiency. Measures to improve the efficiency in charcoal extraction were introduced in the four villages through training of the village charcoal producers.

Plate 1: *Charcoal producers during practical training in Kiegea village in Mpwapwa district.*

3.2.5 Methodology during sustainable charcoal training

3.2.5.1 Identification of charcoal producers

Facilitator in liaison with village government selected 25 participants in each village. These producers are considered as the trainer of trainee and they will later be used to train other charcoal producers found in the village to ensure future proper utilization of the forest resources.

3.2.5.2 Training tools

The training instruments and tools used were demonstration on how kiln is established through flip charts and the training manual. Notes on how to establish an Improved Basic Earth mound Kiln (IBEK) were distributed to all participants for their reference. The participants were duly instructed on how to construct and operate one charge of IBEK stage by stage as follows

- Preparation of the Kiln site

- Dimensioning of kiln structure
- Placing of railings (stringers) and plat form
- Preparation of apron sticks and corrugated –iron-sheet Chimney
- Covering of Kiln with vegetation and soil
- Lighting of the kiln
- Monitoring of carbonization process

3.2.6 Results and discussion

3.2.6.1 Participating charcoal producers

The attendance of village charcoal producers during training session in all villages was satisfactory. 96 charcoal producers attended continuously without any interruptions out of the targeted 40 village charcoal producers.

Table 2: Charcoal producers participated in the practical training aggregated per age and sex.

Village	Beneficiaries						
	Male			Female			Total
	Youth	Adult	Total	Youth	Adult	Total	
Mbungani	12	21	33	0	0	0	33
Kazania	20	10	30	0	0	0	30
Nngambi	8	5	13	0	0	0	13
Kiegea	7	13	20	0	0	0	20
Total	47	49	96	0	0	0	96

3.2.6.2 Monitoring of field trial burning.

The participants were exposed to the construction and operation of the IBEK technology stage by stage under well guided instructions. The rates of carbonization plus trouble shooting were all under strict surveillance by all participants. The yield of charcoal in terms of number of bags is presented in Table 1 below. All data were collected under field conditions. The Charcoal produced was distributed equally to charcoal producers.

Table 3: Yield of charcoal from field-trial burning in Ng'ambi, Mbugani, Kazania and Kiegea Village in Mpwapwa District

Village	Kiln design	Billet length (m)	Billet diameter (cm)	Wood stack volume (m^3)	Number of charcoal bags (count)	Duration of burn (days)
Ng'ambi	IBEK 1	1	2-30	2.5	10bags @ 25Kgs	4
Mbugani	IBEK 2	1	2-30	2.5	10bags @ 25Kgs	4
Kazania	IBEK 3	1	2-30	2.5	10bags @ 25Kgs	4
Kiegea	IBEK 4	1	2-35	2.5	10bags @ 25Kgs	4

Notes:

(a) **IBEK** = Improved Basic Earthmound Kiln

Plate 2: *Charcoal producers after unloading and packing sustainably produced charcoal in Kazania village in Mpwapwa district.*

3.3. Improved Cook Stoves

3.3.1 Meaning of improved cook stoves

The term 'stove' refers to a device that generates heat from an energy carrier and makes that heat available for the intended use in a specific application. Cook stoves are made to transfer the generated heat to food with the purpose to get it cooked, refined etc. and therefore edible for human consumption.

The Improved cooking stove (ICS) is a traditional way of combination of heat generation and heat transfer to a cooking pot. Cook stoves are commonly called "Improved" if they are more "efficient" than the traditional cook stoves. Many of the world's population living in developing countries lack access to modern energy services for economic and social development. The traditional way for improved cooking stove has brought a revolution in Thailand and Bangladesh which reduced time and money consumption, produces minimum Carbon dioxide and saves from health disorder.

The World Health Organization (WHO) has estimated that 46,000 women and children die per year in Bangladesh as a direct result of exposure to indoor air pollution, while millions more suffer from respiratory diseases, tuberculosis, asthma, cardiovascular disease, eye problems, and lung cancer. 70% of the victims of indoor air pollution are children under five years. The best immediate way of addressing this urgent problem is the rapid and widespread introduction of improved cooking stoves that burn biomass much more efficiently and even more importantly designed to draw off the smoke and toxins, thus creating a safe environment for women and children.

A traditional stove is usually a mud-built cylinder with one, two or three raised points on which the cooking utensil rests. One opening between these raised points is used as the fuel-feeding port and the other two for flue gas exit. The stove may be built under- or over ground. In some cases, two potholes are joined together and a single fuel-feeding port is made for common use.

Plate 4: *Example of ICS used in theory training at 4 villages (i.e Kazania, Kiegea, Ng'ambi and Mbugani) in Mpwapwa district.*

3.3.2 Importance of improved cook stoves

- Over recent years, many projects on climate change adaptation implemented in Tanzania encouraged local communities to adopt the use of improved cooking stoves (ICS) to reduce the pressure of massive deforestation for energy use. Moreover, ICS are more encouraged as alternatives of reducing the dangers that emanate from the use of traditional which jeopardize human respiratory health with women and children identified as potential vulnerable groups through inhaling smoke from indoor cooking.
- Improved cook stoves used as one of sustainable climate change management in helping to reduce the rate at which carbon dioxide is emitted into the atmosphere in the sense that less use of charcoal and firewood entails less gas (smoke) emission.
- Improved cook stoves also promotes economic empowerment for women through the sale of stoves which are safe for cooking and time saving.

3.3.3. Raw material and training tools

3.3.3.1 Raw material

Improved cook stove can only be a successful industry where the raw material resources such as Sand or clay soil, cattle manual or Ashes, water, granite rocks, stainless steel, fiber glass, are properly managed to provide a sustainable supply. The main sources of clay soil, cattle manual or Ashes, and water make a sticky fine grained from the earth that can be molded when wet and dried then baked to make bricks and pottery for ICS. The process of making ICS is always very less expensive and available in all living environmental, the government of Tanzania must start considering to implement awareness raising campaigns which will encourage people to adopt ICS technology thus reducing massive deforestation practices.

3.3.3.2 Training tools

The training instruments and tools used were the live demonstration at the training session and built of ICS site, hands on manual, and the training manual. Brochures on the ICS technology were distributed to all participants for their reference. Participants were duly instructed on how to construct and operate one charge of ICS,stage by stage as follows

- ✓ Preparation of the ICS site.
- ✓ Dimensioning of ICS structure.
- ✓ Preparation of ICS material and corrugated iron sheet chimney or bricks chimney.

- ✓ Covering of ICS with mounded soil.
- ✓ Waiting for the ICS until the stage of desiccation finished.
- ✓ Monitoring of desiccation process.
- ✓ Start to use your ICS.

The main challenge is metal chimney which appears to be expensive for village community to afford. An alternative to use tree bark chimneys or bricks chimney were recommended this has been comfortably adopted by many previously trained communities of Mpwapwa District.

- **Granite Rocks**

  Rocks are considered an attractive storage material for thermal-energy storage at high temperatures due to their thermal physical and mechanical properties. The rock selected was granite because of its high density, good thermal properties, and ready local availability.

- **Stainless Steel**

  Stainless steel was chosen as a material because of its availability on the local market. Technically, it undergoes allowable deformation and is resistant to corrosion in high temperatures. Steel has a longer service life than most metals and because of this; its design life costs are minimal.

- **Fiber Glass**

  A section of the stove wall was made from glass wool because it is a poor heat conductor due to low thermal conductivity and thus will prevent heat loss by conduction. Through saving as much heat as possible, the fuel combustion efficiency of the stove is improved; it means saving even much more fuel. In addition, the fiber glass material is locally available.

3.3.4 Methodology used during improved cook stoves training

3.3.4.1 Identification of community participants of ICS training

OCE Tanzania, village leaders in 4 villages, and Mpwapwa Agricultural district staffs in liaison with village government selected 100 participants in which 41 were women and 59 were men to participate in the training session.

3.3.5 Practical training on construction of the improved cook stoves

In order to come up with the desired improved cook stove design and its desired performance, proper reflection into factors such as fuel type, calorific value, air flow rate, insulation, local resources, stove power output, safety consideration, reactor cross-sectional area, diameter, and height are of great importance. In the present study, the size of the combustion chamber and the amount of fuel required to accomplish the cooking task for experimental design was selected based on its local availability within Mpwapwa district.

3.3.6 Result and discussion

3.3.6.1 Coverage of training and discussion

Beneficiary villages were trained on the use of environmental friendly cooking energy such as improved cooking stoves and biogases energy stove. The benchmark of introducing environmental friendly cooking energy was the quest to replace traditional cooking stoves which use firewood in a 3 stone fireplace. On a second look, this picture is often a drastic simplification of the reality. Currently, OCE and Mpwapwa district have moved to address the unfortunate situations prevailing on our firewood, improved cook stoves will make affordable and easy to use as well as environmentally friendly technologies in climatic change mitigation. Overall, one hundred (100) participants in each village were involved in training and discussion about the meaning of ICS, historical background of ICS, importance of ICS, materials, design and construction of ICS.

Plate 6: Community involved in theoretical training of ICS at Ng'ambi village in Mpwapwa district

3.3.6.2. Training results

Participants (100) in each village including village leaders, some of the staffs from Mpwapwa district, OCE and facilitator from RUCDO were involved in theoretical and practical training and discussion about the meaning of ICS, historical background of ICS, importance of ICS, how to design and construction of ICS, material, stages as well as reasons behind of using ICS at their household as one way of climatic change mitigation.

About 44 ICS were constructed in 4 villages (i.e. 11 ICS in each village) as part of practical training to make sure the knowledge of ICS is well understood to the community at these 4 villages.

3.4 Biogas

3.4.1 Meaning of biogas

Biogas is a gas produced by anaerobic fermentation of different forms of organic matter and is composed of different gases including methane (CH_4), carbon dioxide (CO_2), nitrogen (N_2) and hydrogen (H_2), hydrogen sulphide (H_2S) and oxygen (O_2). The proportion of different gases in the mixture varies depending on the type of raw materials used for production of the biogas. Primarily biogas composed of high proportional of methane followed by carbon dioxide with the ratio of 2:1 between methane and carbon dioxide. The other gases occupy very low proportion usually lower than 10%. Typical feedstocks for biogas production are manure and sewage, residues of crop production (i.e., straw), organic wastes from households and industry as well as energy crops including maize and grass silage.

3.4.2 Importance of biogas

It produces energy (heat, light and electricity). Biogas is a renewable fuel and produced from organic wastes thus help to conserves the environment as it reduces consumption of wood fuel. Help to reduce volume of disposed waste products. Reduces wood fuel collection workload to women and children. It can be an additional source of household income.

3.4.3 Biogas plant and its biogas

During brainstorming it was revealed that participants knew that biogas is produced from cow manure. However, they didn't have enough knowledge on how the gas is produced. With aid of illustrations drawn on flipchart facilitator elaborated the meaning of biogas, materials and basic equipment's used for preparation of biogas, basic techniques for biogas preparation and importance of biogas in relation to adaptation and mitigation to climate change as detailed below:-

3.4.3.1 Biogas plant

A biogas plant is an anaerobic digester that treats organic wastes. During the digestion process the micro-organisms transform biomass wastes into biogas. Materials for biogas plant construction includes locally available or made materials such soil bricks, stones and sand. Other materials needed includes water roof cement, iron steel, wire mesh, binding wire, iron pipes, plastic pipes, gas pipes and valves. Other requirement are the raw materials for production of the gas usually unrotten cow manure is used in village environment.

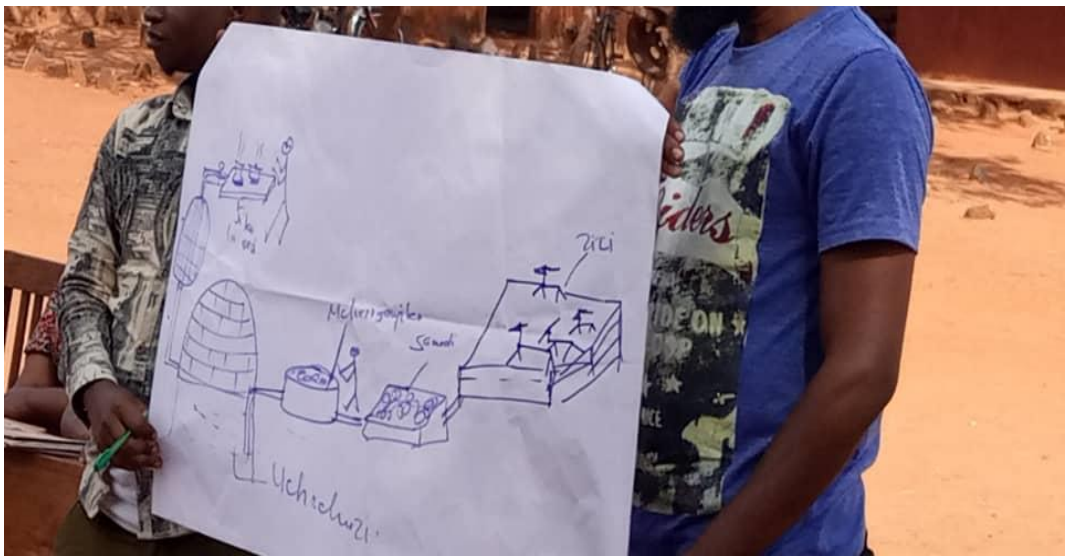

Plate 7: Illustration of biogas plant during the theoretical training sessions

3.4.3.2 Production of biogas

Biogas originates from bacteria in the process of bio-degradation of organic material under anaerobic (without air) conditions. Methanogens (methane producing bacteria) are the last link in a chain of micro-organisms which degrade organic material and return the decomposition products to the environment. In this process biogas is generated, a source of renewable energy.

The gases methane, hydrogen and carbon monoxide can be combusted or oxidized with oxygen. This energy release allows biogas to be used as a fuel. Biogas can be used as a low-cost fuel for any heating purpose such as cooking. It can also be used to run any type of heat engine to generate either mechanical or electrical power.

3.5 Tree Nursery Establishment, Management and Tree Planting

The objective for this training was to increase villagers understanding on tree nursery establishment and management as well as tree planting and management. The training was conducted in Nng`ambi, Mbugani, Kazania and Kiegea villages in Nngambi ward in Mpwapwa district covering basic techniques on tree nursery establishment and management as well as tree planting. The taught contents on nursery establishment and management includes meaning, types and importance of tree nursery, site selection, materials and equipment's for nursery operations, site preparation, preparation of soil mixture and pot filling, seed bed preparation, arrangement of seedling beds, seed treatment and sowing, pricking out, covering bed with shed, watering regimes and other management. Tree planting techniques covered include marking and spacing, digging of planting holes and actual planting. For the practical session a field visit to a proposed nursery was visited to check its compliance to tree nursery operations.

3.5.1 Meaning, types and importance of tree nursery

Through questing participants were able to give the meaning of tree nursery. Therefore facilitator summarized participants' ideas and gave conclusion on the meaning, types and importance of tree nursery as described below:-

A tree nursery is an area where tree seedlings are raised and given special care to ensure good health before being transferred to the field for planting. Forest nurseries are categorized into temporary and permanent nursery based on duration and frequency of the nursery operations across seasons and years. Therefore, a temporary nursery is the one used to raise and care seedlings for specified short duration e.g for example two years or below while in a permanent nursery operation continues for a long duration usually more than 3 years consecutively.

3.5.2 Site selection

Participants were trained on criteria for selection of a good area for tree nursery establishment. Good nursery site should meet the following conditions: -

i. Close to permanent and reliable source of water or water supply e.g spring, river, well or water pipes.

ii. Flat or gentle slope area with good drainage soil

iii. Good supply or easy availability of suitable fertile soil, sand and manure and other ingredients

iv. Close to the planting site

v. Good road connectivity with the planting site

vi. Good security and production from strong winds

3.5.3 Necessary nursery materials and equipment's for nursery operations

Participants also trained on necessary equipment's and materials needed for nursery operation and its importance. Nursery equipment includes hoe, spades, bush knives, sieves, scissors, rakes, wheel barrows, watering canes, hand sprays, polythene tubes etc while the ingredients includes soil, sand, manure, pesticides, seed etc

3.5.4 Site preparation

Participants were trained on the key site preparation activities which includes site clearing, initial treatments and designing of the site according to space requirement for different operations such as seed beds, seedling beds, water storage, stores, fence and pathways. Site clearing involving cutting all useless trees and shrubs while the initial treatments involves destruction of termites' mound and other insect or rodents breeding environment and allowing grasses to grow and stabilize the soil. Site preparation also includes protecting the site against destruction animals by planting or construction of fence.

3.5.5 Soil mixture preparation and pot filling

Participants were trained on how to come up with a proper mixture of soil, sand and manure for transplant beds based on the type of soil and level of soil fertility. The ratio of soil, sand and manure in the mixture depends on the level of clay and sand component in the soil to be used for raising seedlings. The manure should be rotted enough for easy release of nutrients into the

soil mixture. Demonstration for identifying good soil mixture was done through touch and feel techniques followed by actual practice for each participant. For soil mixture for seed beds usually contains only soil and sand. The soil is sieved before mixing with sand.

Also, the trainer demonstrated on how to estimate size of pot bags from a polythene tube roller. The main criteria on estimation of size of pot bags is the type species and duration for staying at the nursery. Species with long roots or that need long stay at nursery site requires larger and longer pot bags compared to species with short roots or that take shorter duration at the nursery site. Furthermore, participants were given skills of making pot bags using locally available materials. Finally, trainers demonstrated on how to fill soil mixture into the pot bags. The key issues to consider including moistening of the mixture before filling into pots for easy filling, light pressing down of the soil mixture in every step of filling to allow easy root penetration and aeration and ensuring that at least 2cm below the top of the pot to avoid escape of soil mixture outside the pots while watering.

3.5.6 Seed bed preparation

Participants trained on meaning of seed bed and key issues to consider while preparing seed beds. Participants asked to share their knowledge and finally trainers summarized different ideas and gave the actual meaning of seed bed and how to construct it. Seed bed is a basin like soil mixture structure of about 1m width, 1m length and 10cm depth with necessary requirements for seed to germinate. Such structure help to conserve moisture, provide aeration, nutrients and hold seedlings for ease growth.

3.5.7 Arrangement of transplant beds

Participants were given the theoretical knowledge on arrangement of filled pots into seedling beds. Pictures showing pots arranged in rows and columns were used to increase understanding to participants. The dimension of a bed is 1m to 10 m with at least 0.5 m spacing between beds. To avoid direct effect of sunshine the beds should be oriented to run east-west directions. The space between beds allow easy movement of nursery attendants while doing their operations such as watering, weeding, shading and root pruning.

3.5.8 Seed pretreatment and sowing

Participants imparted with knowledge on meaning of seed treatment and sowing skills and factors influencing decision on kind of seed pretreatment and sowing. Some seeds need special treatment before sowing for improving the speed and uniformity of germination. Elaboration

was done to trainees on different seed pretreatment techniques depending on specific seed characteristics. For example soaking into flowing water for number of days for seed with chemical interfering germination like teak, soaking in hot water until seed look swollen for light seeds like albizia and acacias, soaking in cool/cold water for seed with soft coat like gmelina and dalbergia, cracking seed coat through sharp objects or burning for seed with hard coat like miombo seeds etc. Then participants were trained on seed sowing techniques on seedbed and direct sowing on pots with soil mixture. The main factor for deciding on raising seedlings on seedbed or direct into filled pots includes the seed size, speed of germination, duration for raising seedlings and easiness of transplanting operations without causing high mortality to young seedlings.

3.5.9 Pricking out or transplanting

Participants also trained on the meaning, its importance and techniques for doing pricking out. The trained defined pricking out as a process of separating out seedlings growing together and transferring them into individual pots filled with soil mixture. Usually done when transferring young seedlings from seed beds to filled pots in seedling beds with objective of providing safe, enough space and comfortable environment for better growth of seedlings. This is done as soon seedlings get the first two leaves and with height below 5 cm. To retain much of the soil around the roots the excise should be done with maximum care. It involves uprooting the seedlings in the germination area, separate the uprooted seedlings, make small holes in the filled pots with your finger or sharp object and put the roots gently right down and feedback the soil by squeezing the soil towards the seedling stem. The nursery attendant should work with small batches of seedlings to avoid dry out of seedlings when the roots are bare. Handle the seedling on the leaves to avoid destroying the delicate seedling stems and ensure that seedlings are watered soon after fitting the seedling into the pots.

Note: Seedlings can also be raised from cuttings. Cuttings from a stem of mature trees like Gliricidia and teak are marked to show the upper side and sown into pots or seed bed and them cared like other seedlings raised from seed.

3.5.10 Seed and seedling beds shed

Shed is very essential for protection of young seedlings from strong sunshine and heavy rain droplets that may cause shock and weaken the seedlings. Participants were trained on importance of provision of shed, materials and skills for construction and application of seedlings shed as follows: -

i. Shed can be erected at a reasonable height above the seed bed or seedling beds using locally available materials such as wood poles, grasses, straw, palm and bamboo mats.

ii. The shed roof should have a gentle slope for draining water outside the seedlings.

iii. For hardening of seedlings shed should be removed from the beds when seedlings are suitable for pricking out and at least two weeks towards the start of planting operations.

3.5.11 Watering regimes

Participants also given importance of watering and precautions needed while doing the watering operations. Plants body constitutes of more than 90 percent water. Therefore, seedling grown in containers access only limited water contents as they don't have the ability of absorbing water deeper in the soil as mature trees does. Nursery attendants should use adequate amount of water for watering as too little water lead to dry of seedlings while overwatering leads to rot of root and stem. The extent of watering depends on various factors such as seedling age, amount of sunlight and soil type.

3.5.12 other nursery management

3.5.12.1 Weeding

Weeds are other plants that compete with seedling for nutrients, water and light and thus interfere the health of seedlings. Remove all the weeds around the beds with your hand or hoe and dispose them. Rubbish can be used as breeding area for insects and therefore should not be left near the beds unless that can be converted to compost.

3.5.12.2 Seedlings hardening off

Participants in groups were led to discuss the meaning and importance of seedling hardening off. After extracting participant knowledge on hardening off the trainer improved the participants' concept on hardening off. Trainer elaborated that hhardening off is the process of exposing the seedlings to harsh conditions to make them strong so that they will be able to survive under harsh climate in the field after planting out. It is also a gradual preparation of seedlings for adapting to field conditions. It involves reducing time for staying under shade and watering regimes. Attendants in the nursery are advised to position seedlings outside a shelter during the day for a short time and gradually extend the time over a course of a week or 2 weeks until

seedlings able to resist direct sun shine all over the days. Also reduce watering intensity and watering frequency gradually until help seedlings adopt condition of shortage of water.

3.5.12.3 Root pruning

Knowledge on root pruning techniques and its importance was given to participants. Root pruning is the process of cutting to reduce roots length to control root system development beyond the container. Seedling root pruning is done regularly because once the root system develops under the ground, it become hard to move the pots, and if the roots are cut when the seedling roots are old, the seedlings will be weakened. The period and interval of pruning depends on different species and other conditions. Usually seedling root pruning is done regularly preferably every 2 to 3 weeks.

3.5.12.4 Seedling protection

Participants reminded that sseedlings are delicate and susceptible to attack by various pests and diseases as well as weather conditions and destructive animals. Such damages can seriously weaken or kill the seedlings. It is important that the damages be dealt with immediately. Therefore, damage and disasters in the nursery may be related to weather conditions, human, livestock and wild animals, insects and rodents.

Participants trained on some methods and techniques used for treating affected seedlings. For example; Worms and insects like termites are the most common recorded insects in the nursery. They eat the roots and stems of many tree species. Termite may be controlled by several methods: like putting a thin layer of ash (2 to 3 cm thickness) on the bed, where the pots or tubes of seedlings will be placed. However periodic application is required since ash cannot be effective for long; digging out the queen from nearby colonies (termite hills), use of plant extracts and chemicals in severe cases or using chemicals such as dieldrin and aldrin.Fungal diseases like damping off is related application of contaminated water, soil with low drainage and intensity of watering. Therefore, it can be prevented through reducing watering intensity, treating water before watering and drying seedling soil mixture with direct sunshine. Jik is one of the chemicals used for treating water.

3.5.12.5 Seedlings pretreatment before planting

In this aspect participants got opportunity to participate into discussion under facilitator guidance on the meaning, importance and how seedling pretreatment is done. Facilitator commented that it's important to ensure that seedlings to be planted are big enough (at least 1.5 ft high) and with good health for enhancing high survival rate after planting. Therefore, seedlings selection and arrangement of seedlings according to its health and height is very important. Attendants should water the seedlings just before transporting from the nursery to the planting site to protect seedlings from drying up during the transportation. Transferring seedlings from the nursery to the field needs great care to avoid damaging them. Avoid piling seedlings up each other when transporting. Using boxes or bags is recommended if the planting site is far but always carry the seedlings upright. If the seedlings were raised in polythene tubes or tins packing them in a box or sack ensure less damage while transporting to the planting field.

3.5.13 Tree planting

During group discussions it was revealed that trainees have enough skills for tree planting. However, facilitator while summarized the concepts shared by participants emphasized about the importance and techniques for tree planting as described below: -

Proper tree planting and tending techniques is very essential for high survival rate. It's important to ensure that seedlings to be planted are big enough and with good health. Always plantation attendants should remember to plant as soon as possible after getting seedlings from the nursery. Tree seedlings should be planted when it has rained and soil is really soaked with water to about 30 cm depth from the soil surface. This will ensure plant growth even if no more rain is available. However, plants grow well if the rain continues for about two weeks after planting. Tree planting involves the following operations:

3.5.13.1 Marking and spacing

It is the exercise of measuring rows and columns and putting marks area where holes will be dug following specified interval. Plants may be spaced at 2.5 m by 2.5 m, 3m by 3m or other specifications based on growth characteristics of the species and targeted tree products. For example, tree for pole production need smaller spacing to fasten increase in height while trees intended for timber production need wide spacing to fasten increase in diameter.

3.5.13.2 Preparation of planting holes

Planting holes should be dug before rainy season commences if possible since water is needed to collects in it to make the survival easy even when rain is not much. Dig a hole of 30 cm x 30 cm

or 60 cm x 60 cm in loamy and clay soil areas respectively in the marks. However, the size of the hole will also depend on the size of the seedling. The purpose of planting hole is to soften the soil so that the roots of the tree can easily penetrate and the loose soil can catch and contain more moisture.

3.5.13.3 Actual planting

Planting of trees in the field follow the following steps and techniques.

a. If ready to plant, re-fill quarter of the holes with wet top soil around the holes removed when preparing the holes.

b. Remove the polythene bag or tube by tearing it while holding the seedling upright.

c. Remove the seedling from the tube with its soil by holding it under the stem.

d. Put the seedling in the hole and cover it with the top soil and then the sub soil.

e. Place the seedlings in the hole without removing the pot soil or bending roots.

f. Press down the soil nicely.

g. Fill the hole with top soil from the forest or the best soil you have nearby (from trees in the farm or collected around the banana base). This soil can be mixed with manure to provide the plant with more nutrition.

h. Use your hands to firm the soil carefully around the roots.

i. Make sure the seedlings sit in the ground at the same level it sat in the container or nursery.

j. When the hole is filled, tread gently with your feet to firm the soil.

k. Firm it into the shape of a well or basin so that it catches rain water and holds water you put on it. Water the seedlings immediately after planting if the rain is not enough. If you plant in dry season, water two times a week-early morning and later in the evenings or at least once but in the evenings.

Note: For some species planting can be done through direct seed sowing or using cuttings. Direct sowing of seeds or cutting planting should be done only when the rainy season has fully set in.

3.5.14 Field Visit at Nursery Site

During the theoretical training it was noted that the village already formed a nursery group with combination of some experienced and fresh participants with no practical knowledge on tree nursery operations. The group was organized by Mpwapwa district council for starting raising 40,000 seedlings through support from the EBARR project. At the time of training the group had already identified and cleared a site for establishing a temporary tree nursery. Therefore, facilitators arranged to meet the nursery group at the site earmarked for tree nursery establishment to have thorough discussion with group members on eligibility of their site and plans for conducting other nursery operation as reflection session to the contents covered during the theoretical training. The objective was to improve the knowledge and skills on nursery operations to Ng`ambi group members.

Plate 8: Water source near the proposed tree nursery site

Through this visit the following opportunities and technical gaps were identified:-

3.5.14.1 Technical gaps

1. Inadequate security of the nursery i.e. prone to human and livestock disturbance
2. Lack of reliable source of un contaminated water
3. Inadequate working equipment for nursery management
4. Limited seed source and varieties
5. Lack of group cohesion
6. Inadequate knowledge on tree nursery management

7. Limited knowledge on markets and commercialization of tree products for sustainability of the nursery operations.

3.5.14.2 Opportunities

1. Presence of nursery site
2. Presence of source of water near the nursery site
3. Presence of experienced nursery attendants within the nursery group and availability of laborers as the nursery site is located close to the village center.
4. Willingness and plan for the EBARR project to support the Nng`ambi nursery group in nursery equipment's, tree seed and other nursery ingredients for raising seedlings.

3.5.14.3 Follow up activities

i. Village leaders to mobilize more villagers to join in the tree nursery operations to learn the practical aspects of seedling raising.
ii. Also, village should select degraded forest and water source areas that need restoration with the native species.
iii. The Mpwapwa district council through the EBARR project to work very closely with the Nng`ambi nursery group and support establishment of permanent tree nursery to supply seedlings to households and nearby institutions. The Nng`ambi nursery also can be used as a training center for the nearby villages.
iv. The nursery group members need capacity building on business skills so that they can treat tree nursery operations as an alternative income generating activities.

3.5.15 Results from Tree nursery and tree planting training

The training resulted to improved understanding of the basic nursery establishment, management and tree planting techniques. Observation revealed that before the training more than 50% of the participants had very little knowledge on tree nursery establishment, management and tree planting techniques while after the training more than 90% of participants had good understanding on tree nursery and tree planting operations. The training increased morally of the Nng`ambi nursery group members to continue with site clearing ready for starting raising seedlings. The training also changed villagers mind set of treating raising seedlings and tree planting as a very expensive activity as they are now aware on using locally available materials for those operations.

4.0 OUTCOMES FOR THE TRAINING

- After the training 98% of the 400 communities participated in the training have shown high willingness to engage into forest management, tree planting, making and use improved cook stoves. Also communities in peri urban area have shown high interest to have the improved charcoal stoves. This increased the willingness to improved cook stove artisans and tree nursery group members to engage into business. Also, Trained charcoal producers from both villages expressed willingness to adapt and disseminate the improved technology forthwith as well as engaging into charcoal business. This is the smart multiplier effect of training of trainers, farmer-to-farmer learned advice.

- Total of 300 beneficiaries supported with improved firewood cook stoves. 98% of the beneficiaries are already using their stoves out which 45% are youth and 55% are adult. They commented that improved firewood cook stoves saves 70% of the load that would have been used in traditional firewood stoves while improved charcoal cook stoves save 2/3 of the charcoal that would have been used in traditional charcoal stoves. Likewise, charcoal producers participated in the practical training of sustainable charcoal production commented that improved charcoal kilns save about 50% of the wood that would have been wasted in traditional charcoal kilns.

5.0 CHALLENGES AND LESSON LEARNT

5.1 Challenges

i. Difficult in getting charcoal producers to participate in the practical aspect of sustainable charcoal production as they were worried that would be caught as they are working without complying with the legal requirements.

ii. Metal chimney appear to be expensive to charcoal producer and therefore to enhance sustainability of the sustainable production producers were trained on construction of chimney using locally available materials.

iii. The water source close to the nursery is being regularly polluted by livestock herds and human activities like swimming and washing of clothes and thus not save for direct use to the nursery operations. Also, the water is saline and therefore the group planned to dig a deep well hoping that will find fresh and clean water.

iv. Villagers do not have tradition of planting trees as they didn't have knowledge on sustainable forest management and therefore very few villagers interested on joining tree nursery operations.

v. Lack of machine for molding improved iron cook stoves delayed communities to construct iron cook stoves.

vi. Inadequate availability of clay soil near the village centers delayed the adoption of construction and use of improved firewood cook stoves.

vii. Low knowledge in marketing for improved cook stove makers, sustainable charcoal producers and nursery group members and thus affecting the sustainability of their operations.

5.2 Lesson learnt

i. Communities are aware of climate change effects and have been using some local methods of adaptation. Therefore, the training creating wide thinking to other measures like using improved cook stoves and sustainable charcoal.

ii. Inadequate enabling environment made charcoal producers to continue with illegal charcoal harvesting.

iii. Villagers mind set of getting paid allowance while participating in training reduced their attention in the training after knowing that organizers were not providing allowance.

iv. Majority of villagers think that planting trees in their farms would compete with their agricultural groups for nutrients, water and light and thus was one of the reasons for not planting trees in their farms. Also, shortage of land for establishing individual tree plantation made some villagers not giving priority on tree planting.

v. Overdependence on donor support on resolving community development projects make villagers reluctant that will receive full support in establishing and implementation of climate change adaptation and mitigation.

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The three days training in each village enriched villager's knowledge and skills on climate change, evidence of climate change, causes, effect, adaption and mitigation measures to climate change.

Villagers are well motivated to adopt improved cook stoves, improved charcoal production kilns and tree planting practices as it will not only conserve the environment but enhancing food security and other livelihoods. Sustainability of implementation of the interventions will be possible if proper system of technical mentoring and close follow up is established by OCE and Mpwapwa DC.

6.2 Recommendation and support needed

i. To implement socio-economic activities in a sustainable manner, villagers need to be supported with development of village land use plans and enhance its implementation.

ii. To make the charcoal producers organized and formally recognized the group need to be supported to form charcoal producer's association. This will enhance members to join efforts in sharing cost of complying with legal aspects, production and marketing of their charcoal.

iii. Awareness creation to charcoal producers on legal procedures for charcoal production. This will make them to work without fear for their products to be confiscated by Forest Managers.

iv. Improved cook stoves artisans need to be supported with molding machines for making charcoal stoves. This assist them to utilize the high demand for improved charcoal stoves.

v. Charcoal and improved cook stove producers should be supported on establishing selling centers, this will allow producers to have access to both local and external market. This will assist them to promote and sell their products in the village and also motivate traders from outside villages to have easy access to ready-made charcoal to supply to town market.

vi. Group members engaging in climate change adaptation and mitigation interventions in the villages should be supported on business skills so that they can develop business plan for promote and marketing their products. To reduce market competition with same products in the market the group member needs to be supported on branding of their product. This includes labelling and packaging whereby all peculiar features and advantages of the products are described in comparison with other products in the market.

vii. Communities should be supported on creating awareness to customers on the importance of using legal and sustainably produced products as there is a challenge of having illegally harvested products sold at same price with legal and sustainable products.

viii. To enhance sustainable management of natural forests and increasing community ownership of the forests, villages need to be supported in establishing village land forest reserves (VLFRs) through implementation of community base forest management approach.

ix. Mpwapwa district council to keep on insisting communities to use improved cook stoves and improved charcoal kilns.

x. Also the district to continue with awareness creation on tree planting by emphasizing more villages to establish tree nurseries, identification of area that need restoration and establishment of wood lots. This will reduce pressure to the natural forests and also maintain forest health for sequestering greenhouse gases.

xi. The district council in cooperation with Inades should conduct follow up to assess how much of the trained participants managed to make and use their own stoves, benefits and challenges that will be encountered by adopters.

List of Plates: Photos illustrating different events during the training

Community involved in theoretical training of CC adaptation and mitigation measures at Kazania village in Mpwapwa district

Community involved in theoretical training of CC adaptation and mitigation measures at Kiegea village in Mpwapwa district

Picture in the left-hand hand side showing Sustainable charcoal produced during practical training at Kazania village in Mpwapwa district: Picture in the right-hand side showing Artisans using her Improved firewood stove in Kiegea village in Mpwapwa district site

Practical training on how to start fire in the establishment of the Improved Basic Earth-mound Kiln(IBEK) at Kazania village.

Picture in showing Improved cook stove during practical training at ng'ambi village in Mpwapwa district:

A woman showing improved cookstoves

Firewood Improved cookstoves at Kiegea village

Improved cookstoves at Nga'mbi village on the left and a chimney on the right from on of the cookstoves in Ng'ambi.

Participants from Ng'ambi village during theory training on the concept of climate change.

Charcoal producers at Kazania village placing railings and billets in the in the Improved Basic Earthmound Kiln.


Charcoal producers from Kazania village placing apron sticks in an Improved Basic Earth mound Kiln

Charcoal producers from Kiegea and Aziz a project coordinator after arranging billets and placing of apron sticks in an IBEK.

Charcoal producers from Kiegea village placing of a chimney in IBEK.

Charcoal producers from Kazania village with already produced charcoal from an Improved Basic Eartmound Kiln(IBEK)

SECTION 2

MIKONO& SHULE YETU (OUR SCHOOL and HANDS) CAMPAIGN/ COVID-19 MITIGATION MEASURES

2.0 INTRODUCTION

Mikono & Shule yetu is a sanitary campaign implemented in primary schools by OCE under the Water Sanitation and Hygiene (WASH) program. The campaign among many other activities disseminate sanitation and hygiene knowledge, donation of sanitary equipment such soaps, sweeping blooms, mopper, brush, buckets and menstrual sanitary pads to adolescent girls. OCE advocates for regular availability and accessibility of clean and safe water, improvement of sanitary infrastructures which favor comfortable services for people with disability and private rooms for changing menstrual sanitary pads. To date, OCE works with Kibangu Ruge English Medium in Ubungo District with 800 pupils as beneficiaries of the WASH program.

2.1 COVID-19 Pandemic

COVID-19 (Corona Virus Disease of 2019) has impacted all facets of Tanzania's economy, and the education sector is not spared. With the World Bank projecting an additional 500,000 people sink to below poverty level in 2021, the ability of parents to provide education material required to schools has been greatly hampered (World Bank, 2021). This is likely to have an impact on the literacy and numeracy levels of learners from underserved communities. The government of Tanzania through the Prime Minister's office in March 2020 ordered the closure of schools and universities for unknown period of time as a strategy to lessen the widespread of COVID-19 infections. Tanzania was the first country in the East African Community to resume classes after the rock down in 2020. Officially, classes resumed after three months (March to June, 2020) with government through the Ministry of Health, Community Development, Gender, Elderly and Children requiring teachers and students adherence to stipulated mitigation measures for COVID-19 pandemic. OCE executed a budget of Tshs 2,832,000 to disseminate knowledge on Covid-19 mitigation measures, purchase and donation of sanitary equipment for Kibangu Ruge English Medium.

2.1.1 COVID-19 Mitigation Measures

OCE in collaboration with Kibangu Ruge English Medium imparted Covid-19 mitigation knowledge to teaching staff and pupils, key message insisted included;

a) To maintain at least a 1-metre distance between you and others to reduce the risk of infection when they cough, sneeze or speak. Moreover, maintain an even greater distance between you and others when indoors.
b) Make wearing a mask a normal part of being around other people.
c) Keeping rooms well ventilated,
d) Avoid crowds
e) Cleaning hands with running water
f) Cough into a bent elbow or tissue.
g) Regular use of hand sanitizer

Section 2; Plate 1

Section 2; Plate 2

Section 2; Plate3

Section 2; plate 1,2 &3, benefiaries (pupils) of Mikono and Shule Yetu Campaign at Kibangu Ruge English Medium washing hands by using sanitary Equipment donated by Organization for Community Engagement (OCE)

2.3 ACHIEVEMENTS

a) Dissemination of Covid-19 Mitigation knowledge to 800 pupils and 10 teachers of Kibangu Ruge English Medium.

b) For financial year 2020/2021 OCE managed to distribute 20 buckets, 10 carton of soap of soap, 15 dozen of face masks, 20 dozen of menstrual sanitary pads, 20 sweeping blooms and 20 mopps

c) Dissemination of Sanitary and hygiene knowledge to 10 teachers at Kibangu Ruge English Medium.

d) Dissemination of Sanitary and hygiene knowledge to 800 pupils at Kibangu Ruge English Medium.

e) Dissemination of Mestrual hygiene knowledge and sanitary padsto 100 adolescent girls at Kibangu Ruge English Medium.

2.4 CHALLENGES

a) Limited financial resources remain a critical challenge to implement **Mikono and Shule yetu campaign** in many needy public schools (government owned) with overcrowded students. OCE continues to look for further partnership with development stakeholders to address the gap.

b) Ten public owned schools within the area of campaign implantation lack water storage equipment (Mainly Tanks). The situation exacerbates the hygiene of more than 1500 studnets in each school. OCE continues to strengthening its partnership with development stakeholders to address the gap.