PROFILING ENVIRONMENTAL SUSTAINABILITY INTERVENTIONS

Strengthening Small Business Value Chains Learning Series

MEDA

Canada

Table of Contents

Acronyms

CAD	Canadian Dollar
CO2	Carbon Dioxide
EA	Environmental Audits
ECC	Environment and Climate Change
EIA	Environmental Impact Assessment
EMS	Environmental Management System
GAC	Global Affairs Canada
GHG	Greenhouse Gas
GLOBAL G.A.P	Global Good Agricultural Practices
IAP	Indoor Air Pollution
KW	Kilowatt
KWH	Kilowatt per Hour
LF	Lead Firm
MCC	Milk Collection Center
MEDA	Mennonite Economic Development Associates
NEI	Natural Extract Industries
NEMC	National Environmental Management Council
OSHA	Occupational Health and Safety
SE	Small Entrepreneurs
SGB	Small Growing Businesses
SSBVC	Strengthening Small Business Value Chain
TALIRI	Tanzanian Livestock Research Institute
TDCU	Tanga Dairies Cooperative Union
TFL	Tanga Fresh Limited
TZS	Tanzanian Shilling
UK	United Kingdom

About MEDA

Since 1953, MEDA has been developing and implementing effective market-driven programs that assist millions of people around the world realize their economic and social aspirations. MEDA combines innovative private sector solutions with a commitment to the advancement of excluded, low-income and disadvantaged communities. As a dynamic technical innovator, MEDA's expertise includes market systems, value chains, climate resilient and environmentally sustainable agricultural practices, financial services, and investment. Our projects focus on the inclusion and empowerment of women and youth along with integration of other marginalized groups.

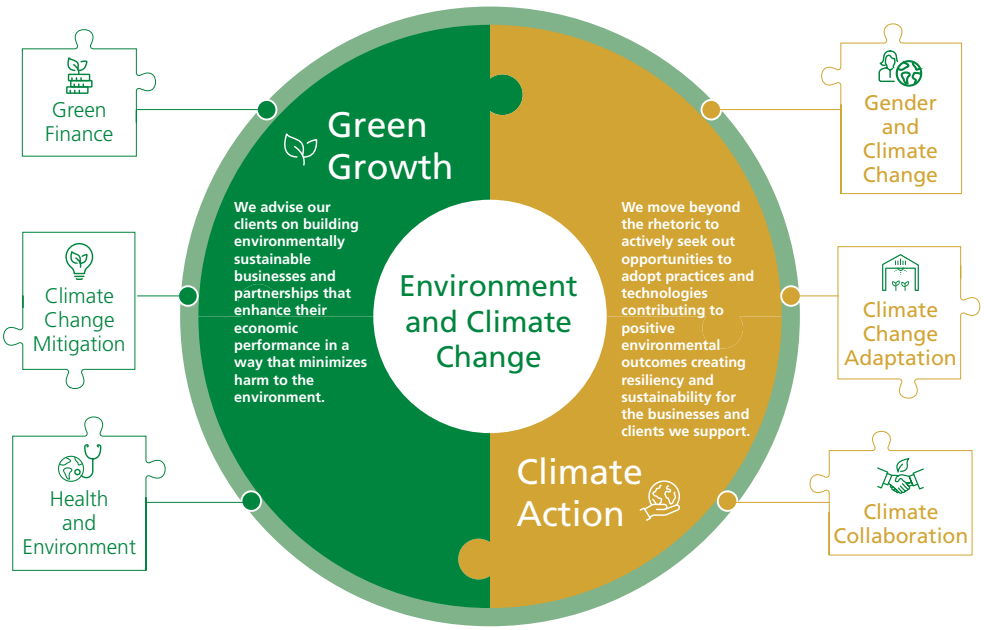
MEDA's Environmental Sustainability and Climate Resilience

MEDA believes that the spirit of entrepreneurship and innovation can empower entrepreneurs of all income levels to act as leaders of environmentally responsible business growth. MEDA works with businesses and entrepreneurs, and local partners to promote the business case for good environmental management and address climate change.

MEDA takes a multi-disciplinary approach to the complex environmental issues our programming encounters. This includes a strong policy dedicated to the creation of environmentally sustainable and climate resilient livelihoods, a clear environment and climate change (ECC) framework and accompanying environmental management system (EMS) as well as a set of approaches and tools designed to support environmentally positive outcomes.

Environment and Climate Change Approaches in Action

MEDA's Environment and Climate framework provides a combined "Green Growth" and "Climate Action" approach.



About SSBVC

The Strengthening Small Business Value Chains (SSBVC) project is a six-year value chain development initiative implemented by MEDA in Tanzania, with funding from Global Affairs Canada (GAC) and MEDA's private supporters. The project's objective is to strengthen existing small business value chains led by Lead Firms (LFs). LFs are 'market makers' creating new and expanding business opportunities for small and growing businesses (SGBs) and small entrepreneurs (SEs) participating in their supply chains. The ultimate outcome of the project is to facilitate an increased contribution by female and male SEs and SGBs to Tanzania's economic growth.

Tanzania's Environmental Context

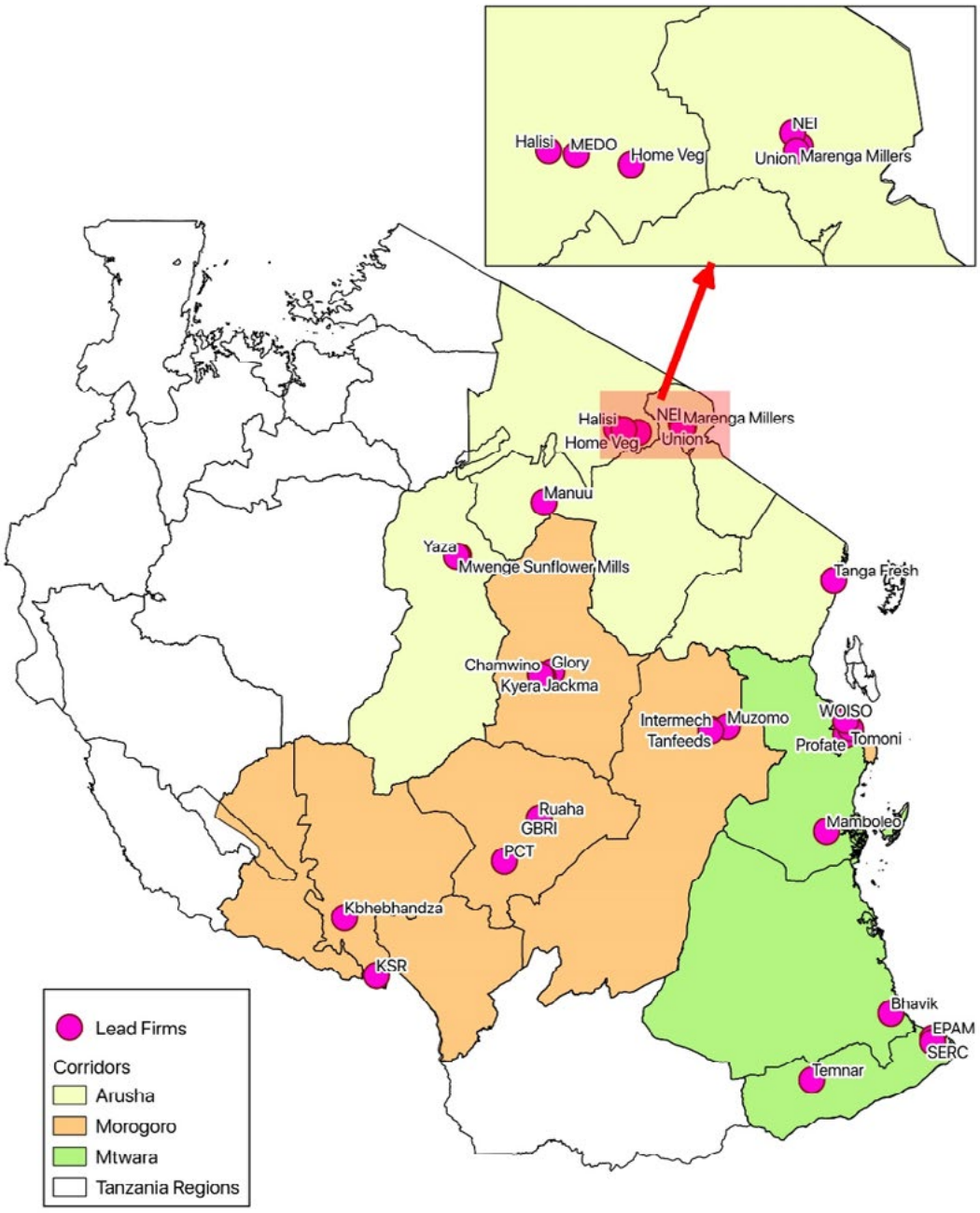
Tanzania is the largest country in East Africa with a population of more than 56 million and spanning an area of 945,087 km. The country is rich in natural resources including forests, wetlands, and coastal fisheries as well as great biodiversity. Over 80% of the population derives their livelihood, income, and employment from the land as most Tanzanians are engaged in agricultural and pastoral activities. Tanzania's climate is changing and business (both agriculture and non-agriculture) is slow to adapt. The average annual temperature has increased by 1°C since 1960 and is projected to increase by 1°C to 2.7°C by 2060s. Sea level is expected to rise by 400-800cm by 2060, which will adversely affect many coastal communities in the country. In the last 40 years, Tanzania has experienced increasingly severe precipitation. Currently, more than 70% of natural disasters in Tanzania are climate change related and linked to recurrent droughts and floods resulting in devastating effects to the agriculture, water and energy sectors. Women are particularly affected because of their traditional role of water and firewood collection.

The biggest threat to business is uncertainty, and climate change is a threat multiplier to businesses. When one part of a value chain is interrupted, such as the harvesting of crops, then the entire value chain feels the impact. By recognizing the impact climate change has on value chains, SSBVC has invested in helping lead firms and SEs they support become more resilient to the impacts of climate change. This includes improving access to climate resilient agricultural practices, clean and renewable energy technologies, and local and international expertise on best practices.

Green Financing Overview

At MEDA, we work with Partners (LFs and Non-LFs) to develop green business models that promote environmentally sustainable business practices.

Combined contributions from MEDA, GAC, and LFs has reached a total of $2,361,450 Canadian dollars (CAD) (4,250,610,000 Tanzanian Shillings (TZS)) towards clean and/or renewable technology, climate change mitigation and adaptation, supporting LFs to develop environmental policies and strategies, meeting industry best standards, regulatory compliance and providing occupational health and safety initiatives.



SSBVC works in three main corridors; Mtwara, Arusha and Morogoro which covers 14 regions.

MEDA has supported five green initiatives through its innovation grants window each worth an average of $50,000 CAD (90 million TZS). These grants are dedicated to solar technology,[1] aiming to create improved access to energy, increase autonomy from unreliable grids, increase energy efficiency, and reduce emissions of greenhouse gases (GHG) as a mitigation strategy.

Through LFs approach, all the grants activities have been integrated with environmental sustainability actions. These activities have focused on climate smart interventions/technologies which include installation of solar grid systems, wastewater effluent treatment plant and rainwater harvesting tanks.[2]

To ensure sustainability, the project has been working with its Partner LFs and SEs to develop Environmental Action Plans which will assist them in current and future climate smart interventions. This has been through supporting them with the development of environmental policies, ensure compliances to NEMC (National Environmental Management Council) which includes Environmental Audit (EA) and Environmental Impact Assessment (EIA) and issues related to occupational, health and safety.

Climate Change Mitigation Overview

At MEDA, we strive to reduce GHG emissions and use natural resources in more efficient ways within projects and support our partners to do the same.

Mitigation methods are encouraged and implemented by several LFs under SSBVC. One of our LF have installed a wastewater effluent plant to prevent soil degradation and surface/ groundwater contamination. This is an innovative measure to prevent misuse of their water resources.

Given that Tanzania experiences around 2,800 to 3,500 hours of sunshine per year[3] MEDA strongly encourages and advocates for LFs to invest in solar energy. Currently there are eight five LFs and one Non-LF who have or are in the process of installing solar tubes and panels to reduce their dependency on gas, coal, firewood or kerosene.

Health and Environment Overview

MEDA requires all the LFs to comply with government regulations in their businesses. These includes; Occupational Safety and Health Authority (OSHA) which is a Tanzanian government institution to ensures safe working conditions and enforcing standards; and National Environment Management Council of Tanzania (NEMC) which is a government body that issues certificates of compliances in Environmental Impact Assessments (EIAs) and Environmental Audits (EA). Adhering to comply to these certification businesses have to invest in time and

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[1] MEDA LFs have installed over 411.4 KW of solar power, diverting approximately 312,500 metric tons of CO2 per year from the atmosphere.

[2] 324 SEs have received rainwater harvest tanks as a climate adaptation measure to harvest water during the dry season. At least, 324,000 litres of water can be conserved and used during the drought season.

[3] https://www.get-invest.eu/market-information/tanzania/tanzania-renewable-energy-potential

Gas cookers installed at Halisi factory

financial commitments which to some companies it become a challenge. Therefore, SSBVC support these LFs on the processes of accruing the certifications (NEMC and OSHA) which includes, Environmental Audit (EA) and Environmental Impact Assessment (EIA); Health and Safety Trainings and OSHA Compliance Certificate.

Gender and Climate Change

We acknowledge the gendered impacts of climate change and support women and other marginalized clients to adapt through targeted strategies and activities, while leveraging their specialized knowledge and leadership to respond to climate-related risks.

MEDA's SSBVC project takes on a gender lens approach in almost every context. Of all trained SEs, 43% are women who have received several trainings integrated with environmental sustainability actions. Some of these trainings includes; hygiene practices, health and safety training, proper waste management practices, proper use of pesticides, proper use of fertilizers, water management, good animal husbandry trainings etc.

Our LFs Clean Tech Stories

The following stories of change and impact highlight some of the environmental sustainability work facilitated with our grant's partners in Tanzania. These includes Solar Hubs technology, rainwater harvesting, green houses, solar power (for irrigation, water heater, cold storage container, wastewater treatment plant), wastewater effluent treatment and biogas.

NEI staff doing solar drying of cured vanilla beans before packaging

Jaza Energy

Sector:
Manufacturing

Location:
Tandahimba,
Mtwara Region

Value Chain:
Clean Technology/
Renewable Energy

Solar Hubs

Jaza Energy builds Energy Hubs which is a solar powered brick and mortar shops in several Tanzanian communities where 500 households or more currently exist without electricity. The Energy Hubs are run by local women who use the captured solar energy from the roofs to charge batteries (Jaza Packs). They then sell them to individuals and SEs who carry them home and use them for indoor lighting and cellphone charging use.

Batteries last for approximately a week before needing a recharge. Customers bring the Jaza Pack to one of these hubs to swap their unit for a fully charged one and pay a small fee of 0.55 CAD (1,000 TZS). The price per week is 1.66 CAD (3,000 TZS) and per month is 5.55 CAD (10,000 TZS) once the customer has a membership.

The innovation grant provided by MEDA was used to develop a flat-packed prefabricated energy hub that is far cheaper and mobile than a traditional brick and mortar shop. The grant also helped Jaza to expand their business to the Mtwara Region of Southern Tanzania.

MEDA's support of Jaza's work is helping Tanzanians replace kerosene which is a main energy source for millions of Tanzanians to light their homes or businesses, charge their phones, and fuel their generators. 66% of rural communities and 42.8% of urban communities in Tanzania rely on kerosene daily whereas only 1.7% of the rural population use solar energy.[4] Kerosene is a poor source of energy as it provides low-quality light, contributes to greenhouse gas emissions and exposes users to indoor air pollution (IAP) which causes respiratory illnesses and vision loss.

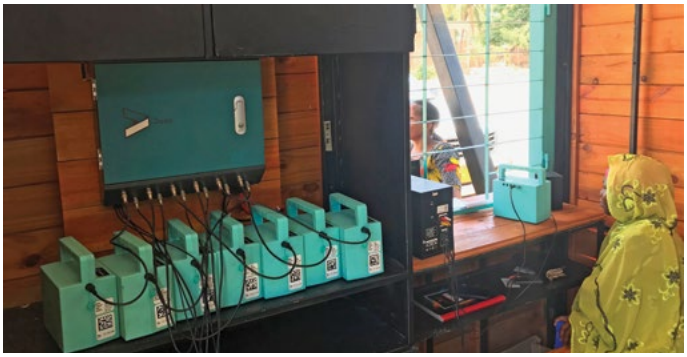
By switching to batteries powered by solar, **Jaza Energy to date has displaced 72,400 litres of kerosene preventing 152,000 tonnes of CO2 from entering the atmosphere. Along with MEDA's help through it's innovation grant, Jaza estimates a further 116,400 litres of kerosene will be disused, preventing 312,000 tonnes of CO2.** Most importantly, Jaza has provided solar energy to rural communities in Tanzania. With funding from MEDA and GAC, Jaza Energy has re-designed and built 20 new Energy Hubs in the Mtwara region. These Energy Hubs are more efficient and cost less to assemble than the previous Hubs Jaza thanks to improved assembly solutions, design of the hub and the materials used. The new design of the Energy Hub is pictured below.

The facade of the Energy Hub, not seen in the image are the solar panels placed on the rooftop.

4 https://www.lightingafrica.org/country/tanzania

Solar panels fitted to the roof of the Hub

Jaza signed a contract with MEDA on Direct Cost Share program to supply 1,000 Solar Jaza Packs to 1,000 SEs at a discounted price. Through MEDA's Direct Cost Share program, SEs can purchase a solar kit for half its price and MEDA will cover the other half.



Jaza batteries being charged at solar hub

A Jaza battery

Although the initial intention for the Jaza Packs were to provide indoor lighting and cellphone charging for SEs, there was another interesting and unexpected use for the battery. Since Jaza is located in the Mtwara region – where 70% of Tanzania's cashews come from – cashew SEs are using the Packs as a form of security for their cashew trees.

In the image above, a one of the beneficiaries for the solar project is demonstrating how one of the many uses for Jaza Packs as a form of security for their cashew farms. The purpose of the light is to frighten potential thieves from stealing the highly valued cashews.

Jaza customer using a solar battery to light his shop

Natural Extracts Industries (NEI)

Sector:
Manufacturing

Location:
Arusha, Arusha Region

Value Chain:
Vanilla Processing

NEI is a social enterprise manufacturing natural food extracts, working across several value chains, from cultivation, to post-harvest processing, value-added flavor extraction, and market commercialization. Their primary crop is vanilla. Even before MEDA's involvement, NEI was at the forefront for developing environmentally friendly processes throughout their vanilla value chain.

NEI works with over 1,600 vanilla farmers, buying vanilla under contract farming and processing beans into vanilla extract. NEI's relationship with its suppliers goes beyond buying their produce; NEI support smallholder farmers in vanilla vine cuttings, with extension services, and provide a guaranteed vanilla market. Additionally, NEI established Farmer Champion representatives where registered NEI farmers receive training in farming techniques and Good Agricultural Practices (GAP), including the use of bio-pesticides and bio-composts.

NEI had installed solar panels to run their cold storage container before MEDA's involvement.

Water tanks

For the past five years, erratic weather has become the new normal for many Tanzanian farmers, particularly for vanilla farmers. The dry season is much longer than it used to be, and the rainy season brings harsh floods in short and intense intervals. As the weather becomes unpredictable, farmers have no other choice but to adapt to these changes.

In support of taking adaptive measures to climate change, NEI proposed purchasing rainwater harvest tanks for their SEs to assist in vanilla growing as well as build a loyal relationship between NEI and their farmers. Together, MEDA and NEI cost-shared the purchase and distributed 324 water harvesting tanks to SEs. According to Renewable Energy Hub UK, the ecological benefit to having a rainwater harvest tank is the ability to recycle water rather than taking water through artificial channels; whereas the financial benefit is the reduction in the use of freshwater for household uses that don't necessarily need freshwater such as flushing the toilet or watering plants.[5] **Between the years of 2012 and 2016, Kilimanjaro and Arusha regions received**

[5] https://www.renewableenergyhub.co.uk/main/rainwater-harvesting-information/benefits-of-rainwater-collection

an annual rainfall of 463.6 mm;[6] the lowest recorded annual rainfall in Tanzania. Vanilla vines require two to three litres of water a week, so the need for rainwater harvest tanks are widespread for vanilla farmers. Farmers who have 100-300 vanilla vines were provided with 2000 litre tanks and farmers with 300 or more vanilla vines were provided with 5000 litre tanks. **At least, 324,000 litres of rainwater can be stored between the 324 SEs. The duration of tanks can last 10-15 years or even longer if it is well maintained.**

The rainwater harvest tanks have proven to be useful as they have increased the incomes of farmers. As a result, NEI are now able to purchase high quality vanilla pods from SEs at a higher price. The better the quality a vanilla pod is, the more money an SE will receive. With such high levels of success, the word had spread quickly about investing in rainwater harvest tanks for several communities in the Kilimanjaro and Arusha regions of Tanzania.

When NEI thought it was too risky to invest in water tanks for SEs, MEDA took on the risk to fund these water tanks. The risk MEDA has taken has paid off because not only are SEs thrilled and utilizing these tanks, it continues to improve the incomes of SEs with the improvement seen on the quality of the vanilla vines.

Rainwater harvest tank installed to one vanilla smallholder farmer in Machame, Kilimanjaro.
The tank has a capacity to store up to 5000 litres.

6 https://www.nbs.go.tz/nbs/takwimu/Environment/NESR_2017.pdf

HomeVeg Tanzania Limited

Sector:
Agri-Food

Location:
Arusha, Arusha Region

Value Chain:
Exporting fresh vegetables

HomeVeg is the first Tanzanian-owned exporter of fresh vegetables. Grown by smallholder farmers who are located in rural areas of Kilimanjaro, Arusha and Tanga Regions. The main produce grown by HomeVeg farmers include snow peas, sugar snaps, and fine beans. Smallholders under HomeVeg supply chain are organized in groups that are formed under HomeVeg supervision. Farmers are trained on Good Agricultural Practices (GAP) in order to abide to the GLOBALG.A.P. standard as per market requirements. HomeVeg ensures that its grower groups are GLOBALG.A.P. certified. Therefore, HomeVeg supervises all agronomic practices done by smallholder farmers, they collect their produce, they grade them, and then oversee export to Belgium and Netherlands.

Greenhouses

A strong relationship between HomeVeg and its SEs is one of the reasons both **MEDA and HomeVeg collaborated in providing ten greenhouses with a drip irrigation system.** Initially, the greenhouses were meant for growing snow peas during the off season, but SEs found growing snow peas were inefficient inside the greenhouses so, they also grew peppers, cucumbers, and tomatoes. Before the greenhouses, farmers were not able to grow these vegetables during the off season, because of the variations in weather and the type of produce. SEs can now grow these crops all year round ensuring a stable income.

Greenhouses additionally provide benefit of lowering the levels of crop diseases and weeds, affordability to maintain, and farmers can grow healthy crops using a small land area for high yield.[7] The success behind the greenhouse exemplifies how mitigating to the changing climate is a sustainable income generator.

Not only has MEDA and HomeVeg supported SEs by providing greenhouses, SEs were also given GLOBAL G.A.P trainings. GLOBAL G.A.P is the certification that provides the standard and framework for independent recognized third-party certification for farm production processes. Global G.A.P Certification, topics covered includes; Site History, Soil Management, Record Keeping, Internal Audit/Self-Assessment, Propagation Materials, Irrigation and Fertilizer Use, Crop Protection, Harvesting and Produce Handling, Workers Health, Safety and Welfare, Waste and Pollution Management; Recycling and Reuse, Environment and Conservation, Traceability and Segregation, and Food Defense. **HomeVeg and MEDA were able to train 3,021 SEs on GLOBAL G.A.P. With both the greenhouses and GLOBAL G.A.P trainings, HomeVeg saw a 36% increase in produce brought from SEs.** The entire horticulture value chain has greatly benefited from a dynamic and strong collaboration between SEs, HomeVeg, and MEDA.

Mamboleo is a private company engaged in the farming and processing of rice in Rufiji District. The company is currently farming over 150 acres of land and is working with more than 1500 out grower farmers around Rufiji river basin. In order to increase productivity and improve quality of rice for the farmers, Mamboleo provided technical trainings on Good Agronomic Practices and provide access to Quality Declared Seeds (QDS).

Two greenhouses are seen here in Lushoto, Tanzania.

[7] http://www.nudgesustainabilityhub.com/initiatives/2016/2/9/greenhouse-farming-in-tanzania

Another greenhouse with a water tank left of the image.
The water tank is for the drip irrigation system.

Inside one of the greenhouses

Mamboleo Farms Limited

Sector:
Agri-Food

Location:
Ikwiriri District,
Mtwara Region

Value Chain:
Rice

Mamboleo has created a good relationship with rice farmers through contract farming where the company is an immediate market for paddy from the farmers. Additionally, Mamboleo works very well with these farmers by providing them access to irrigation equipment including pumps and pipes to enable smallholder farmers to irrigate paddy plots.

The SEs connected to Mamboleo were also clearing mangrove trees to make room to farm rice alongside or near the river. Many of the SEs in the districts where Mamboleo have their rice fields, live in extreme poverty which is one of the factors as to why farmers deforest mangrove trees. Mangroves trees provide wood for fire, income from selling the wood, and clearing the trees to grow rice to sell. However, Mamboleo is continuing to provide awareness creation to these smallholder farmers on the importance of protecting the mangroves.

Solar Irrigation Farm

MEDA is supporting Mamboleo to become more environmentally sustainable by implementing solar for irrigation; this supports Mamboleo to grow higher yielding, use less water intensive rice varieties, Mamboleo and MEDA have invested in installing a large solar irrigation farm to pump water onto Mamboleo's current rice fields. **The 300-acre solar irrigation farm has a**

capacity of 86KW and is estimated to pump a minimum of 3000m3 of water per day. With such a large volume of water pumping through the rice fields, Mamboleo will be able to rent land to other SEs to use and grow rice on. This will help minimize the clearing of mangrove trees and boost the income of their SEs.

The use of diesel was a significant issue facing Mamboleo. The cost of transportation for the diesel between the farm and supplier, the depreciation and the maintenance cost were severely biting into their profit margins. These factors alone made a clear case for the solar pump, but it is also important to note the environmental impact.

The solar powered irrigation farm will also increase the growing season from one season to two seasons per year with the SARO 5 seedling which will be provided to SEs to improve the efficiency of growing rice and increasing the yield size. The rice plots will be a learning and training opportunity for SEs to receive the Good Agronomic Practices trainings.

Solar irrigation farm in construction

Solar panels at Mamboleo farm

Solar-powered water pump for irrigation of paddy at Mamboleo farm

Profate Investments Limited

Sector:
Agri-Food

Location:
Dar es Salaam, Mtwara Region

Value Chain:
Dairy Milk Production

Profate works in the dairy industry producing, processing, and selling various milk products to a diverse market in Tanzania. The company evolved from a small family venture with a single cow mainly for subsistence to a medium-tier dairy production and processing company supplying different milk products and serving a wide customer base.

The company's core business is dairy farming and processing of milk. It Also gets dairy suppliers from around 400 small holder dairy farmers through Milk Collection Centers mostly established under cooperative societies. Profate currently works with 54 SGBs that buy the final products from the processing factory.

Wastewater Effluent Treatment

Dealing with spillage became an apparent issue for Profate. The decomposition of milk is hazardous, so when there is spillage it is washed with water and is unsafely disposed of on ground soil. The wash water is now wastewater which seeps into and contaminates surface water and groundwater sources.

In the dairy industry, wastewater accrues from four sources:

- Cleaning the equipment:
  - Milk storage tanks
  - Whole milk products
- Wash water:
  - Cheese production
  - Butter production

Profate has established a wastewater treatment plant with MEDA's support. The treatment plant protects surface water, groundwater, and ecosystems from an increase in organic matter, nutrients, salts, chemical and biological contaminants. Profate also plans to re-use the water for irrigation purposes to produce biogas to then garden the open space on their factory's property. By using recycled water for gardening purposes, Profate can grow nutritious fodder to sell to their dairy SEs. In addition, Profate can grow more fodder at a smaller area of land size, thus, reducing land space. Installing this wastewater treatment plant, more than 180 CAD (324,000 TZS) each month has been saved from their costs of collecting wastewater.

MEDA has partnered with Profate to install the Solar solution for the existing cold rooms, cooling tanks and reefer at their main factory. Currently, the factory spends 55 CAD (99,000 TZS) per day for electricity costs. It is estimated Profate will save 60 – 70% per month on electricity costs once they finish to install solar technology.

Primary stage (Part 1) of the wastewater treatment plant. The grey sludge at the bottom of the hole is the raw waste and wash water produced from Profate's factory.

Primary stage (Part 2) of the treatment plant. These chambers are where raw waste is digested through an anaerobic process (no air is allowed through). The chambers dissolve solid waste and then flows the newly formed liquid to the secondary stage of the treatment plant.

Secondary stage, also known as the Up-Flow Filter, is entirely underground. This stage is responsible in removing any left-over solid waste from the previous stages. There is a small hole where the effluent becomes safe to discharge into the soil.

The water which comes from the Up-Flow Filter stage.

Tanga Fresh Limited

Sector:
Agri-Food

Location:
Tanga, Arusha Region

Value Chain:
Dairy Processing

Tanga Fresh's mission is to become the number one consumer choice in the dairy industry and promote sustainable growth of small-scale dairy farming in Tanzania. Tanga Fresh sources its raw milk through the Tanga Dairies Cooperative Union (TDCU), with 25 registered SGB cooperative societies supplying 86% of raw milk to Tanga Fresh, promoting sustainable growth of small-scale dairy producers in Tanzania. **Currently, TFL receives 39,000 litres per day and its expanded factory has the capacity to produce up to 120,000 liters per day.**

Tanga Fresh works with over 7,000 SEs from at least 40 registered Milk Collection Centers (MCCs) which are autonomous legal entities owned by dairy farmers with a strong leadership structure (i.e. Chairperson, Secretary, Accountant, and Manager). Tanga Fresh has installed cooling tanks and standby generators to MCCs, they also train MCC attendants on hygiene milk handling and provides interest free loans to SEs and SGBs as needed.

Tanga Fresh is among the companies that puts a strong initiative in integrating environmental sustainability in their business. Through partnering with MEDA, the company is integrating its project activities that incorporates climate change mitigation measures within their business value chain.

Among others, the company has installed solar water heaters to ten MCCs, installation of 15 biogas systems to diary farmers (SEs), and installation of a solar system to power wastewater effluent treatment plant at the factory.

Solar Water Heater

The aim of the installed solar water heater is to improve hygienic condition and quality of raw milk supplied by the diary farmers (SEs) at the MCCs.

The lack of hygiene milk handling from dairy farmers (SEs) was a consistent issue for Tanga Fresh. Tanga Fresh's quality team guides and provides practical trainings on hygiene at the MCCs and for utensils/milk cans to improve milk quality. **The water can be boiled up to 80 degrees Celsius, hot enough to destroy any bacteria. Each water tank can carry up to 200 litres of water, meaning 88KWH is the highest possible energy capacity** the solar tubes can produce.[8]

Solar tubes located on the rooftop of MCC's Milk Collection Center

Water storage tank

Biogas

MEDA and Tanga Fresh are currently working to install 15 biogas systems that encourages hygienic practices as well as reducing methane levels from cow manure. The biogas is produced from the raw diary waste which if left unused it releases methane which pollutes the environment. Cow manure is difficult to manage so the project is installing digester. The digester is used to decompose cow manure by a process called anaerobic digestion. They are called digesters because organic material is eaten and digested by bacteria to produce biogas. The biogas produces usable energy for cooking/or heating and therefore replaces the use of firewood.

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8 https://www.wired.com/2011/12/coffee-pot-physics

Below is one of the biogas digester installed to Tanga Fresh diary farmer.

Where the cow manure is stored

Process of converting the manure into useable energy

Process of converting the manure into useable energy

Solar Powered Wastewater Effluent Treatment System

Tanga Fresh is currently managing the wastewater from the processing factory by a wastewater effluent treatment plant. It is estimated that, over 360,000 litres of clean water is used to process 120,000 litres of milk per day. The plant is for turning industrial effluent into useful water through making wastewater recyclable and is a requirement of NEMC compliance.

Currently, the company is using national grid power to run the waste-water treatment Plant, of which is expensive and unreliable. It is from this fact that, MEDA and Tanga Fresh are **installing a 25KW powered solar grid** to run the wastewater treatment plant. **The solar grid will help save the company close to 26,000 CAD (46,800,000 TZS) per year.** It is expected that, the recyclable water can then be used for other purposes including irrigation for fodder and improve pasture at a nearby Tanzania Livestock Research Institute (TALIRI). Fodder and improved pasture will be sold to SEs at subsidized price. It will also reduce the seasonality of milk production, which will allow farmers to produce milk for longer, due to the increase feed and availability of fodder throughout the year.

The wastewater effluent treatment plant at the Tanga Fresh factory.

Halisi Products Limited

Sector:
Manufacturing

Location:
Arusha, Arusha Region

Value Chain:
Agri-Food

Halisi Products Limited is a manufacturer of food products sourced from raw material (cereals, legumes and bee products) suppliers. Such as farmers, distributors and warehouse owners. Halisi's* sells products such as nutritional flour, honey, peanut butter, soya drinks, tea masala, pilau masala, and cinnamon, ginger and cardamom powder. Halisi aims to become the leading enterprise in Tanzania by creating sustainable crop markets to smallholder farmers and creating youth employment. Currently, Halisi works with about 1,000 SEs and has approximately 1,000 customers who purchase Halisi products for distribution to supermarkets, wholesale and retail shops.

Solar Dryers

Halisi experienced several inefficiency issues when it came to drying grains. The company has to dry grains outside under the sun which makes the grains vulnerable to dust, stones, and birds. Outdoor factory space was severely underutilized to accommodate for drying grains. And, during rainy season, grains could not be dried outside and therefore had to be brought in. Inefficiencies such as these ran up the cost for Halisi.

**Halisi means "natural"*

MEDA partnered with Halisi to purchase two solar dryers, with 32 cages (16 cages per dryer). The cages are used to improve aeration during the drying process. The solar dryer has improved efficiency by 40% and enhanced drying turn around from eight days previously and now to two days. Halisi has increased the daily drying capacity from 750 Kgs without solar dryers to 2000 Kgs with solar dryers.

One of the solar dryers at the Halisi's factory

Grains are being dried inside a solar dryer. As of now, Halisi has installed 32 cages.

Tomoni Farms Limited

Sector:
Agri-Food

Location:
Kibiti District,
Mtwara Region

Value Chain:
Fruit Processing

Tomoni Farms Ltd is a privately-owned company located at Tomoni Village in Kibiti District. The company has a total of 700 acres of land, of which 250 have been developed with horticulture products. This includes, oranges and limes (2,500 trees each), bananas and pawpaw (over 10,000 plants each), pineapples (over 700,000 plants), mangoes (5,000 plants), avocados (400 plants), lemons (1,000 plants), and about 25 acres of passion fruit.

Although Tomoni predominately operates on its own farms to fulfill market demand but they also buy fruits from 285 smallholder farmers and 40 SGBs who supply their distribution channels. The company have in place a sort and park house, trucks and distribution vans, cold storage, vending outlet and a mini processing outlet commonly referred to as a farm fresh bar.

Solar Cold Storage Container

The issue that Tomoni faces is the short shelf life of fruits, which can create excess waste when fruits are not needed or used. Prior to the project partnership, Tomoni procured a 30-tonne cold storage container to freeze their fruits to use later for fruit juices and smoothies. The storage container needs a consistent source of electricity to run, however, the cost of running the storage container seeped into Tomoni's business profits. **MEDA and Tomoni invested in**

the of a solar PV system with a capacity of 11KW to run the cold storage container. The cold container has enabled Tomoni to reduce post-harvest losses. Most of the produce that would have been wasted for lack of market is now being processed and frozen for future use.

With solar cold storage container, Tomoni has increased the purchase of 150 tonnes of fruits from cost savings through reduced electricity costs. This has enhanced Tomoni to increase its supply of fruits from the small holder farmers reflecting an increase in smallholder farmer's income and employment.

The solar PV system which is connected to the cold storage container.

Summary Visuals

The section below summarises the visual environmental sustainability output for solar and rainwater harvesting technology which have been supported by MEDA.

KW installed for Solar Project

Solar energy is a sustainable energy and is inherently more sustainable than fossil fuel energy sources. As a way of converting the sun's energy into electrical energy, solar panels make use of the single most sustainable resource on the planet – the light of the sun.

The table below shows kilowatts installed to each Partner with solar Project hence lowers carbon footprint.

LF	KW Installed
Jaza Energy	80
Mamboleo Farms Limited	86
Profate Investments Limited	13.5
Tanga Fresh Limited	25
Tomoni Farms Limited	11
Woiso Original Product	45.9

Rainwater Harvested

MEDA supported NEI vanilla smallholder farmers with 324 rainwater harvesting tanks which helps to collect and store rainwater to be used for irrigation during drought season. The method of rainwater harvesting used is rooftop harvesting.

The summary below shows different sizes of tanks distributed to these smallholder farmers.

Rainwater harvested → 324 water tanks distributed.

- → 10000L
- → 5000L
- → 2000L
- → 1000L

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