

Case Study

Solar-powered Water Infrastructure in Zambezi and Kavango regions, Namibia.



Beneficiaries at Mayana, Kavango East region celebrating the official inauguration of the solar power water infrastructure

I. Introduction/Background

Namibia is no exception to the adverse climatic conditions and it is considered to be one of the most vulnerable countries when it comes to the effects of climate change since it is the driest country in Southern Africa. Namibia's economy is highly dependent on natural resources and the expected production losses will potentially affect 70% of Namibia's population, being dependent on agriculture for their livelihood. It is not easy to predict, with any level of certainty, the effects of climate change. However, Namibia's rural communities and the poor throughout the country are the most vulnerable to the negative impacts of climate change. Adaptive capacities amongst vulnerable groups are considered to be very low. The effect of climate change in Namibia is also worsened by the low population densities, long travel distances and the lack of infrastructure which further increase the countries vulnerability to climate change. Various pilot projects on climate change adaptation are underway, while very little has been done with regards to climate change mitigation focusing on the sustainable utilisation of renewable energy in the country. Namibia Red Cross Society (NRCS) in partnership with

Spanish Red Cross have extensive experience in implementation of adaptation interventions including those of the humanitarian kind regarding disaster risk reduction, livelihood and food security in order to enable vulnerable communities to adapt and mitigate major impacts affecting their livelihoods due to erratic rainfall and climate variability which is observed to generate important socioeconomic and environmental consequences. In the loop of addressing both components, adaptation and mitigation to climate change. Both National Societies implemented a European Union (EU) funded project with the objective of contributing to mitigate the negative impacts of climate change within rural vulnerable communities in Northern Communal Areas by "Promoting the use of renewable energy and energy efficient technologies in 9 targeted rural communities in Kavango and Zambezi regions".

Starting in March 2017, with a budget of approximately seven million Namibian dollars (N\$7.500.000) (500.000€) or five hundred thousand euros, 80% of this funding was EU contribution while the other 20% was Spanish Red Cross contribution, the intervention aimed at introducing solar powered irrigation infrastructure systems in 8 selected community gardens in both Kavango (East & West)

and Zambezi Region and increasing the use of selected renewable forms of energy and integrating energy efficiency technologies at household level in 9 communities in the above mentioned regions. During 26 months of the implementation more than 2.000 people benefited directly from the intervention which encapsulated the following main components:

- Installation of solar-powered water infrastructure in community gardens.
- Constructions of energy efficient cooking stoves (demos) and promote replication.
- Distribution of solar lamps to households.
- Capacity building on renewable energy and energy efficient technologies through awareness sessions and training.

The Action was successfully implemented with the support of Ministry of Agriculture, Water and Forestry (MAWF) and the Namibia Energy Institute-Namibia University of Science and Technology (NEI-NUST).

This case study focused on highlighting the solar powered infrastructure installed at community gardens as a key element in providing a more reliable water supply and way forward for small scale farmers.

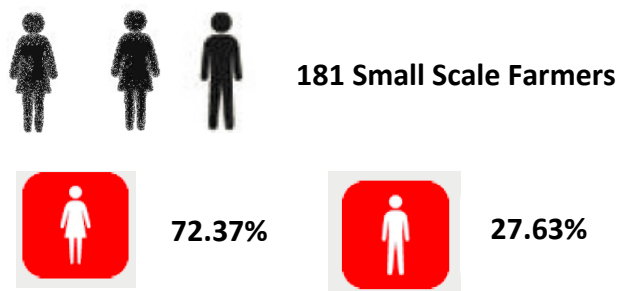


Garden installation in Kavango

II. Achievements/Results

The design of the action was framed around 2 main results: 1) Households and small scale farmers increase the use of selected renewable forms of energy and energy efficiency technologies in their daily life; and 2) Vulnerable communities of the targeted regions have increased awareness about the

integration of renewable forms of energy into the rural community system. One of the components of Result 1 was the installation of solar powered water infrastructure in community gardens. The target was to benefit directly around 200 rural farmers (20% men, 80% women) from Kavango West and East and Zambezi Regions. The majority of the direct beneficiaries were small-scale farmers engaged in subsistence agriculture, mainly widowed women and women headed households, families and women deserted by dependents as well as people living with HIV/AIDS. The need to irrigate agricultural land efficiently, economically and sustainably is critical for food security. Costs for irrigation using diesel power are rising at >10 % per year. Diesel power produces greenhouse emissions apart from being expensive for the rural communities. The use of energy efficient irrigation solutions produces no emissions, and generates no noise. The use of energy efficient irrigation systems implied that the community were able to produce more crops at a profit with less input cost specifically on the irrigation systems which covered the bigger margin of the input cost of production for the gardens.



This activity directly benefited more than people. A total number of 8 community gardens, 3 in Kavango (East & West) and 5 in Zambezi were improved in close collaboration with the Ministry of Agriculture, Water and Forestry (MAWF) and the Agro-Marketing and Trade Agency (AMTA) of the same ministry. While the integration of the mitigation component started in March 2017, those community gardens were part of the scale up livelihoods and food security strategy of Namibia Red Cross Society in conjunction with Spanish Red Cross. Those gardens were previously identified in late 2014 with the support of local stakeholders. Recurrent drought and lack of capacity and capabilities of those small scale farmers impacted

severely their food security since they depend on subsistence agriculture.



Vegetable production in a garden in Kavango

At that time, the design of the action was done in close collaboration with AMTA with the aim of bringing those agricultural entrepreneurs into the marketable production chain. Reliable water source at the garden and capacity building among members were the criterion of AMTA to integrate those farmers into their system which included an agreement where the produce would be put in the market. Red Cross facilitated the installation of reliable water infrastructure while AMTA and Agribusdev, the other Agency of the MAWF was in charge of the agricultural development of farmers, and improving the agricultural production capacity of the farmers. The generous funding support from the EU assisted in mitigation to climate change and the installation of solar powered infrastructure in the 8 community gardens. Erratic rain over the years seriously affected the water sources of some of the gardens; therefore, in close collaboration with the Department of Rural Water Supply of the MAWF, every garden was assessed by hydrologists and agricultural engineers of the MAWF in addressing the suitable community garden infrastructure and improvement.



MAWF Hydrologist taking mud samples during drilling

Groundwater resources are managed by the Government; Namibia Red Cross Society being , auxiliary to the government, compliments its efforts in assisting vulnerable communities.



Engineer from MAWF NHQ during an inspection of an installation in Zambezi

The need of involving and collaborating successfully with the Namibian Government was crucial since the inception of the intervention to also guarantee the sustainability and exit strategy. After the MAWF conducted the field assessment, the report showed the situation with regards to the availability of water, the most recommended infrastructure and solar powered system together with the way forward. Their expertise was of high relevance during the preparation of tender documents and during the installation of the infrastructure on site as they supervised the work of the constructor to make sure that all the work done was according to the tender and the standards of the Government. MAWF at central level coordinated with their extension officers in the regions to guarantee that both national and regional level operated in a coordinated way once the action finished;. As a result, **four solar powered boreholes** were drilled in Mayana and Sharukwe (Kavango East and Kavango West respectively) and in Muyako and Mpacha (Zambezi Region). The drilling of the boreholes was supervised by a Geologist of the MAWF who was taking samples of the subsoil also for their records. Testing of water was also done by MAWF implying zero cost to the project. The rest of the gardens, due to their vicinity to main river streams, were upgraded with **floating solar powered pumping systems**; this resulted in another **four** community gardens in Sikondo (Kavango East) and Saili, Lyebangwe and Walumba (Zambezi) benefiting

from this intervention. The irrigation component was also supervised by engineers of the MAWF who assessed the capacities of the water infrastructure according to the number of farmers and the hectares of the field. Once farmers have reliable water availability and irrigation capacity, they are included in the capacity building agenda of AMTA to significantly supply vegetables to AMTA. Hence contract agreements were signed between the farmers and AMTA creating a direct link with relevant stakeholders. With regards to infrastructure, the equipment has been officially handed over to the MAWF, for now, maintenance of water infrastructure is the responsibility of MAWF under the Directorate of Rural Water Supply who are also in charge of repairing any major damage if it happens; for minor repairs, farmers themselves have their own structures where they all contribute to sustain the basic needs of the garden. Globally the activity in its small way contributed towards the reduction of GHG emissions and through the provision of more affordable renewable ways of pumping that has minimised maintenance costs, while increasing profits for the farmers. While the initial cost of installing this system is expensive for the community, the maintenance costs are low. The energy efficient forms of irrigation solutions are a very attractive alternative to diesel powered pumping and support sustainable agriculture.



Regional Staff of MAWF taking water samples from a borehole

III. Challenges/Opportunities

The intervention facilitated the enhancement of community irrigated vegetable gardening development in order to increase agricultural production and productivity. Irrigation development is a major intervention since it enabled rural farmers, who had access to land and water to grow more vegetables throughout the year which could otherwise not been possible under drought conditions

and looming climate change. Integrating the active participation of MAWF facilitated the coordination with the government at central and local level, creating a big opportunity to enhance stakeholders' responsibility on the struggle towards climate change negative impact on vulnerable communities who depend on sustainable agriculture where the main farming systems feature crops, livestock and vegetable growing. In this regard, energy played a crucial role in the lives of smallholder farmers. There was a need to consider alternative means to enable rural households (HHs) to access clean sustainable energy while promoting and protecting the environment on which these HHs rely for food security, since small scale agriculture production is their main source of income. Limited access to both water and energy particularly affected women, the elderly and children, who dedicated excessive time to collecting water and firewood which resulted in less time dedicated to livelihood and schooling activities. Lack of adaptation capacities to the adverse impact of climate change, together with limited access to reliable, affordable and sustainable energy services contributed to a self-perpetuating cycle of poverty; rural households need reliable access to energy if the country is to achieve economic growth and small scale farmers play a crucial role in the economic development if Namibia and also reduce the dependency on fresh product imports mainly from South Africa. Besides, most of the challenges faced during the implementation of the project lay in advocating for farmer behavioural change to think beyond subsistence farming but rather consider production that would also be marketed. Behavioural change is a long process which needs lots of mentorship and monitoring to eventually develop the farmers. Targeted beneficiaries used to grow vegetables on a small scale level that comprised own consumption and selling of very little surplus to contribute to the house hold economy. Therefore the engagement of MAWF, AMTA and Agribusdev plays a crucial role in capacitating these farmers, mentoring their entrepreneur and business capacities and divert their mind-set into a marketable approach, diversifying their livelihoods and play a crucial role not only for their household economy but for the economic growth of the country.



Community members actively supporting the drilling of the borehole in Kavango

IV. Impact

Impact of the solar-irrigation system was assessed using a set of different criteria that gave evidence on how the intervention benefited the target population, the criteria are listed below:

- Environmental outcomes
- Economic/social outcomes
- Technical outcomes
- Institution building potential
- Project sustainability
- Dissemination/replication potential.

Main highlights of the results of the assessment showed that through the installation of the solar-powered water supply the beneficiaries increased significantly their crop and vegetable harvests which is directly related to the availability, quality and quantity of the water. Now, many households have enough food for their needs. This, therefore, has given the majority of farmers and their households a balanced and diversified source of food. Surplus produce is sold to generate income to enable these farmers to purchase other household needs and to pay for their children's school fees and moreover, new business opportunities have emerged, especially the linkage with AMTA that will contribute to play a crucial role in a sustainable market chain.

The transition from diesel to solar energy for pumping water into their gardens has produced a positive impact in terms of cost saving. They do not buy fuel anymore, the money that was in the past spent on buying fuel is now used for minor repairs and purchasing other implements needed for crop and vegetable production. These savings are managed by water management structures established in each community by the members themselves reflecting the

ownership and willingness to sustain and improve on the long term the outcomes produced.



Project Officer in Zambezi Region showing crop field in a garden

The availability of fresh vegetables on the local market also had a positive impact on other community members from the village who used to travel long distances to the local markets to buy vegetables but now with the installation of the solar-powered irrigation systems, the stable availability of a reliable production in the vicinity enabled them to spend more time on other productive activities.

From the institution building point of view, the active partnership with the Namibian government helped to institutionalize the intervention and to ensure its quality through continuous technical support reinforcing the links between the community and government officials which directly guarantee the sustainability in the long run. Additionally, the group dynamics at the gardens are well organised so any challenge can be solved internally and they are empowered enough to raise their problems/challenges to local structures or any kind of institution with the capacity of supporting small scale farmers. Garden management structure is well

defined in terms of roles, monthly contributions and any other coordination mechanism.

V. Lessons Learnt

The different aspects of the action required the adoption of new innovations at various levels as well as changed management of renewable resources at local level. The targeted regional areas had different social, economic and environmental contexts and hence needed the development of strategies that were appropriate to the local context. This action in partnership with the relevant Regional Councils and Ministries further developed, tested and disseminated specific solutions and practices on renewable forms of energy in the rural areas. The technical guidance was given by experts in the field of water resources management and climate change mitigation.



Healthy vegetable production in a garden in Zambezi

The provided experts and local entities together with the local partners developed and disseminated locally appropriate messages and implemented plans. These messages on the developed innovations and plans were designed to create a conducive environment for increased uptake and adoption of the best practices on climate change mitigation. From a very positive point of view, the fact that the targeted communities were already involved in adaptation initiatives with both national societies facilitated the adoption of mitigation approach when it came to behavioural change and practices especially at HH level. The communication channel, mentoring and monitoring relationship with these small-scale farmers was highly dynamic therefore piloting the integration of renewable forms of energy and energy efficient technologies was a very good first step to develop

good practices that could be adopted by competent government structures and creating an opportunity to be scaled up to other regions once the intervention finished. Consequently, in the targeted areas a collaborative approach persuaded to improve application and sustainability of the action as well as dealing with other issues that may affect the sustainability of the action.

VI. Conclusions/The way forward

The intervention has the potential to be replicated not in terms of technical inputs in place in the gardens but with regards to the coordination mechanism with the government, at head office and local level, and the active participation of the beneficiaries. There is now enough evidence that shows how this action contributed to mitigate the effect of climate change by integrating renewable forms of energy into the agricultural production which basically also contribute to enhance the economic growth of small scale subsistence farmers. But if there is something that was learnt in the implementation is the coordination mechanism and the crucial involvement of MAWF and both Agencies, AMTA and Agribusdev, together with extension officers and other relevant stakeholders such as local authorities and traditional leaders that actively supported the activity. Namibia Red Cross Society reinforced its role as a key partner for the Government in the efforts to build the resilience of vulnerable small scale farmers affected by the negative effects of climate change.



Beneficiary calculating the tomato production