Progress report of tunnel installation in the iSimangaliso Wetland Park

Introduction

Climate change has been recognized for decades, and its impacts are being felt globally. Temperatures are rising, oceans are warming, and natural disasters such as hurricanes, cyclones, tornadoes, and floods are becoming more frequent, destroying homes and taking lives worldwide. Unpredictable weather patterns negatively affect the agricultural sector globally, with farmers facing severe challenges as productivity declines. Tower gardens and shade tunnels have proposed and are being experimented with in the fight against climate change.

As the summer season approaching, the field team is working hard to put up the 15 tunnels across the three hubs. A total of 14 tunnels have been put up across the three hub area; 5 each in Mabibi and Nkovukeni households, 3 in KwaDapha households and 1 at the hub. The field team together with hub supervisors, is using baseline information and existing criteria; (i) women headed households (ii) grant dependant households (iii) people who are already farming; to decide where interventions are most needed. The YES group have been invaluable in helping with tasks such as digging of trenches, collecting of materials and setting up of tunnels.

Mabibi Climate Change Adaptation (CCA) workshop

Mabibi is a small community in Northern KwaZulu-Natal, also known as Zululand, situated in a wetland and a proclaimed national park under the management of iSimangaliso and Ezemvelo. The community consists of smallholder farmers with livestock such as cattle, goats, and traditional chickens. They also have household gardens where they grow vegetables and field crops like maize, sweet potatoes, cassava, and nuts. However, production has declined due to intense heat and reduced rainfall. Some farmers have stopped tending to their gardens because crops are either not growing or are spoiled by too much rain. Others face pest issues in their gardens.

The purpose of this workshop is to train the YES youth group and Hub staff on innovative ways to assist the community in adapting to climate change. First, they must understand the concept of climate change, how it occurs, and how to mitigate its effects.

Past, Present, and Future

Past

- About 90% of households used to grow watermelons, but now it's difficult.
- Imbuya (indigenous spinach) and iskilwane (wild tomatoes) used to grow in grazing lands.
- Indigenous fruits like Bonsi, Amathundulula, Amavilo, Inonsane, Amatemela, and Amadongwa thrived in the park.
- Sugarcane was also widely grown.

Present

- Temperatures in the community are rising.

- Isibhayi Dam is decreasing in volume, making it harder to catch fish.
- Springs within the park are drying out.
- Rainfall is inconsistent, and pumpkins are rotting before maturity due to extreme weather fluctuations.
- Tornadoes have been reported along the coast.
- Alien invasive species are spreading in the park.
- Wildlife in Mabibi is relocating as their food sources are disappearing.

Future

- Droughts will become more severe.
- Lake Sibhayi may dry up completely.
- Both commercial and subsistence farming may cease.
- Livestock production will decline due to drought and poor grazing.
- National economic collapse and widespread famine could occur.
- Unemployment, poverty, and crime will increase.
- Tourism in the area will decline.
- Indigenous plants and herbs will go extinct in the wetland, and invasive species will take over the park.

Scientific Presentation on Climate Change

SAEON presented research on climate change impacts in South Africa, focusing on recent events like tornadoes, hurricanes, and floods. The youth group connected the presentation to their own observations, including a recent tornado along the coast that damaged households in Enkovukeni. The presentation also highlighted the declining water levels in Lake Sibaya, exacerbated by nearby plantations.

Seasonality Diagrams

Two groups were tasked with creating charts to depict current rainfall and temperature levels. The first group found that temperatures have been steadily rising, shortening winters and disrupting seasonal patterns. The second group noted that while rainfall seems to follow traditional seasonal patterns, it is less effective, with shorter, less beneficial showers.

Figure 1: Groups presenting their seasonality diagrams

Possible Solutions by the YES Youth

- Reduce the number of plantations (such as Gumtrees) in the area
- Promote the clearing of alien invasive species
- Establish firebreaks and encourage fire monitoring
- Replant indigenous trees and plants that have disappeared
- Reduce livestock density to prevent overgrazing and erosion
- Stop the burning of veld (grassland) in the community

Climate-Resilient Agricultural Practices

Following the workshop, the focus shifted to agricultural practices aimed at combating climate change. Many community members have stopped growing crops due to high temperatures, droughts, and pest problems. Those still trying face additional challenges, including lack of water. Practices such as deep trenches, micro-tunnels, and tower gardens are being introduced to help mitigate these issues.

The YES youth and Hub staff will monitor the implementation of these practices, adjusting based on the needs of each field. For example, a farmer with a steep field might implement contour farming, while those facing water scarcity may benefit from micro-tunnels or trench beds.

Demonstration Day

On 18 September 2024, a demonstration took place at the household of Hlengiwe Makhanya, who met the criteria for showcasing climate-resilient farming methods. The YES youth observed the construction of micro-tunnels, which began with digging deep trenches for planting beds. Layers of green and dry matter, along with cattle manure and soil, were used to create fertile planting beds. After constructing the tunnel, seedlings of diverse crops—such as beetroot, kale, spinach, and herbs—were planted to promote biodiversity, which helps control pests. Mulching was applied to regulate soil temperature and moisture and to improve soil fertility.

Figure 2: YES team preparing trenches at Hlengiwe Makhanya's

Figure 3: YES team putting up its first ever tunnel

Three tunnels have been installed in this village, benefiting Nomahlathi Thwala, Sibongile Ntuli, and Hlengiwe Mkhanya, all of whom meet the criteria as heads of their households. Materials had to be sourced from outside the households. The heads requested manure from neighbors with livestock, and the field team and YES helped load and transport it. The same was done for organic matter, with a large pile from grass cutting and maintenance at the hub, which was transported in two truckloads to the sites and used to fill the trenches.

Nomahlathi is an elderly woman living with her grandchildren, with grants being the household's main source of income. When the field team arrived, she was emotional, pointing to her children's graves in the yard. Her eldest son passed away while halfway through building her house. The tunnel will allow her to grow fresh vegetables year-round, complementing her field crops like peanuts and maize.

Figure 4: Nomahlathi Thwala delighted at her tunnel where she will be growing vegetebales

Hlengiwe Mkhanya, another household head, is part of the "missing middle" and supplements child support grants by making mats. She has tried farming for household consumption, but livestock have posed challenges. The introduction of a shade tunnel will improve her farming efforts by keeping livestock out and enabling year-round cultivation. Of the three households, Sibongile's soil was the poorest—extremely sandy with little organic matter. Her trenches were filled with the most organic material and manure.

The Ntuli family relies heavily on their garden, which has dark, fertile soil due to silt and organic matter buildup. It was the only garden where we found earthworms. Located at the lowest point of the property, the garden retains moisture, and Sibongile has dug two pits to collect water for irrigation. When we arrived, she was growing a variety of crops, including spinach, onions, peppers, cabbage, and peanuts. Sibongile also collects incema, a type of grass, to make and sell mats to supplement her income from child support grants and her pension.

Figure 5: Tunnel mulched with leaves at Hlengiwe Makhanya's

Figure 6: Dark soils with organic matter and earthworms at the Ntuli household with team digging trenches

Figure 7: Sibongile Ntuli's tunnel done and planted with seedlings

In the absence of field staff, the Mabibi YES team along with extension officers based at the hub visited Nonkululeko Makhanya and Sibongile Mbonambi; selected participants who fit the criteria; and dug trenches. Upon the field team return to Mabibi on the 14th of October 2024, a trench was put up at Sibongile Mbonambi where kraal manure was collected from a nearby household. Poles were bent and left at Nonkululeko Makhanya's and the field team managed to successfully put up her tunnel.

Figure 8: Mabibi YES team's first independently put up tunnel at Nonkululeko Makhanya's

Nkovukeni

Figure 9: House destroyed by the storm at Bhekiwe Ngubane's

Bhekiwe, Vusi, and Nomusa Ngubane were identified as among the most vulnerable. Bhekiwe now lives in a one-room structure made of iron sheeting with her daughter and grandchild, after their house was severely damaged by a storm. The fresh vegetables from the tunnel will be a valuable source of nutrition. Initially skeptical, Bhekiwe was pleased and amazed once the structure was completed, appreciating the protection from birds and monkeys. Although water remains a challenge, she is confident that the tunnel will make more efficient use of the little water she can access, benefiting both her crops and her family.

Figure 10: Bhekiwe marvelling at the tunnel with drip kits supplying water to crops

Nomusa Ngubane

Figure 11: Tunnel at Nomusa Ngubane homestead

The search for manure in Nkovukeni proved difficult. After digging trenches, the field team spent a large part of the day collecting manure and organic matter from nearby households, which delayed the tunnel's completion. However, the trenches were filled and raised above ground level. The following day, the team split into two groups, with one setting up Nomusa Ngubane's tunnel and the other digging trenches for Vusi Ngubane. Nomusa's tunnel was installed in about two hours, showcasing the team's growing efficiency and attention to detail.

On Friday, September 27, 2024, the team volunteered to install Vusi Ngubane's tunnel independently to test their capability without external assistance. They first filled the trenches with manure and organic matter, then assembled the galvanized steel frame and attached the nets. The team worked collectively and successfully completed Mr. Ngubane's tunnel, sending pictures to the lead field staff to show their achievement

Figure 12: Nkovukeni YES team putting up tunnel on their own at Vusi Ngubane

In the absence of field staff, the YES team in Nkovukeni visited two more households where they prepared trenches and gathered material to make up the beds prior putting up the structure. On Thursday the 10th of October 2024, the group split into two team and visited the two households to put up the tunnel and did so successfully.

Figure 13: Stunning work by the team at Gloria Zwane's

The Enkovukeni team has been one of the two wonderful YES group working with in tunnel installation. On Thursday the 10th of October 2024, the group successfully put up its second tunnel independently getting each time they do. The group was able to self-manage and had

the tunnel complete in a space of three hours at Khulekani Mthembu’s with one done earlier at Gloria Zwane.

Figure 14: Snapshot of the team's day at Khulekani Mthembu's

KwaDapha

Things have not been easy with this community regarding participation in workshops especially to with the community with regards to beneficiaries. A resolution was taken to look through the baseline data and select deserving households based on the developed criteria. As things stand, three tunnels have been put up in the community and one at the hub.

Figure 15: Tunnel put up at Khululiwe Sibiya alongside her iron sheet and drabs of net fenced garden

For Khululiwe Sibiya; affectionately known as MaZungu Sibiya; the tunnel will be a great addition to her garden fenced by iron sheeting and netting. She is keen on growing more vegetables to sell in KwDapha and surrounding villages. She already reckons that the shade tunnel will do better than her garden due to the organic matter buried in the soil providing nutrients and storing water in the soil. She is very much keen on seeing and trying out newly introduced crops in kale and the numerous herbs she is not used to.

Figure 16: KwaDapha team mastering tunnel at Thabile Doris Tembe's

The trio of Thabile, Zandile Mthembu and Sibongile Mthombeni work together in a field in a low lying area with a borehole where they grow vegetables for their families. Although they have separate plots, the trio work together buying seedlings, collecting water and manure to produce fresh vegetables. They were also among the ten farmers who tried out tower gardens they each have in their plots. The trio agreed to share the one tunnel as another practice to improve their cropping activity which they will share among themselves. The reason for having it at Thabile's homestead was based on the proximity to borehole which is their only stable water source. Thabile also had chicken litter and organic matter in grass and leaves readily available on site that they used to amend fertility. The chicken litter was from a combination of traditional chickens and broilers that she grows from day olds and sells locally.

Table1: List of tunnel beneficiaries

Area	Tunnels put up
Mabibi	Nomahlathi Thwala
	Hlengiwe Makhanya
	Sibongile Ntuli
	Sibongile Mbonambi
	Nonkululeko Makhanya
Nkovukeni	Bhekiwe Ngubane
	Nomusa Ngubane
	Vusumuzi Ngubane
	Gloria Zwane
	Khulekani Mthembu
KwaDapha	Nomusa Manzini
	KwaDapha Hub
	Thabile Temabe, Zandile Mthembu, Sibongile Mthombeni
	Khululiwe Sibiya

Note: The lists were done suing the baseline data spreadsheet and working with hub supervisors

Next steps

The field team is set to put up the last tunnel in KwaDapha and the see to the installation of drip kits enabling the households to use greywater thus reducing the stress and need for fresh water while stretching the already available water as much as possible. The team is also tasked with monkey proofing the tunnels by installing doors that will be locked.

A series of workshops will also follow looking at pest and disease control, seed saving to enable farmers to keep their own seed thus reducing the costs of buying seeds as well as seedling production from their own seed. Soil fertility management will also be key as pests and diseases take opportunity in ailing crops; organic teas and brews and management of crops through a range of herbs and combination of crops that compliment each other will be crucial.