

RYABSOA

Stories of landscape and people

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Graduation thesis

Living with drought prone landscapes.
Spatial design interventions for a rain and dry seasons
mitigation system in Ryabega, Eastern Rwanda.

First mentor: Dr.ir. Inge Bobbink

Second mentor: Prof.dr.ir. Anne Loes Nillesen

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Circular Water Stories Lab

Landscape Architecture Master Track

TU DELFT

2023-2024

This comic book illustrates a fictional narrative made out of multiple interviews conducted on-site and with informations collected in the research phase of this thesis.

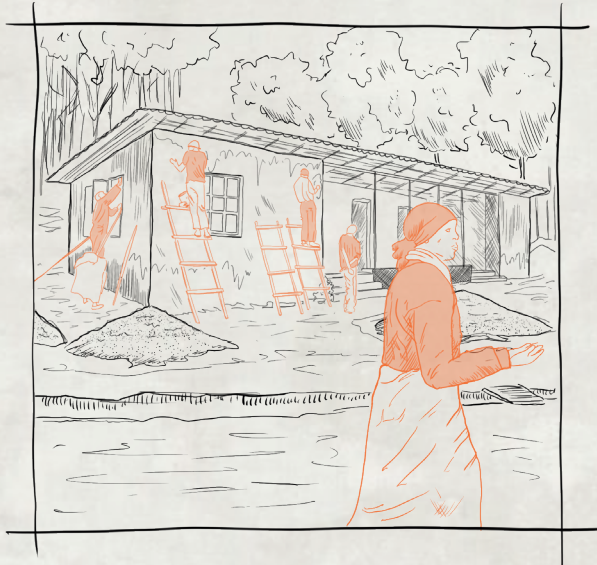
The narrator is a 25 years old farmer that goes by the name of Eugenie. She will guide us throughout her hometown, Ryabega and the current challenges, the agriculture, communities and landscape are facing.



Located in the eastern Savannah, the original landscape was made of sub-arid high grass and trees.

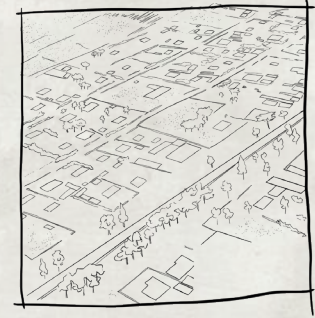
The current landscape of Ryabega is heavily deforested and used as a productive machine for intensive agriculture.



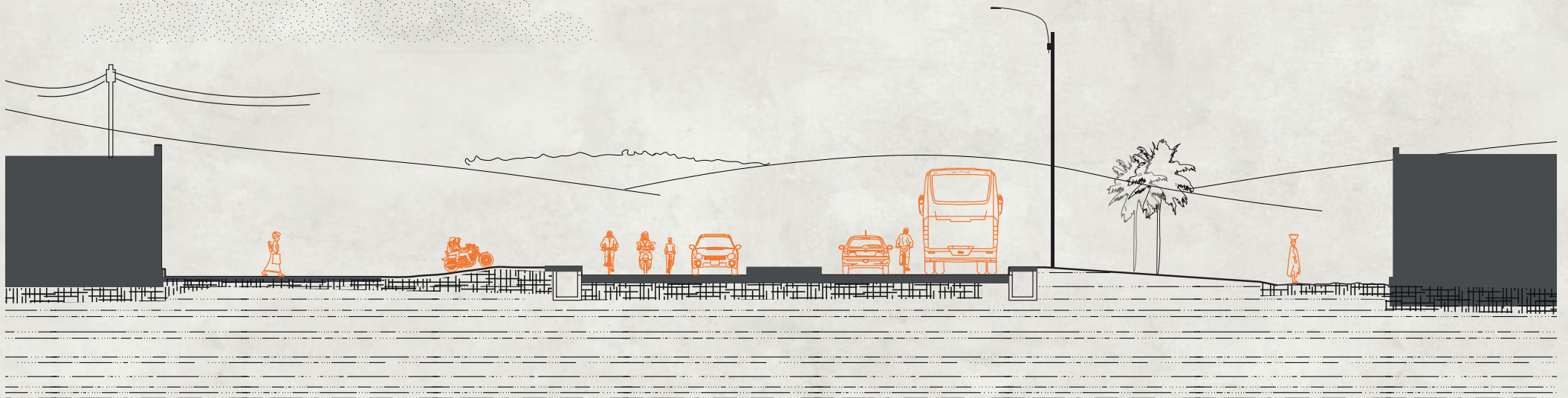


The days start early at **6:30am**. Later on, the commercial part of the town is mostly animated by people commuting. Farmers are on their way to the crops.

The town is planned on a rational and efficient grid, creating long, monotonous streets.

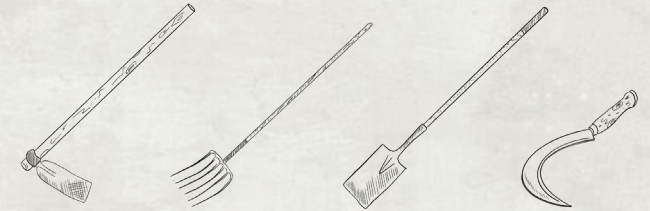


People build their own residences with local materials.



At **8:00am**, farmers are working in the fields. The town center is mostly animated by the traffic from and to Nyagatare, the main city of the district.

I usually work with my friends. Our crops have been merged by the cooperative to increase productivity.



The land is worked by hand with multiple tools. As agriculture is not a profitable activity, most farmers can't afford machineries without funds from the government.





«We had a drought and we were starving.»

However, farmers are vulnerable to current challenges. They rely on rain-fed agriculture. Most crops need a lot of water and struggle with higher temperatures. This impacts many farmers in the town.



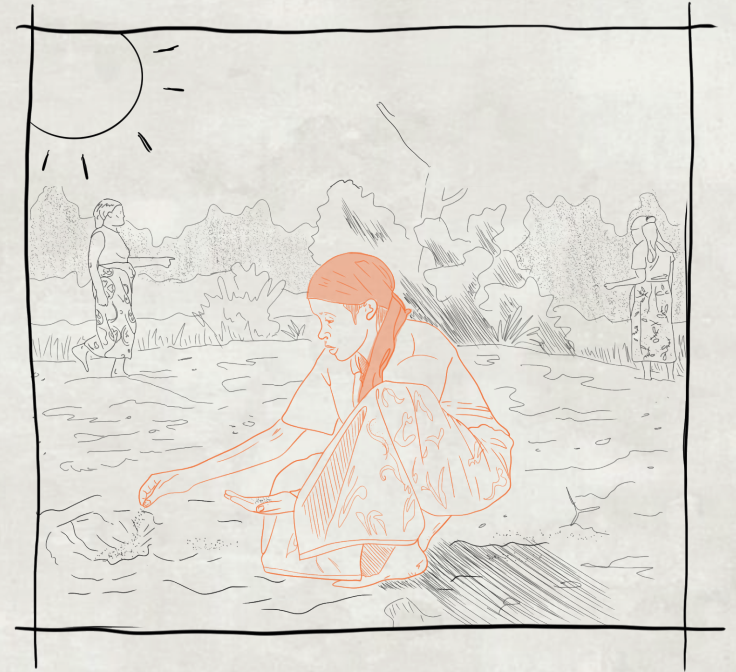
Potatoes



Sorghum



Wheat



Agro-pastoral



Banana



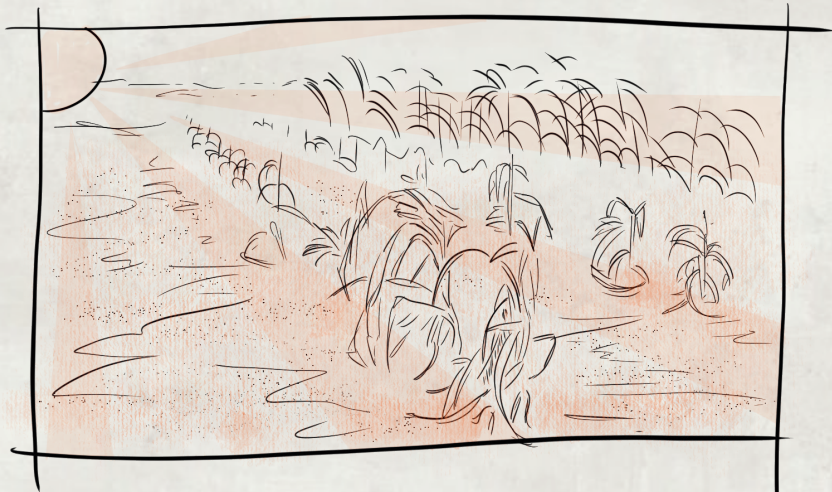
Beans



Maize



Mixed vegetables



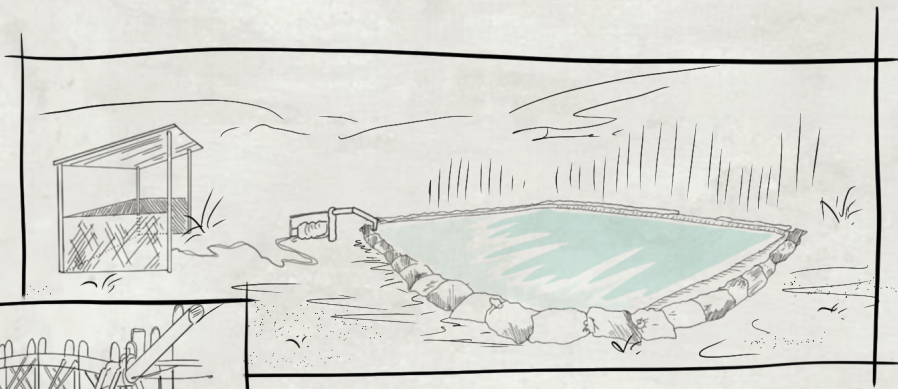
«There will be a shortage of money for those who rely on agriculture.»

«2021 has been bad with no rainfall. I do not plant the seeds because I wait for enough rain. That is a loss for farmers.»



Struggling with water demand, some farmers were able to buy groundwater pumps thanks to governmental subsidies or pivot irrigation with funds from international investors.

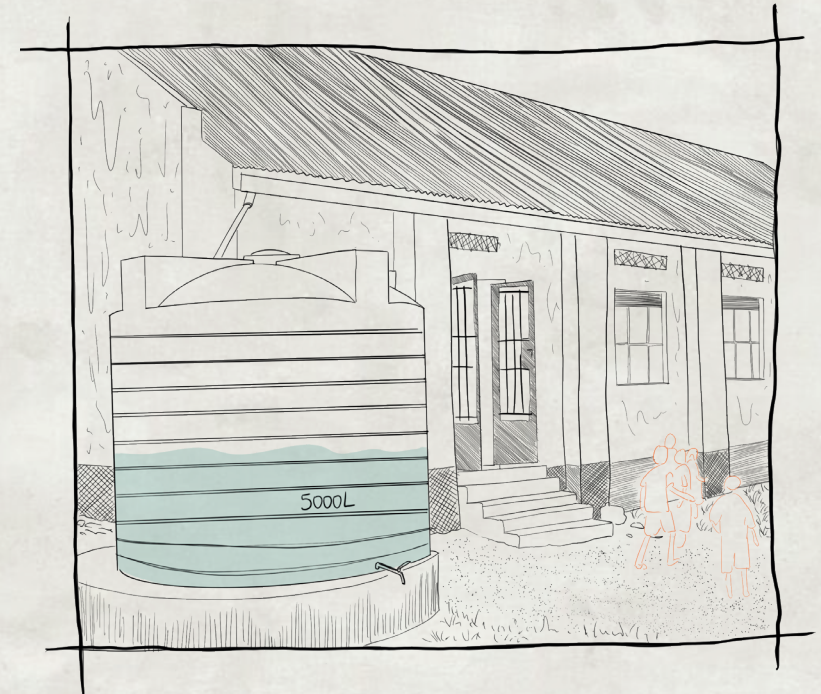
However, only 5 to 10% of them have that luxury.



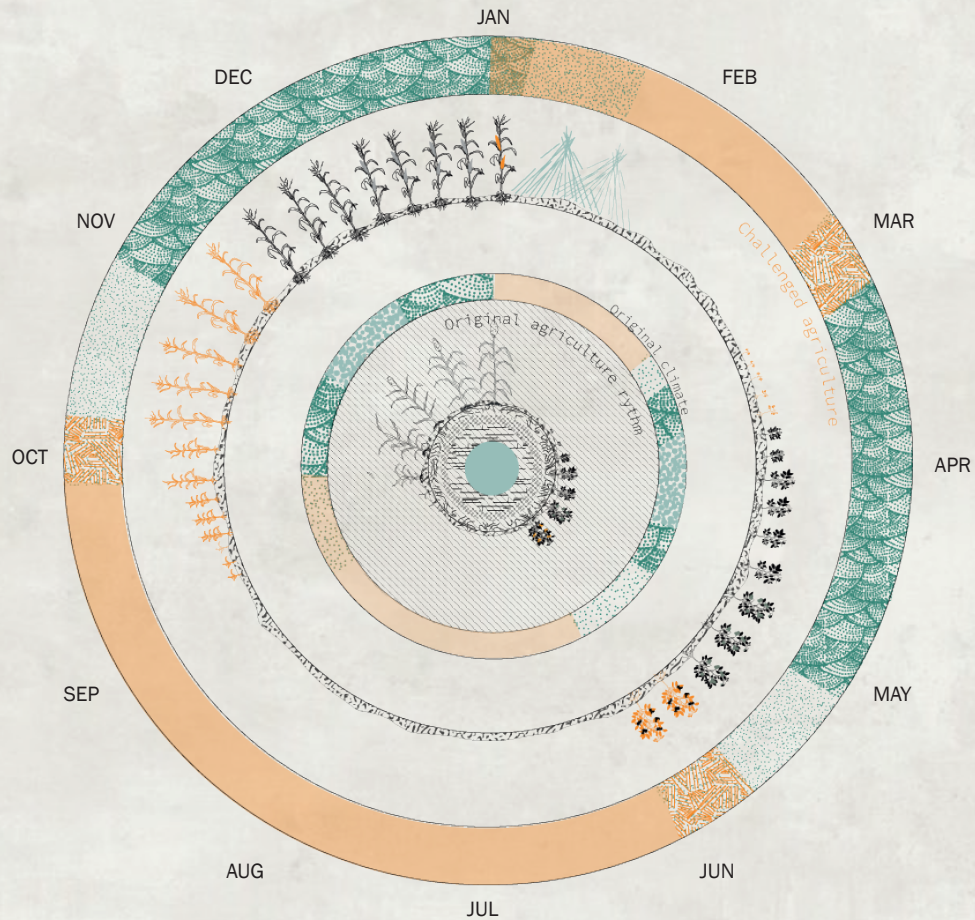
Locals can buy water at the nearest shop and invest in a plastic tank. Both options are still quite expensive as rural communities struggle with poverty.



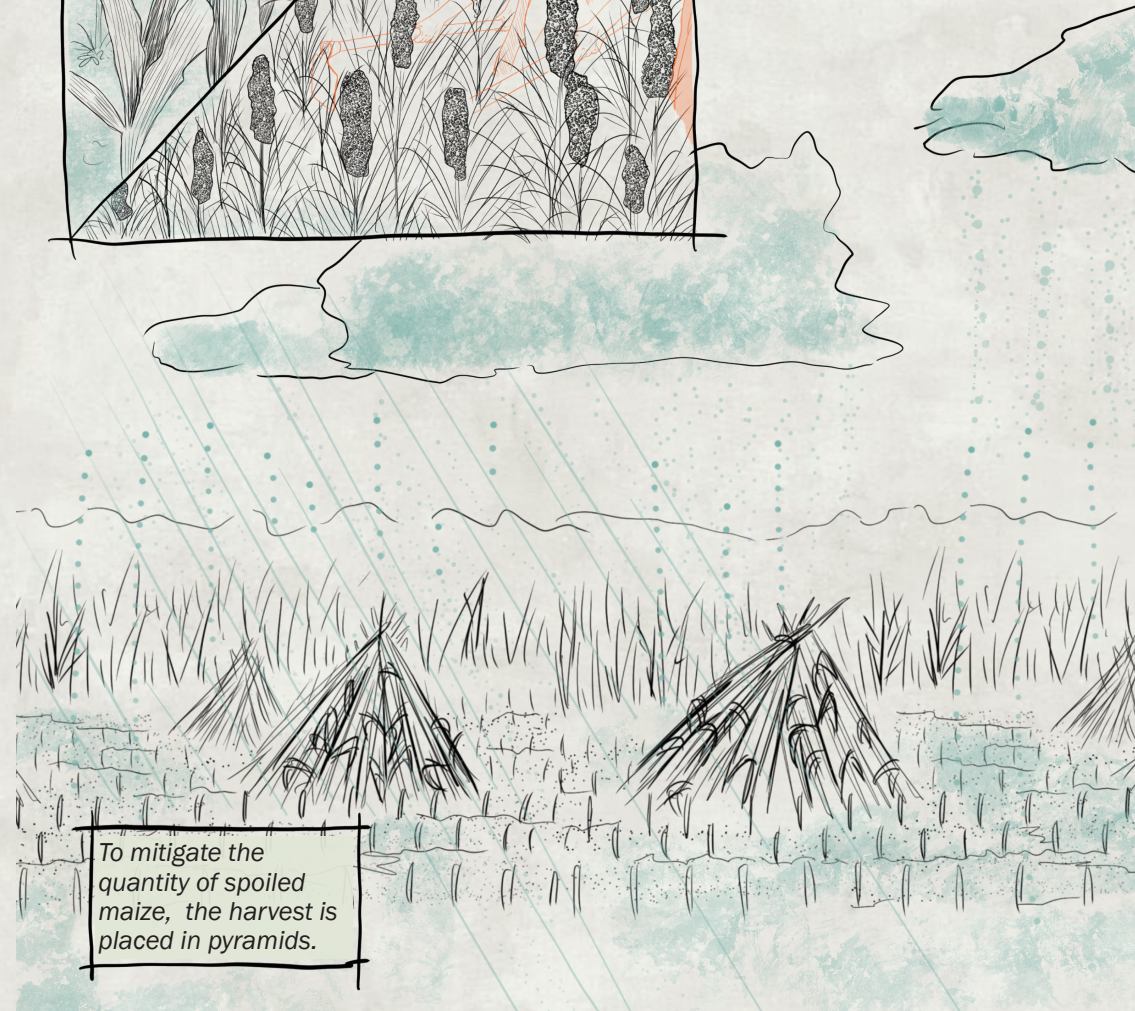
The lack of water directly impacts us as well. My mom is concerned when the rain does not come. We try to find other water sources.



In addition to the higher temperatures during the dry seasons and the recurrence of droughts, global warming has impacted the rain patterns as well. They have become irregular and are even spoiling the crop harvest in January.



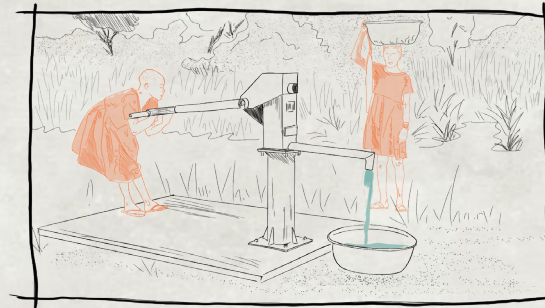
Farmers sow at the start of the rain seasons and harvest at the end.



To mitigate the quantity of spoiled maize, the harvest is placed in pyramids.



At **12:00 am**, Farmers are traveling back from their fields carrying the harvest on their bikes, while other farmers are leading the cows and cattle to the dedicated grazing fields and pastures. In Rwanda, it is not allowed to let the animals graze on the roadsides.



Many people cross the road and are in conflict with the high traffic as so many different people are present. Bikes, pedestrians, buses, cars and animals are all making use of it.





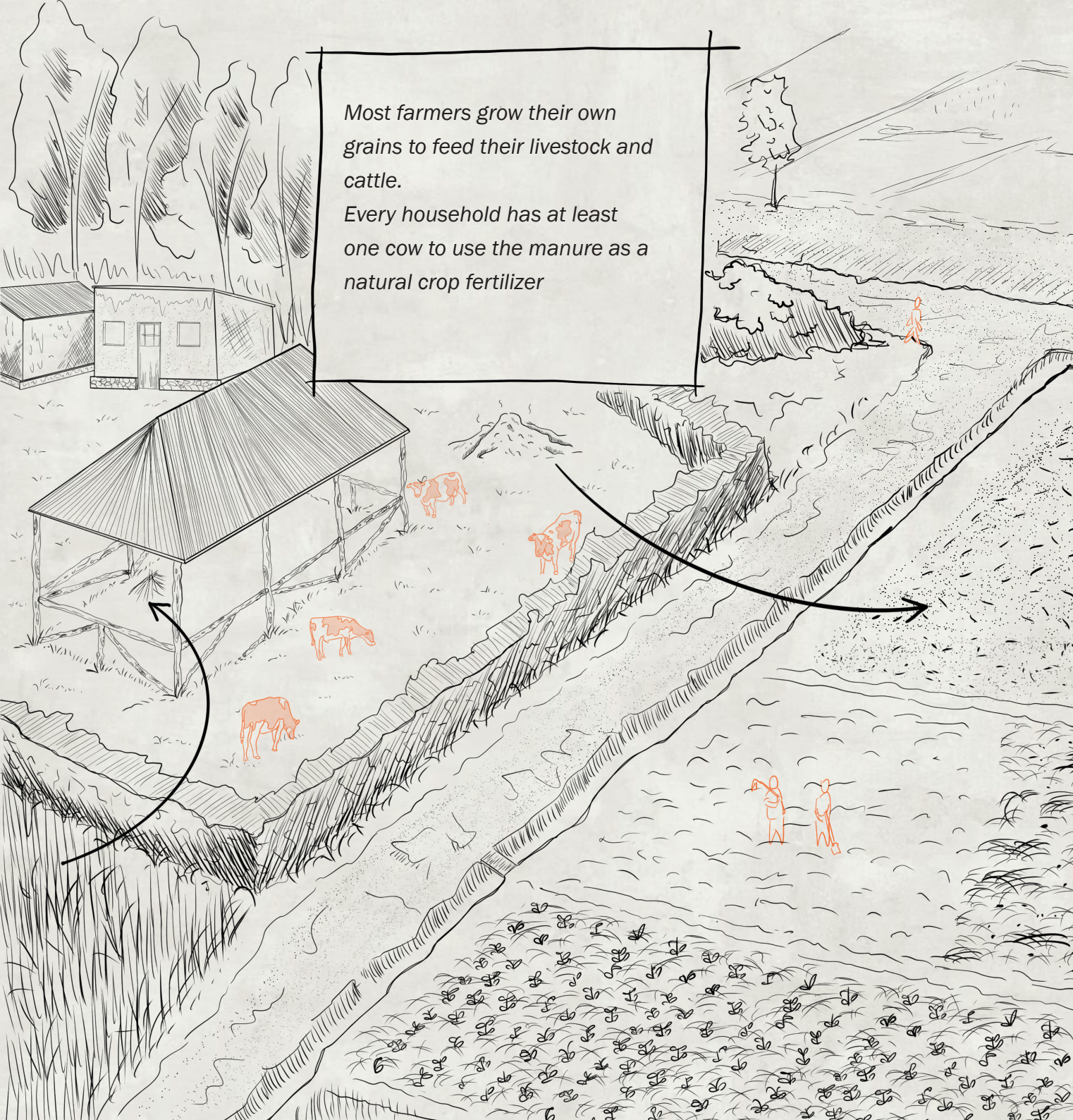
At **4:00 pm**, it is the end of the school day for the children.

They are walking on the road alongside buses and cars.

In the afternoon, farmers tend to their cows in the grazing fields.

Like I have mentioned before, the landscape is now used for agriculture and farming. We have lost a lot of the natural Savannah habitats, and some birds are even endangered because of our activities.





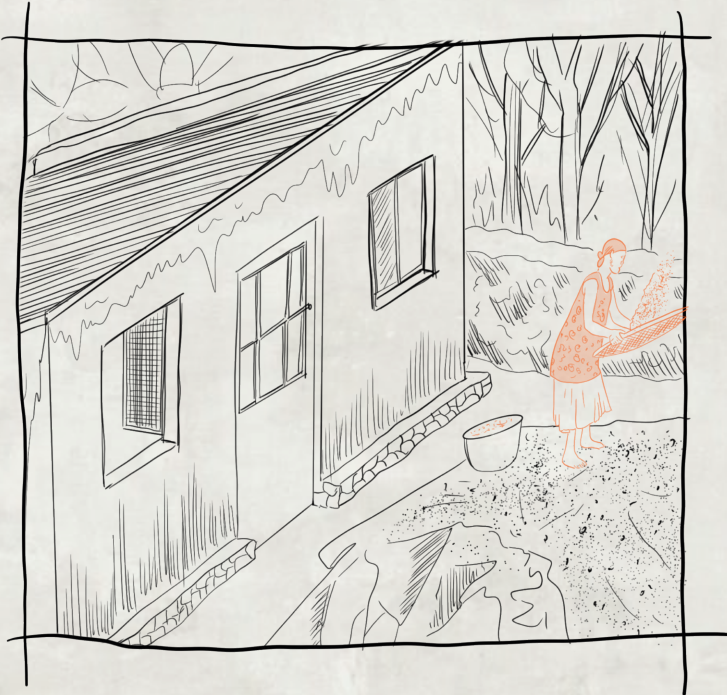
Most farmers grow their own grains to feed their livestock and cattle.

Every household has at least one cow to use the manure as a natural crop fertilizer

The government Crop Intensification Program has created a cooperative system.

Our crops have been merged to plant the same seeds and harvest them in larger quantities. 70% of farmers are part of that system.

Others are planting smaller crops and sometimes sowing climbing beans with the maize to increase productivity.



From
the sorghum
crops, my mom collects the
seeds and grinds them to create
flour.

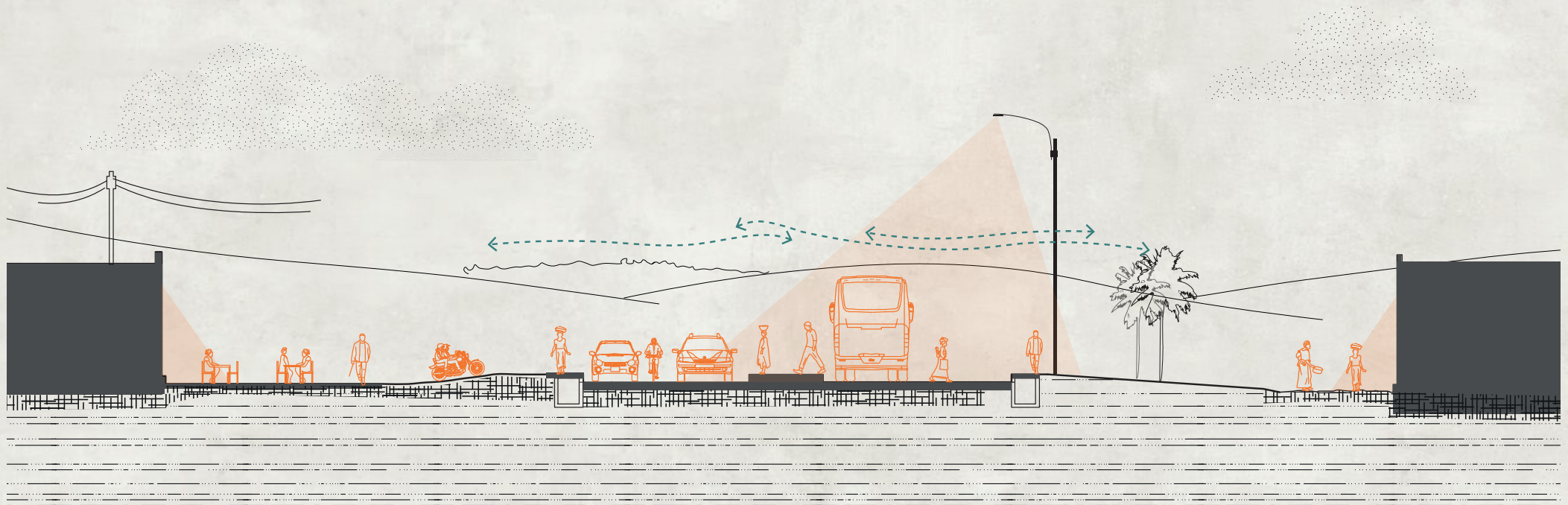
My favorite food is makoze. It is
made with mashed corn.

70% of
farmers
are women.
They are the
first ones
to notice
climate
differences,
as they
impact
their whole
routine.



Ryabega becomes animated in the evening, and I usually meet up with some friends or my family for a beer. We have several good ones made in Rwanda.

At **6:00 p.m.**, the day is already over and dark. During this time, many people are circulating in the town center. Others are laying out tables and chairs near the cafés to have a beer with their friends. Temperatures are much more comfortable to be outside.



LOCALLY

RESILIENCE

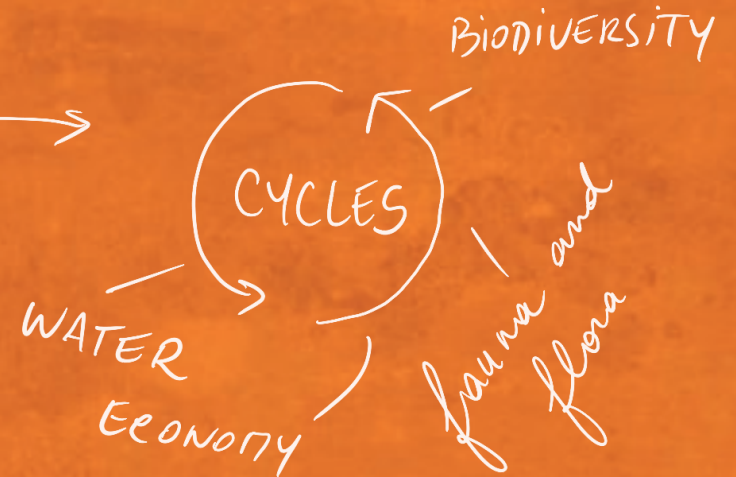


SELF-SUPPORTING



living with
→

!! DROUGHTS
~~VULNERABILITY~~



SOURCED

WOOD
SOIL
REED

MATERIALS

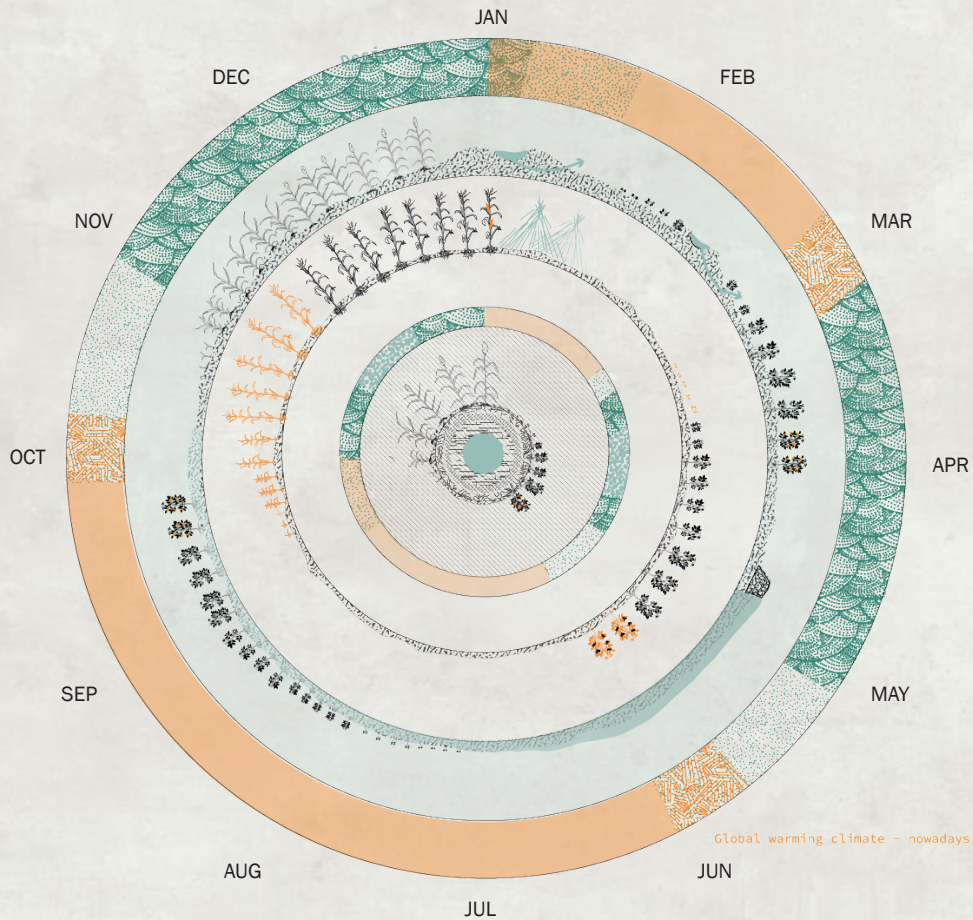
TECHNIQUES

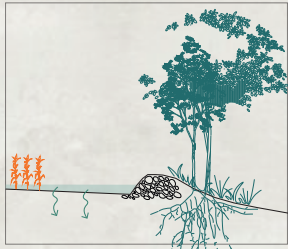


INTERVENTIONS



Global warming has impacted climates, rain and dry season patterns, and thus the people relying on them for agriculture. There are opportunities to learn from an arid traditional system, where people had time to adapt to such conditions, and adapt it for a rain and dry seasons mitigation system.

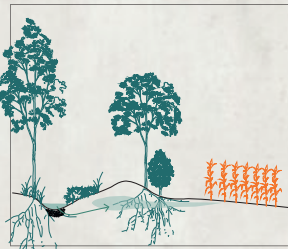




1 Seasonal agricultural basin



2 Reservoir basin



3 Channel



4 Tree line improvement



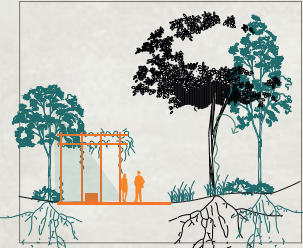
5 Green hedge improvement



6 New water conservation park



7 New green urban park



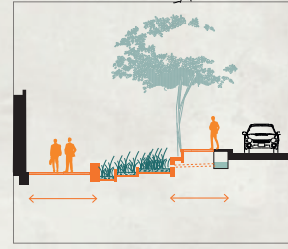
8 New green arches social pockets



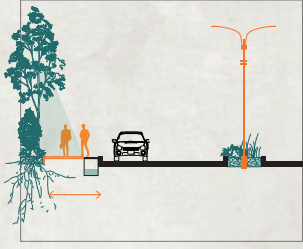
9 Residential green improvement



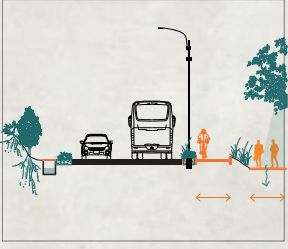
10 New resilient housing



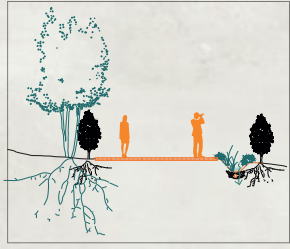
11 New urban features



12 New main road profile



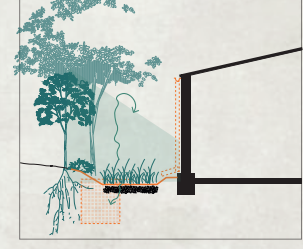
13 New road profile



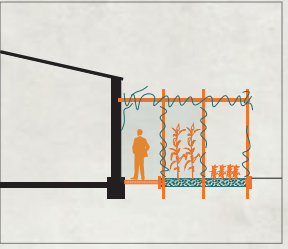
14 New street profil



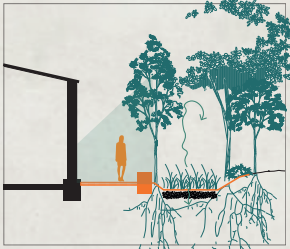
15 New main road gutter



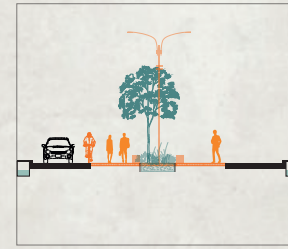
16 Roof water collecting Private tankaa



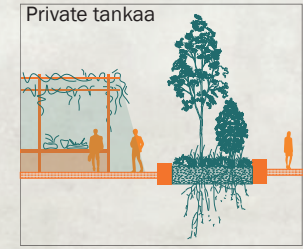
17 Sheltered productive garden



18 Private rain garden



19 The road as part of the public spaces



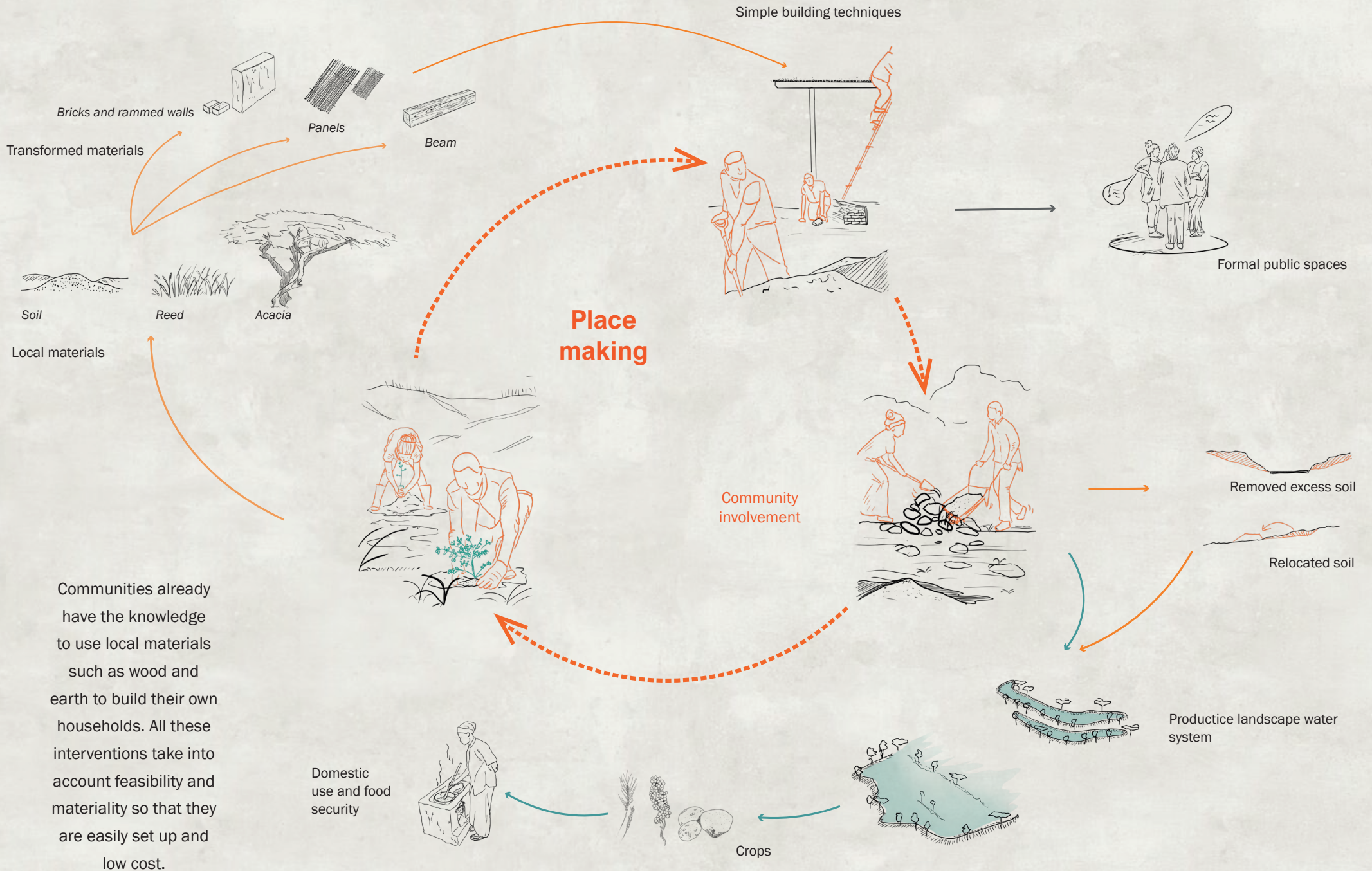
20 Drought resilient market place

The interventions are developed in order to, together, create a dry and rain season mitigation system.

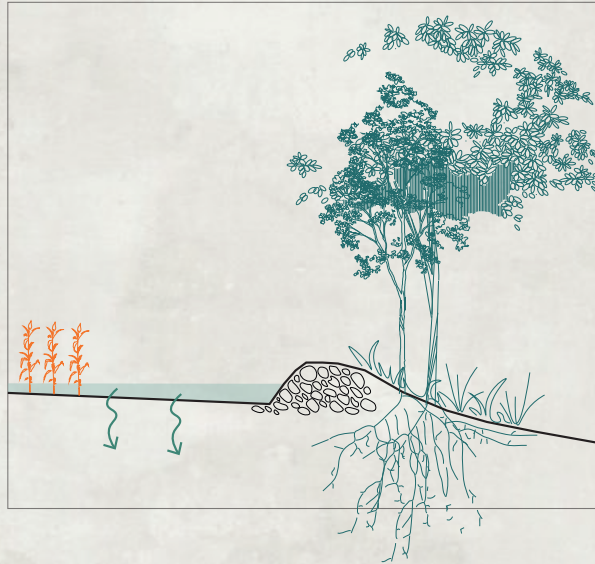
Based on nature-based solutions, bioclimatic architecture and resilient landscape theories, they address four main aspects:

1. Water conservation
2. Soil moisture
3. Microclimate humidity
4. Drinking water access

By implementing tree covers, vegetation and specific design features, these interventions aim to create qualitative social spaces, social interaction, water circularity, town economic autonomy, resilient housing and drought temperature mitigation.



Communities already have the knowledge to use local materials such as wood and earth to build their own households. All these interventions take into account feasibility and materiality so that they are easily set up and low cost.



Technique: **Seasonal basin**
 Use: Long dry season crop
 Material: Soil and rocks
 Height: 1.5m embankment
 Length: Site-specific
 Width: Site-specific - 1.7m top surface for accessibility

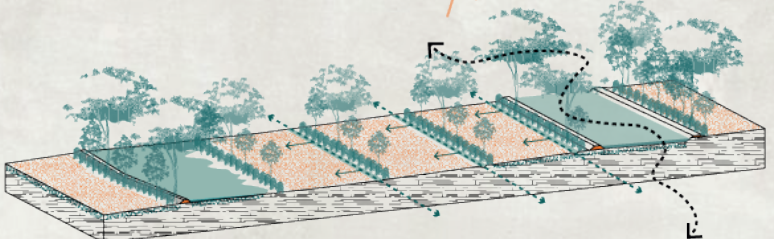
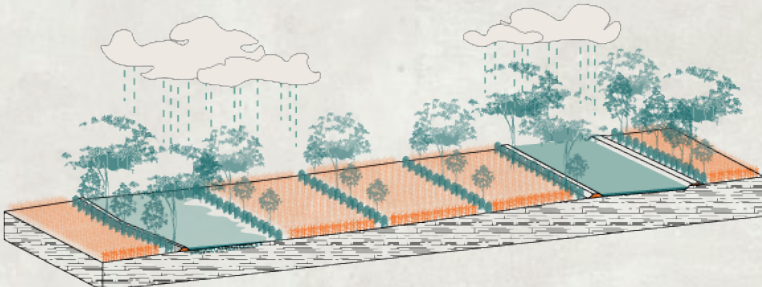


Technique: **Reservoir**
 Use: Water conservation and irrigation during short dry season
 Material: Soil and rocks
 Height: 2m embankment
 Length: Site-specific
 Width: Site-specific - 1.7m top surface for accessibility

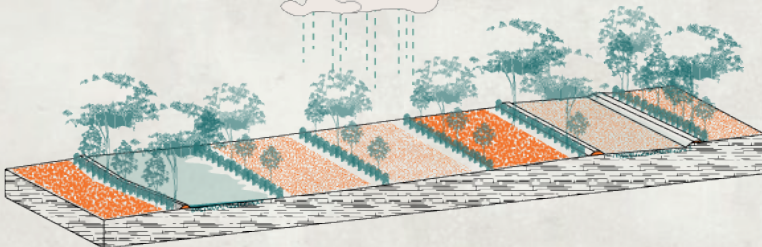
Long rain season
September - January
Growth - Rain irrigation



Range : 400-700 mm



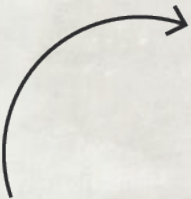
Short dry season
February - April
Sowing - Reservoirs
and channel
irrigation



Short rain season
March - June
Growth - Rain irrigation



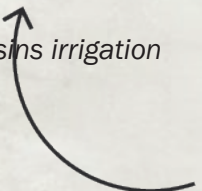
Range : 300-500 mm

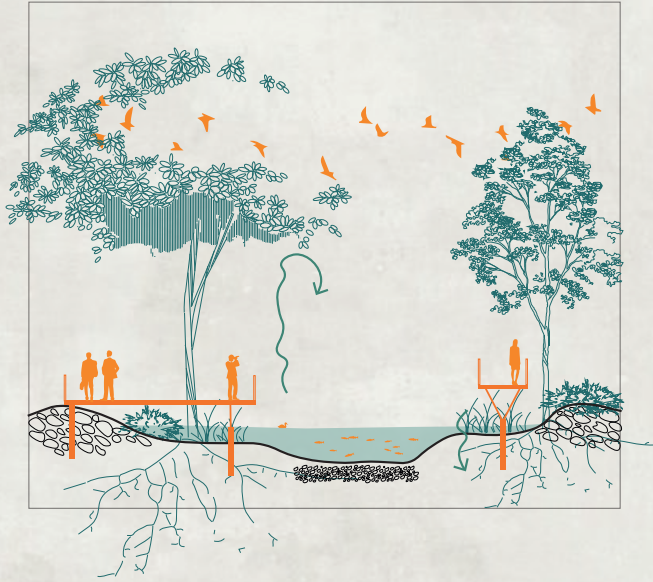


Long dry season
June - September
Growth - Seasonal basins
irrigation



Arid crop types



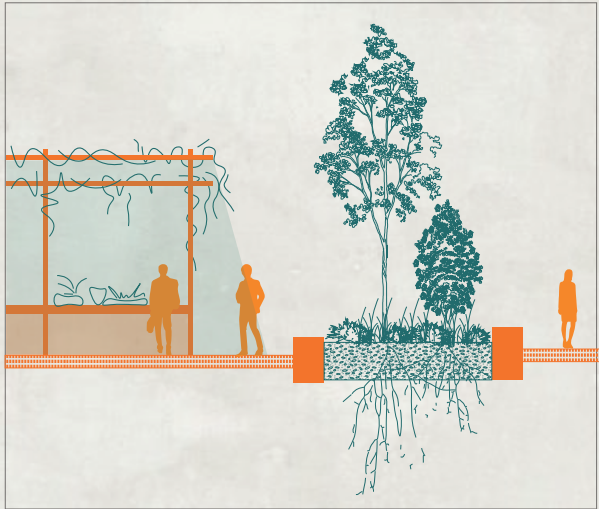


Technique: **New blue/green urban park**
 Use: Water conservation, birdwatching and recreation
 Material: Wooden decks
 Height: 50 cm above water level
 Length: 3m
 Width: 3m

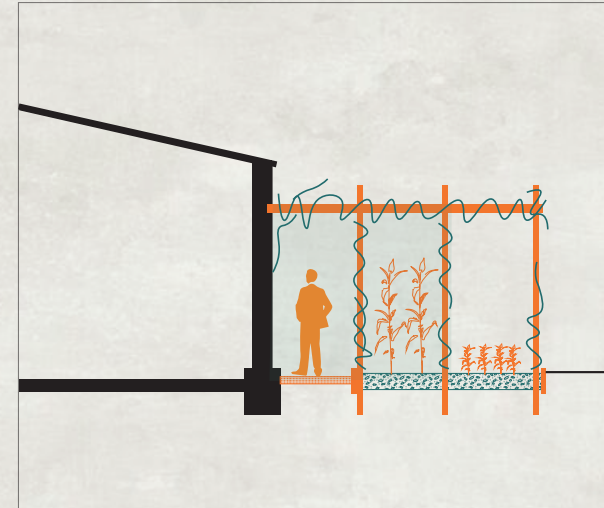


Technique: **New green urban park**
 Use: Biodiversity and recreation
 Material: Elevated soil paths, earthen bricks pavement
 Height: /
 Length: Site-specific
 Width: 2-3m

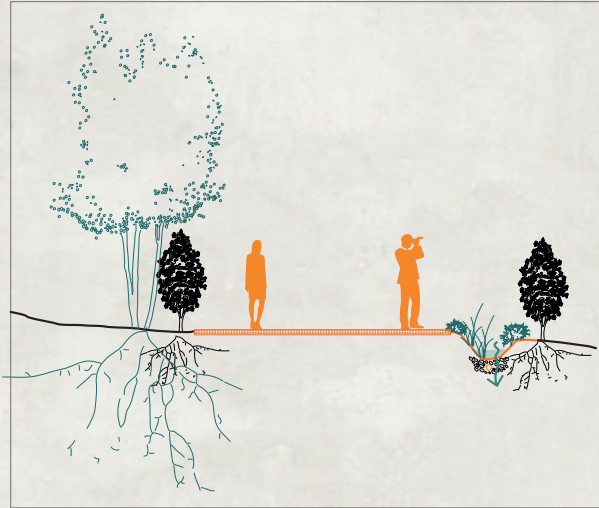




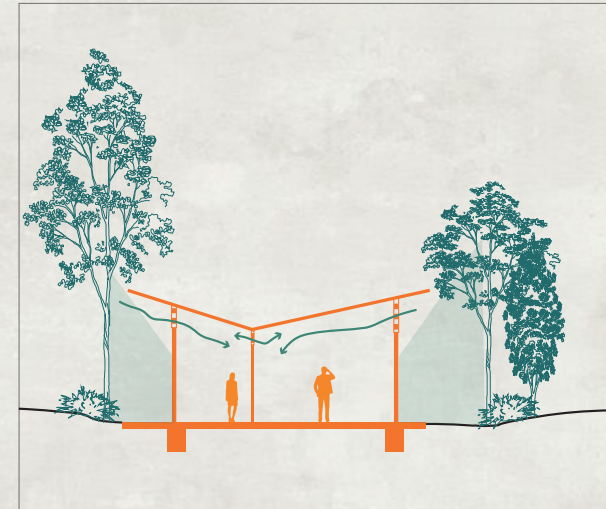
Technique: **Shaded pockets**
 Use: Moisture and humidity conservation, recreation
 Material: Wood
 Height: 3m
 Length: Site-specific
 Width: Site-specific



Technique: **Shaded pockets**
 Use: Agriculture
 Material: Wood
 Height: 3m
 Length: Site-specific
 Width: Site-specific



Technique: **Paved streets**
 Use: Circulation and guiding water to the side gutters
 Material: Earthen bricks, sand and gravel
 Height: /
 Length: Site-specific
 Width: Site-specific



Technique: **Resilient housing**
 Use: Bioclimatic architecture residences
 Material: Wood roof structure, rammed earth walls
 Height: 2.7-4m
 Length: Site-specific
 Width: Site-specific





Murakoze !!

The intervention catalogue developed aims to offer diverse concrete actions that can be replicated in other drought-prone landscapes. One of their most important aspects is the use of local building knowledge and locally sourced materials such as earth and wood. Indeed, we aim to provide accessible opportunities for communities to build their own landscape. Many vulnerable areas remain vulnerable because of the lack of subsidies and investments.

This catalogue shows that by multiplying simple interventions and involving the people - autonomy, water circularity and landscape resiliency can be achieved.

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