

The Organization

The Project

**Strengthening Community Resilience
with Sustainable Agriculture Through
Water Harvesting and Conservation**

Data Analysis Plan and Data Visualizations

July 2023

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Declaration

All the information provided here are imaginary, created solely for the purpose of simulating a case to develop innovative intervention that will strengthen resilience of concerned communities (example country taken here is Somalia). The case scenario is based on plausible assumptions and projections but does not reflect the actual situation or needs of any specific location or group. The aim of this exercise is to develop a sample portfolio showcasing the skills and knowledge related to information management and data visualization. This also includes creative thinking, and exploration of possible solutions that can enhance the well-being and security of vulnerable populations in a complex and dynamic context.

Background

Agriculture is primary occupation of Somalia and one of the main drivers of its economy. However, agricultural practices here are still predominantly carried out in a traditional manner. The natural rainfall is the main source of water, and the agricultural yield is therefore heavily dependent upon distribution and amount of rainfall and its timing.

Recent alteration in rainfall patterns noted during the last decade, primarily due to climate change, has had an adverse effect on the agricultural sector. This has led to increased frequency and intensity of drought or erratic rainfall distributions. This strain on the agricultural sector has exacerbated food insecurity and has disrupted rural livelihoods.

There is a need to act on this soon as continuation of this pattern will only deteriorate the resilience and wellbeing of the community.

Objective

To strengthen community resilience against adverse effect of altered rainfall patterns on agriculture, **The Project** proposes an intervention for climate resilient agriculture practices. This includes water harvesting and conservation by constructing reservoirs to collect rainwater and its consistent distribution through drip irrigation techniques. This reduces the complete dependency on natural rainfall and allows efficient and effective use of water resources to get better agricultural yield and therefore strengthen community resilience, which is the ultimate objective of this proposed intervention.

Scope of Work

The proposed areas of interventions will be in Mogadishu, Baidoa, Garowe, Hargeisa, and Burco. A reservoir for water storage will be constructed in each of these places and supplementary materials to set up irrigation system will be provided. End users will be provided relevant trainings to enhance technical skills and knowledge related to the intervention. This activity will target all the farmers in the intervention areas.

Deliverables

- A reservoir each into each location based on the storage volume required.
- Irrigation access to beneficiary's farmland through provision of accessories (pipes and fittings)
- Improved technical skills and knowledge of improved irrigation and farming practices through provision of relevant trainings.

Theory of Change (TOC)

For this intervention, following are the premises for its successful implementation and achievement of objectives.

Assumptions:

- Water harvesting and conservation initiatives are effectively implemented.
- Community participation and ownership are fostered throughout the process.
- Adequate resources and support are available for the implementation and maintenance of water harvesting and conservation systems.

Components of TOC:

- **Water Availability:** Water harvesting and conservation systems, such as small reservoirs, rainwater harvesting techniques, and soil conservation measures, are implemented. These

interventions increase the availability of water, especially during dry periods, by capturing and storing rainfall runoff.

- **Improved Agricultural Productivity:** The availability of water through water harvesting and conservation enhances agricultural productivity. Farmers can practice improved irrigation techniques, enabling them to cultivate crops during extended dry seasons. Increased agricultural productivity contributes to food security, income generation, and reduced dependency on external aid. This, in turn, strengthens community resilience by enhancing self-sufficiency and reducing vulnerability to food insecurity.
- **Environmental Stewardship:** Water harvesting, and conservation promote sustainable environmental practices. These initiatives encourage soil conservation, reduced soil erosion, and improved land management. Consequently, they contribute to the preservation of natural resources, including fertile soil and water bodies. Environmental stewardship strengthens community resilience by ensuring the sustainability of natural resources, mitigating the impacts of climate change, and fostering long-term ecosystem health.
- **Adaptive Capacity:** Through the implementation of water harvesting and conservation practices, communities develop increased adaptive capacity. They acquire knowledge, skills, and technologies related to water management and sustainable agriculture. This enhanced capacity enables communities to respond and adapt to changing environmental conditions, such as droughts or erratic rainfall patterns. By building adaptive capacity, communities are better prepared to withstand shocks and stressors, reducing vulnerability, and enhancing resilience.
- **Community Resilience Strengthened:** As water harvesting and conservation initiatives strengthen agricultural productivity, environmental stewardship, and adaptive capacity, the overall resilience of the community is strengthened. The interplay among these factors creates a positive feedback loop, reinforcing community resilience over time. Stronger resilience allows communities to navigate and recover from shocks and stresses, maintain essential functions, and thrive in the face of adversity.

The TOC should be accompanied by monitoring and evaluation mechanisms to assess the progress and outcomes of water harvesting and conservation interventions. Regular assessments and feedback loops will help refine and adapt the interventions based on the community's evolving needs and contextual factors.

Monitoring and Evaluation (M&E) Plan

Objective

The objective of this M&E plan is to establish a systematic approach to monitor and evaluate the Water Harvesting and Conservation activity implemented to strengthen the resilience of the agricultural community in Somalia. The M&E plan aims to assess the effectiveness, efficiency, and impact of the activity and provide actionable insights for continuous improvement.

Key Indicators

The M&E plan will include the following key indicators to measure the performance and impact of the Water Harvesting and Conservation activity:

- Number of water harvesting structures constructed/rehabilitated.
- Quantity of water harvested and stored.
- Area of agricultural land benefited from water harvesting and conservation.
- Increase in crop yields and agricultural productivity.
- Number of training sessions conducted on water harvesting and conservation.
- Community satisfaction and perception of the activity's impact.

- Economic benefits generated for the agricultural community.

Data Collection Methods

- The M&E plan will utilize a combination of quantitative and qualitative data collection methods to gather relevant information. These methods may include:
 - Field visits and observations to assess the physical implementation of water harvesting structures.
 - Surveys and interviews with farmers to capture their experiences, and perceptions.
 - Water flow measurement and monitoring systems to quantify the amount of water harvested and stored.
 - Yield assessments and crop cutting experiments to measure the increase in agricultural productivity.
 - Review of project documents, reports, and records to gather quantitative data.
 - Focus group discussions with community members to capture qualitative feedback.
 - Key informant interviews with project staff, stakeholders, and experts.

Data Analysis and Reporting

The collected data will be analyzed using appropriate statistical methods and qualitative analysis techniques. The analysis will provide insights into the performance of the Water Harvesting and Conservation activity and its impact on the agricultural community. Regular reports will be generated to communicate the findings to stakeholders. Baseline will be established through collection of data prior to start of the intervention. This will serve as a benchmark, against which future data will be compared to measure the effect of intervention activities.

Frequency and Responsibility

The M&E activities will be conducted throughout the project implementation period. Monitoring and supervision will be frequent during infrastructure setup. Once the reservoirs are built and irrigation system set up, monitoring and data collection for different kinds of activities will be done at definite intervals to track progress and identify early warning signs if any. The frequency of data collection, analysis, and reporting will be as follows:

- Data collection related to yield measure during yield times.
- Frequent data collection for harvest measurement and to assess performance against targets and objectives.
- Monthly data analysis and reporting to assess performance against targets and objectives.
- Quarterly data analysis and reporting to assess performance against targets and objectives.
- Annual comprehensive evaluation to measure the overall impact and provide recommendations.

The responsibility for M&E activities will be assigned to dedicated M&E staff within the implementing organization. They will work closely with project staff, partners, and stakeholders to ensure effective data collection, analysis, and reporting.

Learning and Knowledge Management

The M&E plan will emphasize a learning and adaptive approach, aiming to use the findings to inform project implementation and improve outcomes. Lessons learned and best practices identified through the M&E process will be shared and integrated into future activities and

similar initiatives.

By implementing this M&E plan, the Water Harvesting and Conservation activity will be effectively monitored and evaluated, providing valuable insights for evidence-based decision-making, adaptive management, and continuous improvement.

Data Collection and Analysis Process

As this is a simulated exercise, some of the processes mentioned here will be indicative only. E.g., it is assumed that data collection is done through administration of developed questionnaire, but the random data used will be generated directly, which will be in line with developed questionnaire.

Majority of data collection will be done through use of Kobo questionnaires, administered through relevant project staffs.

Proposed steps:

- Baseline data will be collected by administering kobo questionnaire.
- Regular monitoring data collection will be done through administration of different sets of kobo questionnaire.
- Collected data will be processed and cleansed by means of excel power query, to prepare data for further analysis and visualizations.
- All required relationships will be established among different data tables (baseline, monitoring tool, infrastructure information etc.) to form relational database.
- For this document, visualizations will be prepared in both Tableau and Power BI. Visualizations will be interactive and will be updated automatically upon provision of new data. Link to Tableau visualization will be shared whereas for Power BI, only snapshot of the interactive dashboard will be shared as dashboard sharing cannot be done without professional license.

Sample questionnaire

Link to sample questionnaire for baseline survey:

<https://ee.kobotoolbox.org/x/ljHMLELj>

Below is the sample image of data collected from baseline questionnaire after processing through power query.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Baseline												Income from	Baseline Total
1	SN	Name	Gender	Age	District	Latitude	Longitude	Date	Land Size	Land ID	Crops	Baseline Yield	Agriculture	income
2	1	Kartiile Khadar	M	54	Mogadishu	2.08617	45.295897	7/6/2022	2	MO-1	Tomato	800	1,440	2,362
3	2	Xayd Ladan	M	41	Mogadishu	2.08617	45.295897	7/6/2022	4	MO-2	Bean	500	2,200	4,004
4	3	Sharmooge Diric	M	26	Mogadishu	2.08617	45.295897	7/6/2022	7	MO-3	Maize	800	4,200	7,938
5	4	Batuulo Xareed	F	43	Mogadishu	2.08617	45.295897	7/6/2022	6	MO-4	Tomato	1,000	5,400	8,478
6	5	Siraad Garaar	F	52	Mogadishu	2.08617	45.295897	7/6/2022	1	MO-5	Bean	600	660	825
7	6	Hidan Bedri	M	38	Mogadishu	2.08617	45.295897	7/6/2022	3	MO-6	Bean	700	2,310	3,442

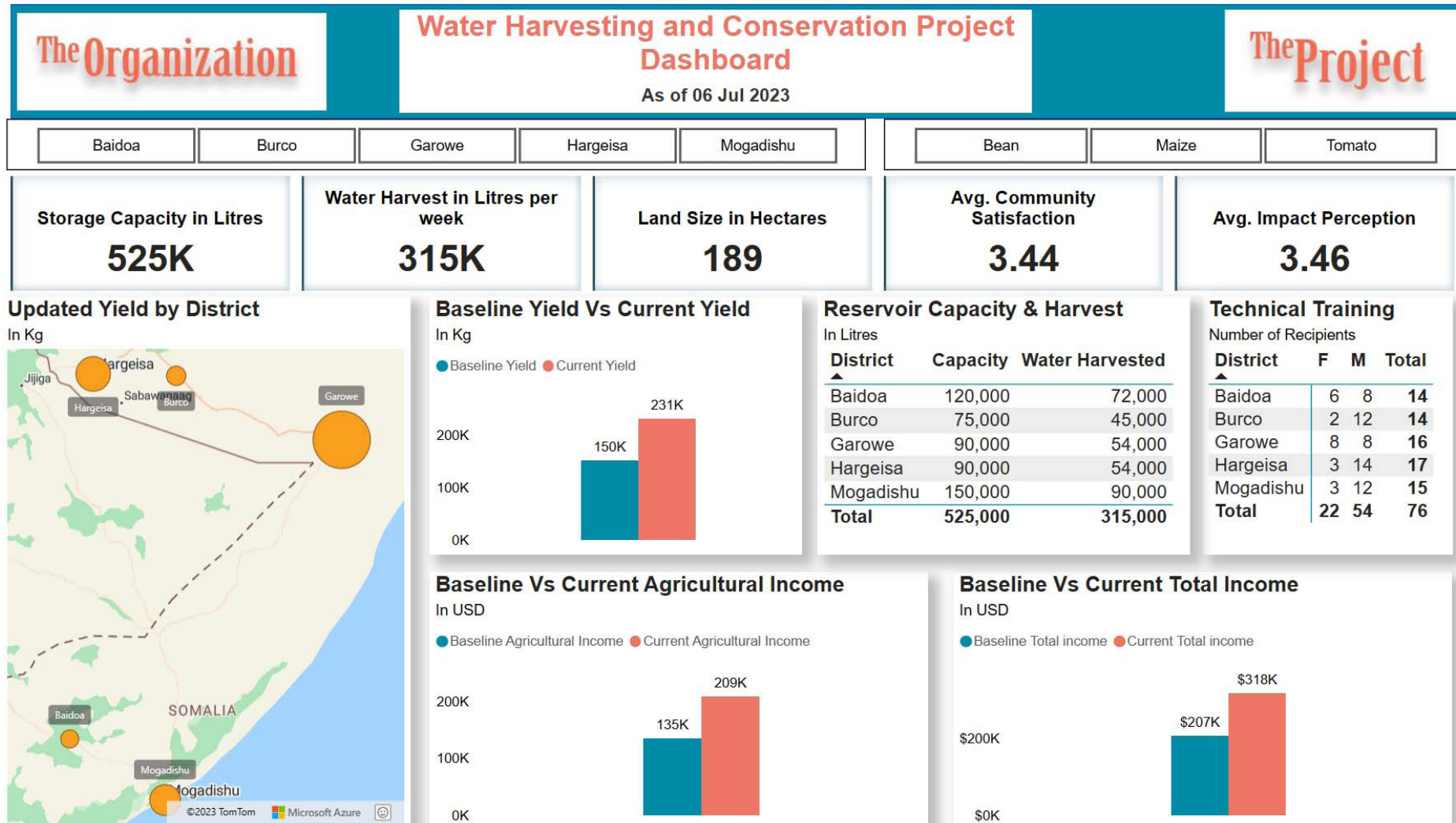
Links to sample questionnaire for regular data collection:

<https://ee.kobotoolbox.org/x/cleyoZa4>

Below is the sample image of data collected from regular monitoring tool after processing through power query.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	Updated												Income from	Updated Total	# Trained	Satisfaction	Perception
1	SN	Name	Gender	Age	District	Latitude	Longitude	Date	Land Size	Land ID	Crops	Updated Yield	Agriculture	income			
2	1	Kartiile Khadar	M	54	Mogadishu	2.08617	45.295897	7/6/2023	2	MO-1	Tomato	1,600	2,880	\$4,723	2	5	5
3	2	Xayd Ladan	M	41	Mogadishu	2.08617	45.295897	7/6/2023	4	MO-2	Bean	875	3,850	\$7,007	2	5	5
4	3	Sharmooge Diric	M	26	Mogadishu	2.08617	45.295897	7/6/2023	7	MO-3	Maize	840	4,410	\$8,335	2	1	1
5	4	Batuulo Xareed	F	43	Mogadishu	2.08617	45.295897	7/6/2023	6	MO-4	Tomato	1,500	8,100	\$12,717	1	4	4
6	5	Siraad Garaar	F	52	Mogadishu	2.08617	45.295897	7/6/2023	1	MO-5	Bean	630	693	\$866	2	2	1
7	6	Hidan Bedri	M	38	Mogadishu	2.08617	45.295897	7/6/2023	3	MO-6	Bean	735	2,426	\$3,614	1	2	2
8	7	Good Wanaag	M	48	Mogadishu	2.08617	45.295897	7/6/2023	1	MO-7	Maize	875	656	\$998	1	2	3

Data visualization Power BI



Above is an image of an interactive visualization developed using Power BI Desktop free version. This interactive visualization will automatically update with database updates. Since sharing Power BI dashboard requires professional license, only its screenshot is shared here.

Tableau

Tableau visualization was prepared using Tableau Public, which is a free version of Tableau. The link to the visualization is here.

https://public.tableau.com/views/DataAnalysisandVisualizationPortfolio/Dashboard1?:language=en-US&:display_count=n&:origin=viz_share_link

Below is a screenshot of the same tableau visualization. Same as Power BI, this visualization is also interactive and intended to update with database updates.

