Capacity development and training on enhanced rainfed agriculture and sustainable landscape and watershed management in the Zambezi Basin for regional stakeholders

TIARA workshop 17-23 November, Malawi

C.T.D.O ZAMCOM FACHIG

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Cover photo: Participants of TIARA Capacity Exchange and TIYENI field staff (Chance Mwenitete, TIYENI)

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1. Introduction

The Transforming Investments in African Rainfed Agriculture (TIARA) programme, led by the Stockholm International Water Institute (SIWI), aims to unlock the potential of rainfed agriculture in Africa. TIARA focuses on transforming rainfed agriculture by increasing crop yields and in-field productivity. This involves promoting sustainable practices that recharge water, restore soil health, sequester carbon, and strengthen biodiversity. TIARA facilitated a Training of Trainers (TOT) on Integrated Landscape and Water Management in Malawi from the 18th – 23rd of November 2024. The field interventions under the programme are being promoted by CTDT (Zimbabwe), FACHIG (Zimbabwe), Tiyeni (Malawi), COMACO (Zambia) and ZAMCOM at the regional level in collaboration with governments, local authorities and farmers. The TIARA programme has three components:

Political Leadership and Advocacy: TIARA aims to enable high-level leadership and political commitments to support green water solutions and unlock public and private investments in enhanced rainfed agriculture.

Capacity Development: The programme includes capacity development covering enhanced rainfed agricultural practices and nature-based solutions (NBS), as well as approaches to scaling up sustainable and resilient practices at the landscape and watershed scale that generate multiple ecosystem services and livelihood benefits. This helps strengthen the sustainability of technical assistance provided to farmer organizations.

Knowledge Generation and Business Case Development: TIARA also focuses on generating knowledge and developing business cases to attract finance for sustainable and resilient agricultural practices, including metrics for measuring watershed impacts.

Farmers, participants and Tiyeni field officers (Anna Tengberg, SIWI).

The objective of the capacity development, training and knowledge exchange was to develop capacity on the landscape approach to enhanced rainfed agriculture as a vehicle to scale up sustainable and resilient practices. It involved a mix of training sessions, regional knowledge exchange and field visits to demonstration plots and landscapes under restoration. The target audience included the SIWI partners in Malawi, Zambia and Zimbabwe (e.g. Tiyeni, COMACO, CTDT, FACHIG) working in the field with rural communities supporting them to improve rainfed farming and landscape management practices.

2. Training sessions on integrating water into the landscape approach

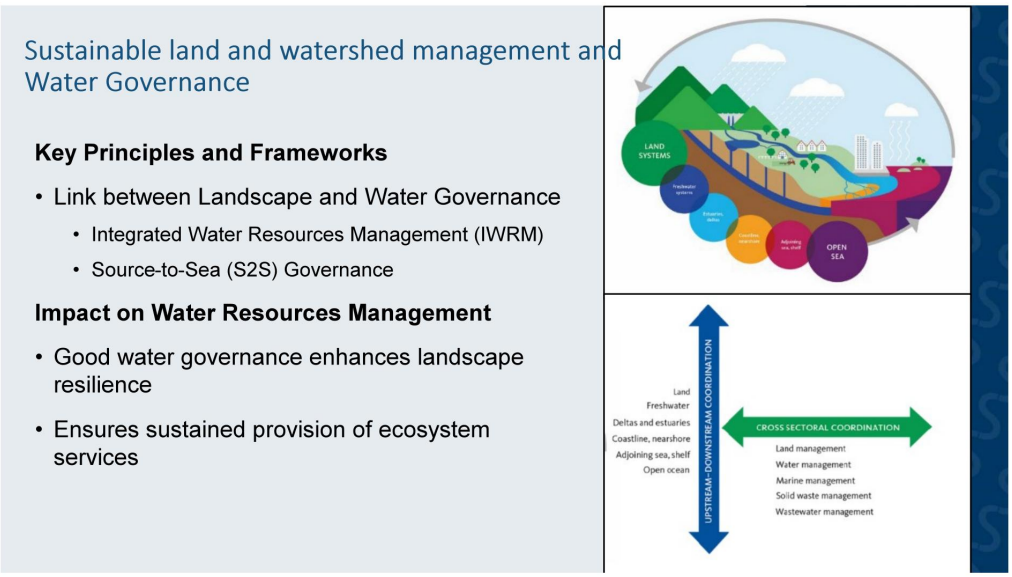
The integrated landscape and water management training of trainers focused on (1) introduction of the landscape approach, (2) resilient and sustainable landscape management technologies and approaches, and (3) hydrological impacts of watershed management using three manuals adapted to TIARA based on a series of six manuals on the landscape approach developed by SIWI and IWMI. The manuals were introduced by Dr Anna Tengberg from SIWI with the purpose to disccuss the training toolkit and provide approaches to sustainable landscape and watershed management in the Zambezi basin to support enhanced rainfed agriculture. The expected outcome was improved understanding of the role of enhanced rainfed agriculture in landscape restoration that contributes to improved livelihoods and rural economy as well as environmental benefits in terms of water, carbon and biodiversity

2.1. Introduction to the landscape approach

The landscape approach has many definitions and is based on a set of principles adopted by the Convention on Biological Diversity (CBD). It emphasizes the integration of agriculture, forestry, energy, and water for sustainable development. Landscape approaches can be a mechanism for dialogue and discussion among multiple stakeholders, and ecosystem services provided by landscapes are at the core of the approach. The session included presentation and discussion of spatial assessment of ecosystem services, with a special focus on water-related ecosystem services in landscapes. The importance of Stakeholder engagement in landscape restoration, and involving

women, youth, and indigenous people was addressed, and the need for building alliances for successful restoration.

This session also focused on water and landscape governance and gave examples of different governance frameworks, such as Integrated Water Resources Management (IWRM) and Source to Sea/Lake (S2S) governance. Important governance functions, such as policy and strategy, coordination across sectors and scales as well as access to finance were discussed.



The concept of sustainable land management (SLM) was introduced and the classification of SLM technologies and approaches:

- **Agronomic measures –** measures that improve soil cover (e.g. green cover, mulch), enhance organic matter/soil fertility (e.g. manuring), soil surface treatment (e.g. conservation tillage), and sub-surface treatment (e.g. deep ripping)
- **Vegetative measures** – include plantation/ reseeding of tree and shrub species (e.g. live fences, tree crows), grasses and perennial herbaceous plants (e.g. grass strips)
- **Structural measures** – include terraces, bunds, dams, pans, ditches, walls barriers, palisades
- **Management measures** – include change of land use type, change of management/intensity level (e.g. from grazing to cut-and-carry), major change in timing of activities, and control/change of species composition**.**

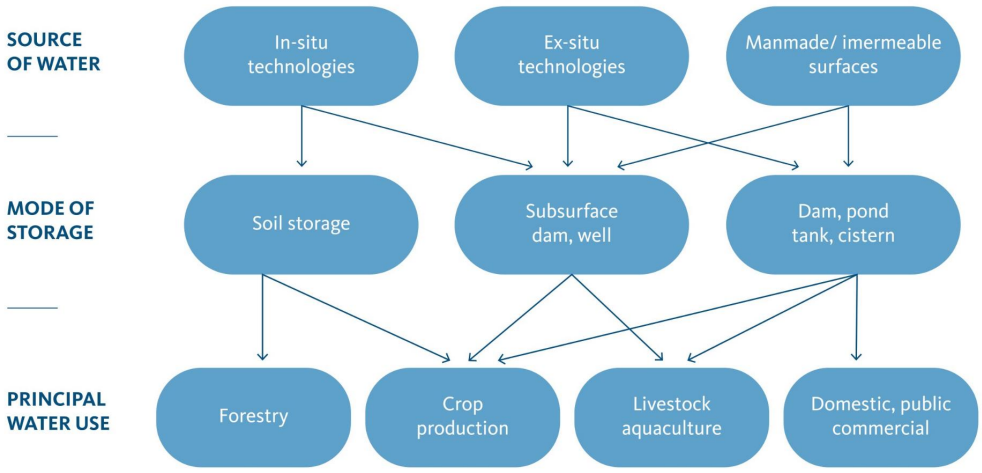
SLM Best Practices can be reported to WOCAT (https://wocat.net/en/global-slm-database/), which is the UNCCD default best practices database for SLM. Sharing TIARA best practices globally could contribute to scaling up enhanced rainfed practices and facilitate access to finance.

2.2. Water productive and resilient landscape management technologies and approaches

The session included definitions of key terms, such as water-use efficiency and water productivity, as well as the Agricultural/Farming/Livelihood Systems Approach, which is well aligned with the landscape approach. It also covered the value-chain approach with examples of both agricultural and forest-based value chains. Moreover, the rainfed-irrigated continuum was discussed whereby agriculture is considered to be part of a continuum from fully rainfed systems to systems with supplementary irrigation to fully irrigated. Agroforestry is also an integral part of enhanced rainfed

agricultural practices and factors to consider related to planting of trees in the landscape were addressed.

Sources of water, modes of storage and principal uses of water from different water management technologies (Source: Erkossa et al., 2020).

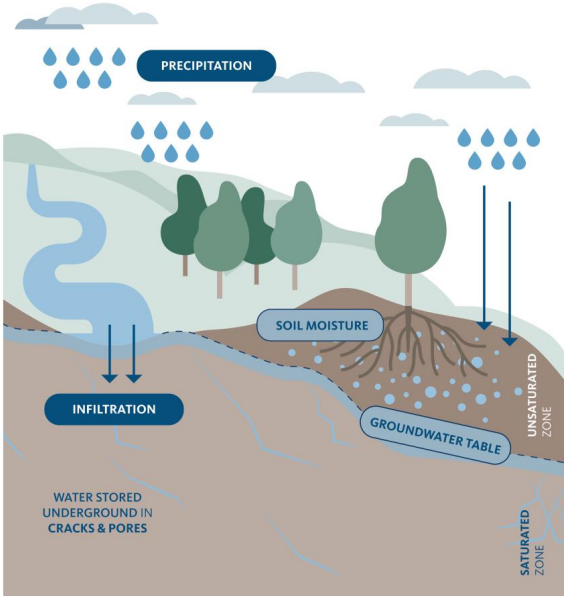


2.3. Watershed impacts

The session covered the hydrological cycle that describes the perpetual flux of water between global reservoirs: oceans, atmosphere, land surfaces, soils, groundwater, and solid Earth. It was emphasised that vegetation plays a significant role in maintaining the cycle through transpiration, interception, and moisture retention, and that land use changes like deforestation can affect nearby and distant water supplies.

Watersheds and Watershed Storage

- A watershed is a topographically delineated area drained by a stream system.
- Water is stored throughout the land surface, soil matrix, and aquifers in a watershed.
- Factors affecting storage include rainfall, catchment resistance to flow, sub-surface characteristics, and rainfall intensity and duration.
- Overland surface depressions and vegetation canopies store water for a few minutes up to several days. In the soil matrix, water can be stored for weeks depending on soil type.

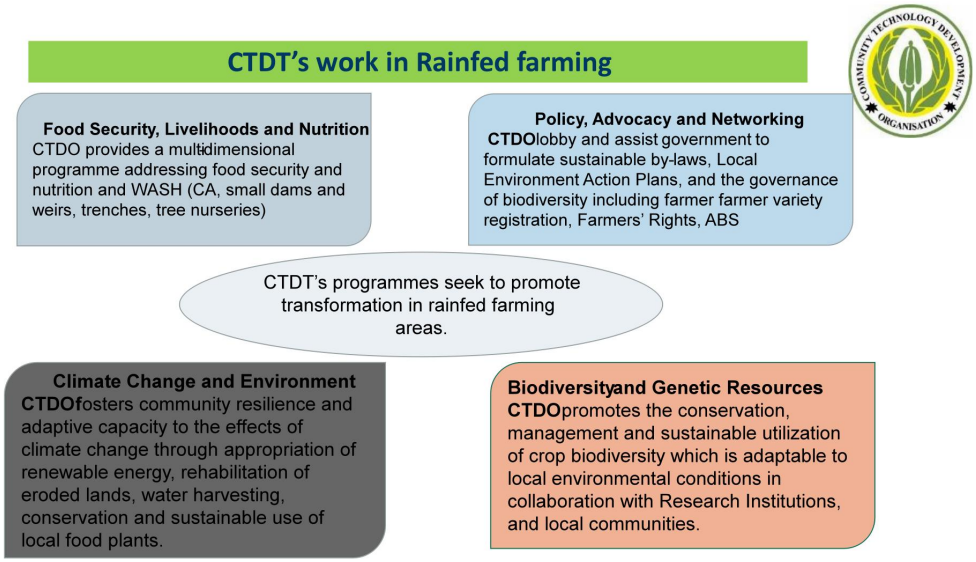


The session also introduced the concept of citizen science and how it could be used to set up community-based monitoring of hydrological data, soil erosion and sedimentation.

3. Regional exchange of best practices

3.1. The Community Technology Development Trust (CTDT), ZImbabwe

Mr Noble Zvivero presented enhanced rainfed best practices from CTDT that reach around 900 000 farmers in 8 out of 10 districts in Zimbabwe.



CTDT promotes different water harvesting technologies including conservation agriculture (CA) and small dam construction that has contributed to the improvement of smallholder farmers' resilience, livelihoods and eco-system. It also promotes conservation works like trenching to regulate runoff and improve soil moisture retention (including downslope). The water harvested in the trenches support crop growth during periods of mid-season droughts which are common in the Zambezi Catchment Area districts. This has contributed to increased crop yields in the smallholder farmers' fields.

Future opportunities for CTDT to stengthen its work inlude support to (i) Research and Development on watershed management and water harvesting technologies to control erosion and siltation of rivers and dams; (ii) Improve local small livestock breeds to enhance resilience and strengthen economic investments, manage human wildlife conflicts and reduce environmental degradation in the Zambezi Basin; (iii) Digital innovation for soil testing, soil health analysis, land degradation and impact assessments along the basin, and (iv) Farmer-led innovation in appropriate small-scale mechanization. However, the the following challenges still exist and need to be addressed:

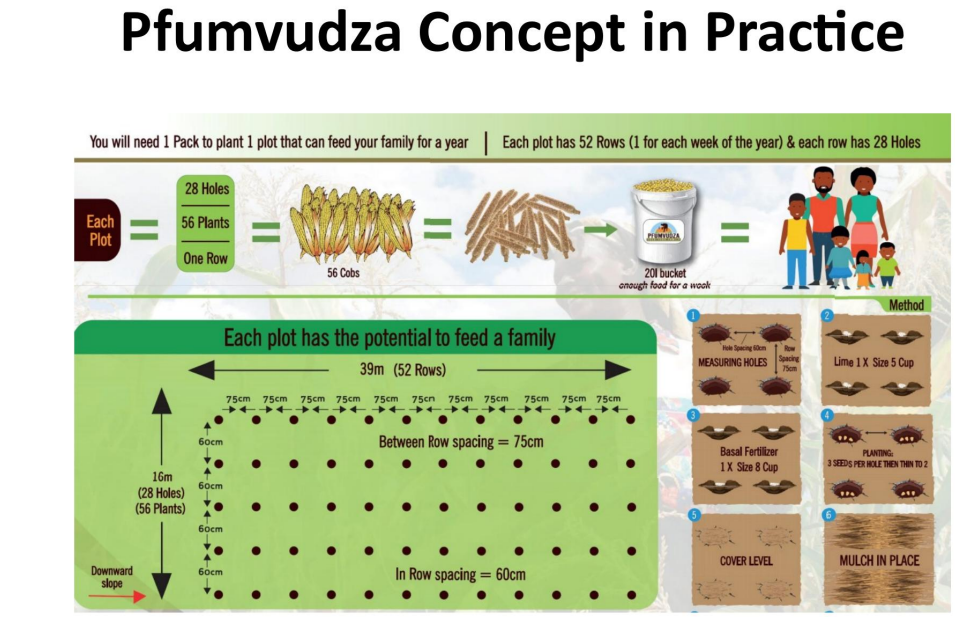
- Farmers are not trained on the benefits of CSA, especially environmental as emphasis is on productivity.
- Rainfed agricultural technologies are labour intensive, and with limited access to appropriate mechanisation, smallholder farmers find it difficult to effectively work on improving the soil.

- Other aspects of CSA (crop variety diversification, soil and water management, agroforestry and agro-ecology) are not prioritized.
- Transboundary regulation of shared river basins.

3.2.

3.2 Farmers Association of Community self-Help Investment Groups (FACHIG), Zimbabwe

Ms Runyararo Evelyn Motsi presented FACHIG's work to transform lives of vulnerable women and men in rural communities of Zimbabwe through value chain-driven entrepreneurial and sustainable agriculture. FACHIG has 12 600 members of which 73% are women farmers. FACHIG's work on soil health and management in rainfed systems promotes Pfumvudza, a concept of conservation agriculture (CA) which incorporates aspects such as potholing, mulching, cover cropping and use of organic manure.



Pfumvudza involves (i) Concentration of resources on small land units for optimizing resources and maximising profits, food and nutrition security outcomes; (ii) Planting using potholing method helps in moisture retention for the crops and even if there is a dry spell the crops will not be affected; (iii) High soil fertility through use of vermi compost manure, and (iv) Improved soil structure and ventilation.

FACHIG's work on the human-wildlife conflict nexus addresses competition for water, land and forests between humans and wildlife. Interventions include establishment of solar powered boreholes for human and livestock consumption to reduce movement to water points and rivers

frequented by wildlife, and off farm and on farm enterprise support on small grains and chilli production for wildlife control and value chain marketing across the landscape.

FACHIG's work on sustainable forest management supports farmers with diverse indigenous tree species, communal woodlots for reforestation, and reforestation hubs.

3.3. Tiyeni, Malawi

Mr France Gondwe from Tiyeni presented experiences, challenges and lessons from deep-bed farming (DBF) in Malawi. DBF is the best solution to smallholder varietal potential yield on smallholder farmers field for crops such as maize cassava and pigeon peas, and is the the best medium for maximum intercropping (5 to 6 crops at high yield), leading to significant increases in gross margins. Tiyeni has also introduced farmer-led monitoring soil erosion in the field, also called citizen science.

Conventional Ridge	
Land Size(ha)	0.40
Land preparation(MK)	17,875.00
Making ridges	60,625.00
Manure Making(MK)	1,500.00
Manure Application(MK)	1,000.00
Manure Transportation Cost	2,500.00
Seed(MK)	21,756.25
Planting	16,062.50
First Weeding	41,656.25
Amount on Mbeya Fertilizer (0.25 bags)	8,000.00
Amount on (159kgs) of fertilizer(MK)	275,437.50
Fertilizer Application	16,125.00
2nd Weeding(Banding)	47,750.00
Fertilizer Application	16,125.00
Harvesting	18,812.50
Stooking	12,812.50
Shelling	16,625.00
Total Cost (MK)/Acre	574,662.50
Total Cost (MK)/Ha	1,436,656.25
Total Cost (USD)/Ha	**845.09**
Total Yield(kgs)/Acre	934.13
Gross Income per Acre (MK)	747,300.00
Gross Margins per Acre (MK)	172,637.50
Gross Margins per Acre (USD)	**101.55**
Total Yield (Ha)	2,335.31
Gross Income per (Ha) (MK)	1,868,250.00
Gross Margins per(Ha) (MK)	431,593.75
Gross Margins per Ha (USD)	**253.88**

DBF	
Land Size(ha)	0.40
Land preparation(MK)	27,031.25
Bed Maintainance(MK)	10,520.83
Manure Making(MK)	29,890.89
Manure Application(MK)	30,625.16
Manure Transportation Cost	12,604.17
Seed(MK)	14,395.83
Planting	14,616.76
First Weeding	41,708.98
Amount on Mbeya Fertilizer (1.13 Bags	44,079.01
Amount on 91.31kgs) fertilizer (MK)	121,979.66
Fertilizer Application	13,508.56
2nd Weeding(Banding)	39,469.32
Fertilizer Application	17,154.39
Harvesting	22,737.60
Shelling	19,940.65
Total Cost (Acre)	460,263.06
Total Cost (ha)	1,150,657.64
Total Cost (USD)/Ha	**676.86**
Total Yield (Acre)	1,612.00
Gross Income (MK)/Acre	1,289,600.00
Gross Margins Per Acre (MK)	829,336.94
Gross Margins Per Acre (USD)	**487.85**
Total Yield (Ha)	4,030.00
Gross Income (MK)/Ha	3,224,000.00
Gross Margins Per Ha (MK)	2,073,342.36
Gross Margins Per Ha (USD)	**1,219.61**

There is very high demand on DBF from smallholder farmer representatives and extension officers from various districts, as well as from Estate Farmes and Pyxus, LUANAR, Toleza, Goodman. There is also demand from international Partners (Ghambia, Cotton Group). More than 30 000 farmers have been reached with the Deep Bed method by 2023.

Mr Isaac Monjo Chavula, Tiyeni, presented Tiyeni's recent success in mobilising funding from the Global Innovation Fund (GIF) to implement DBF in the Lunyangwa basin, a tributary to the Zambezi river in Malawi. This initiative started as a concept note developed by SIWI for TIARA that was used to approach donors. The GIF project has received funding for a first phase to establish the socio-economic and watershed benefits of DBF before a second phase of field implementation will start.

Tiyeni means "Let's Go!" in Chichewa, Malawi's most widely spoken language.

3.4. ZAMCOM (Zambezi Watercourse Commission)

Mr Gerald Mundondwa from the Zambezi Watercourse Commission (ZAMCOM) provided the background and context of the Statement of Intent by the ZAMCOM Council of Ministers on rainfed agriculture. In the statement the ZAMCOM Council Members stated that:

STATEMENT OF INTENT BY THE ZAMCOM COUNCIL OF MINISTERS 2024 1/3

They acknowledge that they are uniquely placed to channel finances to activities that promote enhanced rainfed agriculture, in parallel with long-term investments in irrigation.

They recognise the role played by smallholder farmers as Africa's Frontline Land and Water Managers and how their actions can improve water resources management and protect investments in water infrastructure.

They understand that there are many unaddressed rainfed agriculture financing opportunities in the Zambezi Watercourse which can be accessed relatively rapidly.

They will promote policies which support the attraction of multiple channels of finance to smallholder farmers for enhancing their agriculture practises and actively contribute to scaling up rainfed agriculture financing in the Zambezi Watercourse.

They are committed to extend resources to allow work towards tracking deployment of rainfed agriculture finance to improve the return on investment.

They are willing to work with institutional and public financiers seeking to deploy climate finance in the Zambezi Watercourse.

They will welcome the opportunity to share experiences and acquire knowledge of successful business strategies for integrating rainfed agriculture in country plans.

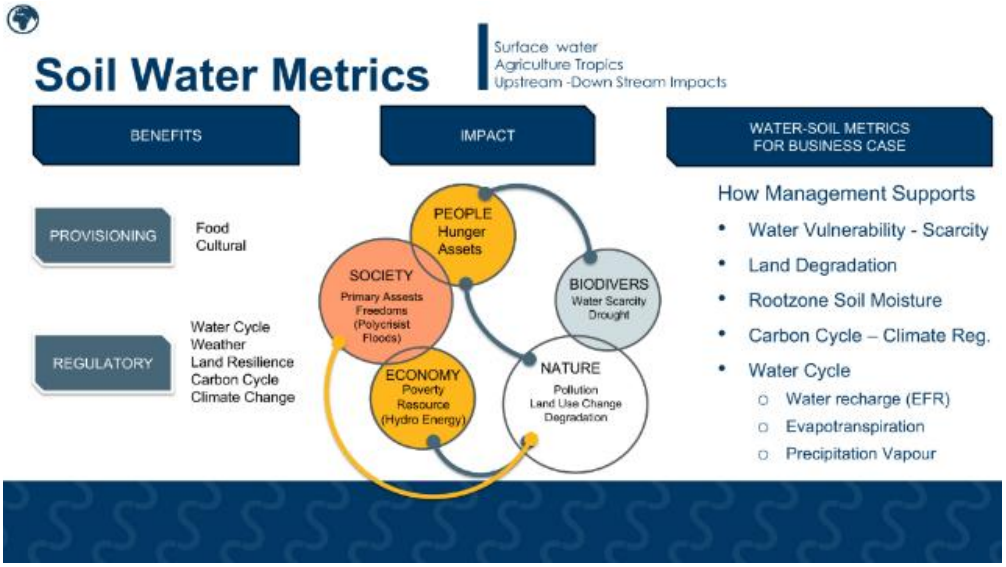
They are willing to promote water resources management / water conservation and rainwater harvesting as the region is migrating to small- and large-scale irrigation systems across the Zambezi region.

The statement is a result of TIARA's advocacy work to transform investments in enhanced rainfed agriculture and provides an entry point for leveraging political support and to reaching out to donors and investors.

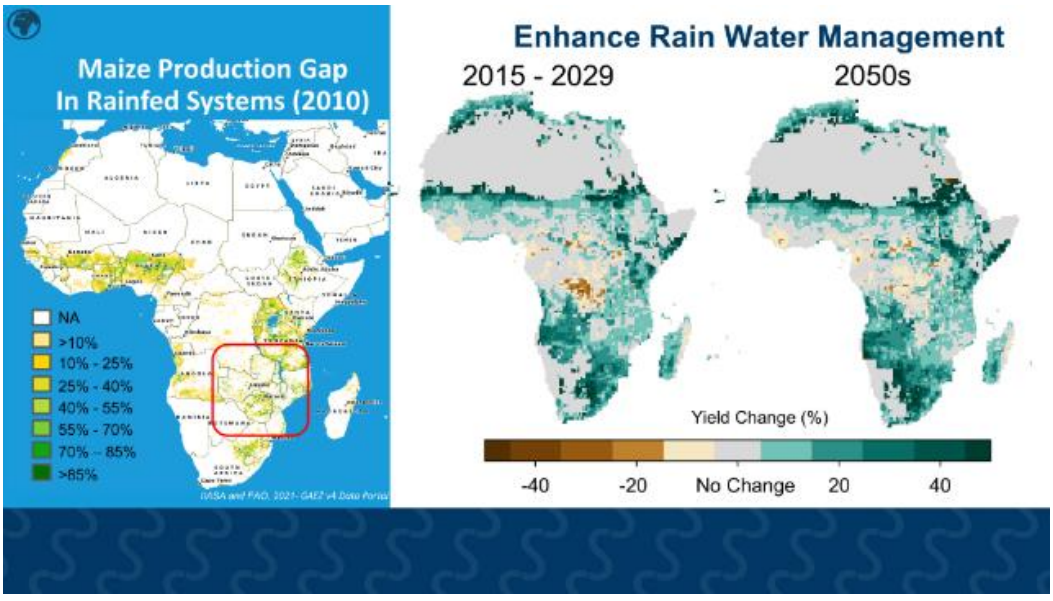
3.5. Progress with the business case for enhanced rainfed agriculture

Dr Maganizo Kruger Nyasulu, SIWI, provided a background of why it is so important to increase investments in enhanced rainfed agriculture, especially in Africa, where rainfed systems cover more than 96% of the land and serve more than 60% of the population. Rainfed systems in general have low productivity further exacerbated by climate change. There is also a huge invetments gap compared to irrigated agriculture and only 6% of public investments go to rainfed agriculture.

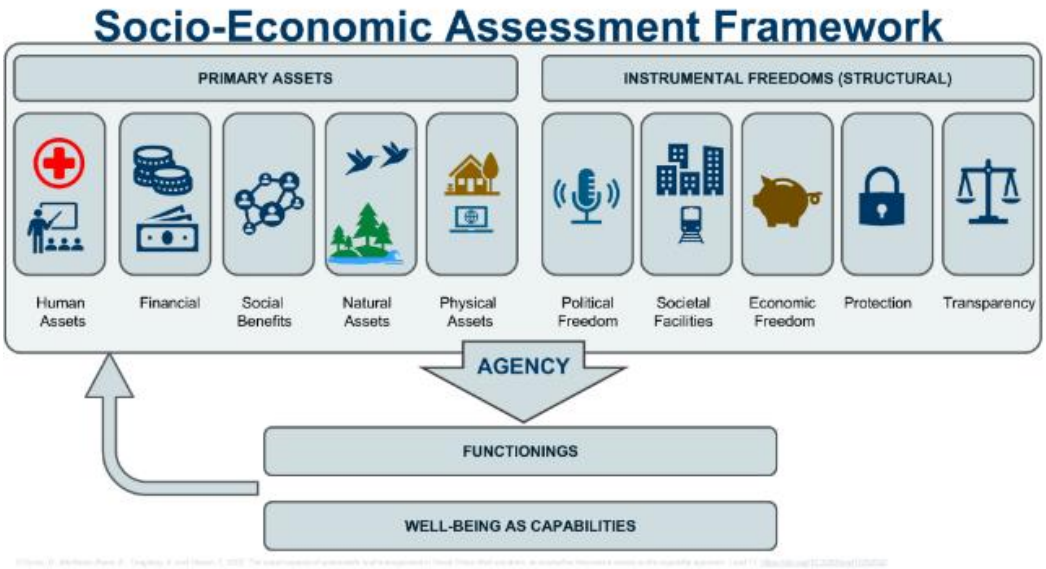
He also introduced TIARA's framework for the Triple-Bottom Line (TBL) approach to assess benefits to People, Planet and Profit that is developed to attract more investments in enhanced rainfed agriculture. The TBL framework stresses the benefits to soil and water management to Planet in terms of the water and carbon cycles, nutrient retention, reduction of sedimentation, and resilient ecosystems. It is thus important to idenify soil and water metrics that monitor all the watershed benefits, as well as ecosystem services.



To address the maize production gap in Africa, Dr Nyasulu's modelling using global vegetation and moisture cycling models shows that enhanced rainwater management can significant increase yields in the future.



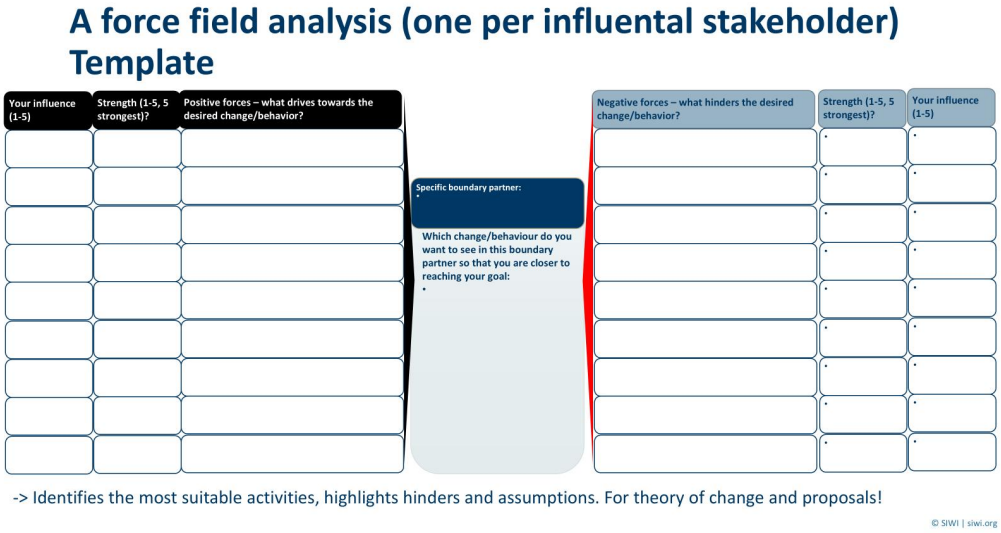
TIARA has also adopted a socio-economic assessment framework for the TBL that uses a capabilities approach and assesses different primary assessts and capitals, and instrumental freedoms that contribute to human well-being.



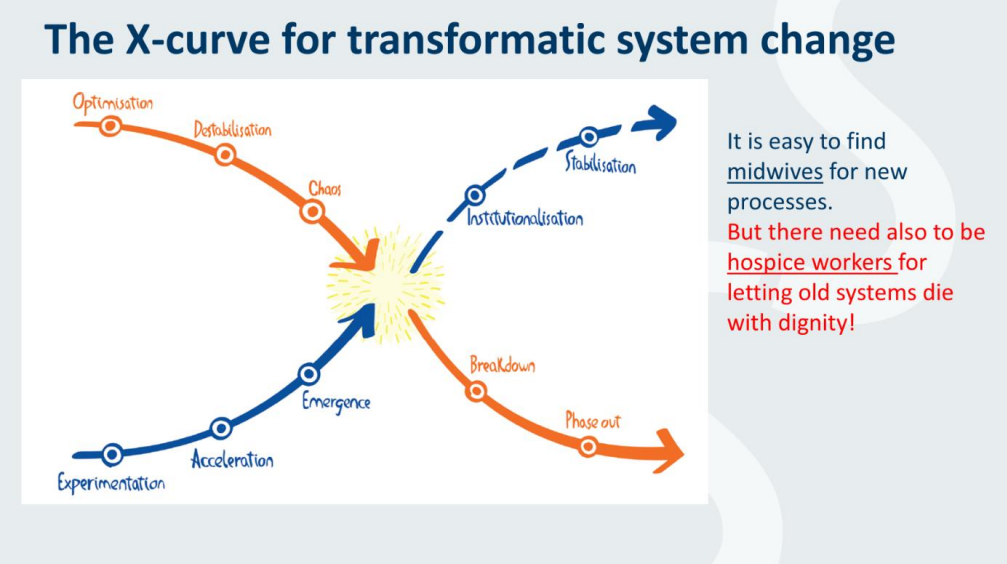
The business case for enhanced rainfed agriculture will be consolidated and assessed using the TBL approach, but some more field data is needed for the benefits to People which is planned to be collected in early 2025.

3.6. Stakeholder and Force-Field analyses

Mr. Stefan Heilscher, SIWI, presented the force-field method, and the participants could test the concept in a real-experience exercise. The Force-field analysis is a powerful tool for deciding which actions have the greatest chance for success and to contribute to change. It should be used after stakeholder analysis and with key stakeholders, also in a multistakeholder discussion.



After describing the desired outcomes contributing to the main goal, often a change in behavior, negative forces hindering this change, and the positive forces supporting this change are being identified. Awareness, resources, competence, partnerships, knowledge, laws, and political decisions are the most common forces for or against the desired change. Assigning scores to each force identifies how strong the force is. In the last step, the possibility to intervene through activities is being analysed. Through this, the best possible activities - those that promote change, either the strengthening the driving forces or the weakening the resisting forces - can be found and agreed upon. The force-field analysis thereby provides convincing arguments for chances of success and theory of change in a proposal to a donor. It also eases planning, monitoring and evaluation. In addition, the concept of the transformation X-curve was presented to the participants.



4. Field visits

The field visits were part of the planned activities during the Capacity Development and Training on Enhanced Rainfed Agriculture and Sustainable Landscape and Watershed Management in the Zambezi Basin for regional stakeholders.

The first field visit was to an area in the Central Region outside of Lilongwe. The sites visited included (1) Mr and Mrs Kapatuka Plot, (2) Mr and Mrs Aaron Gama Plot, (3) Piggery Project (Pass-on) (Kalulu EPA), (4) Magodi Group (Chiwamba EPA). The visit provided an opportunity for SIWI, CTDT, FACHIG and ZAMCOM Officials to have an appreciation of the Deep Bed Farming practice through interacting physically with farmers, government extension staff and Tiyeni Project implementation team. This was part of the activities during the training on the Landscape Approaches. The field visit provided the platform for farmers to express their views regarding the impact they have experienced in terms of soil and water conservation as well as improved household food and nutrition security. It also strengthened the technical capabilities and innovation of Tiyeni through sharing knowledge with colleagues from Zimbabwe on the best practices, social inclusion and opportunities available for upscaling the interventions.

The team led by Mr Isaac Chavula (Tiyeni Country Director) embarked on an excursion to Kalulu EPA (Extension Planning Area) and they were warmly welcomed by the Farmer Group at Mr. and Mrs Kapatuka plot in Mbwindi Village.

Farmers, participants and Tiyeni field officers at the Kalulu EPA (Stefan Heilscher, SIWI).

The Deep Bed Farming Technology: The Tiyeni Country Director, Mr Isaac Chavula welcomed the visitors and informed farmers of the purpose of the visit. He asserted that the Tiyeni Project and many other projects being implemented by different partners in the Zambezi Basin riparian communities are very crucial in sustainable conservation and utilization of soil and water resources in the region. Thus, he appealed to farmers to replicate the Deep Bed Farming practice at individual plots and have more follower farmers. To achieve sustainable landscape restoration and water resources management there is need for greater cooperation and multi-stakeholder participation among communities in the Zambezi Basin. Any mismanagement in one area has far-reaching impacts on other areas because there are no boundaries especially in water resources management.

The Tiyeni Field Officer (F.O) explained the basic principles of Deep Bed Farming which are:

- Breaking the hard pan
- Soil and water conservation
- Feeding the soil

Thereafter, the host farmers (Mr and Mrs Kapatuka) outlined their experiences and the benefits accruing from practicing DBF. Initially their group had 6 farmers in 2022 but now they are about 30 farmers. The main activities include, breaking the pan using hoes, construction of the contour marker ridges, making the beds along marker ridges, box ridges (kambewa) at an interval of 2m or 3m across furrows and raised foot paths. Farmers use markers for the measurements of length and width of the contour ridges, bed height, and furrow depth. They also apply manure (2-handfulls per planting station) and mixed with the soil and then peg planting stations. During the Cyclone Freddie

which devastated most areas in Malawi, farmers observed that fields that had deep-beds were not washed away compared to the conventional ploughed areas.

Mrs Kapatuka explains deep-bed-farming and its benefits at Kalulu EPA (Stefan Heilscher, SIWI).

With support from Tiyeni and government agricultural extension staff, farmers have practically learnt how to do crop rotation, establish crop diversity plots and add nutrients to the soil and water conservation measures. Some of the crops being grown are maize, beans, groundnuts, soy, cow peas and pumpkins.

According to the farmers, there are a multiplicity of benefits associated with the DBF innovation, and some include but are not limited to the following:

- Rainwater harvesting,
- Reduced soil erosion, increased infiltration leading to improved soil moisture, percolation and better recharge of groundwater.
- Interception by vegetation (including vetiver grass) reduce raindrop compaction of the soil facilitating more infiltration.
- Good crop establishment, left maize stover stumps help hold the soil intact,
- Mulching helps in nutrient enrichment of the soil and storage of soil moisture and deters wind erosion.
- Gully reclamation

Mr and Mrs Kapatuka expressed satisfaction with the way their lives have been transformed through adoption of the technology. Before implementing the DBF practice they used to harvest on average **10 bags** of maize but this has greatly increased to **40 bags.** Remarkably, the couple has managed to build a house from the proceeds of selling surplus produce. In addition, they have diversified livelihoods into piggery project and slowly they are transitioning from subsistence to commercial farming. Additional income has enabled the farmers to pay for children's school fees, hire a tractor for land preparation and buy inputs like Mbeya fertilizer.

The delegation observed that the practice (DBF) is quite labour intensive and suggestions were postulated towards the possibility of utilizing mechanical means to prepare the land such as use of two-wheel tractors, earth augers, and rotavators. This will go a long way in addressing labour challenges especially to women and youth who are the ones mostly affected (more than 60% of labour requirements in farming is provided by women) with manual operations.

Thereafter, the team visited Mr and Mrs Aaron Gama to learn more about how manure is prepared in pits and the procedure for adding manure to the soil. Interestingly, the farmers learnt about deep bedding after attending a field day at the Kapatukas' plot and decided to learn more about the practice. Now they are the lead farmers in training others on the establishment of deep beds and feeding of the soil. The couple demonstrated adding of two handfuls of manure onto the basins and mixing with soil. The manure is prepared from animal dung and crop residues in compost pits (2 open pits at the homestead) by mixing with water and it takes about 3 months for the mixture to fully decompose. Some of the neighboring farmers have also seen the positive benefits of Deep Bed Farming and have applied the practice on their individual plots through assistance by the lead farmers.

Manure production and application by Mr and Mrs Aaron Gama (Stefan Heilscher, SIWI).

Afterwards, the delegation proceeded to the piggery project which is a pass-on scheme with support from Tiyeni. Here, the group of farmers are diversifying livelihoods and building resilience to economic shocks associated with reliance on rainfed farming by rearing pigs (both local landraces and improved breeds). The piggery project is directly linked to farming in that, profits from surplus produce is used to buy the stock feeds while manure from the pigs is mixed with chemical fertilizer to produce Mbeya Fertilizer which is then applied onto the field thereby revitalizing the soil nutrients. Again, women are active in feeding, and watering the pigs, cleaning the pigstay as well as crushing/mixing the manure for the production of Mbeya fertilizer.

Lastly, the team visited the Chiwamba EPA, and were hosted by the Magodi Group. The group is made up of 10 members (3 males, 7 females). This is a new group which has recently adopted the DBF approach. One of the questions which the group was asked is why Deep Bed Farming? In response, one member from the group said they learnt about the technology during field days and from other farmers who told them about the benefits. The Agriculture Extension staff in the area linked the farmers to Tiyeni who then provided the technical support.

The place is ideal for DBF because of the undulating terrain coupled with steep slopes. Generally, the landscape has been badly affected by rampant deforestation and extensive livestock rearing resulting in bare ground and massive land degradation. There is urgent need to restore the degraded landscape by implementing the catchment/watershed approach which is participatory and multi-sectoral. Collaboration between Tiyeni and government departments responsible for the climate,

environment and forests, farmers and local authorities as well as the judiciary is critical to formulate Local Environmental Action plans (LEAP) which will guide the processes of reforestation and soil conservation works. More efforts should be channeled towards raising awareness in schools, churches and villages gatherings about the dangers of deforestation and amplifying the voices of farmers so that they get financial and technical support to construct conservation works around the catchment. This could be through government supported initiatives like the 'food for work' initiative and incentives for reforestation. Water conservation works such as weir dams can be designed and constructed to regulate run-off while helping the community to easily access water for establishing nutrition gardens. GIS and Remote Sensed data could also aid in modelling the potential hazards and provision of scientific data which is necessary in land-use planning.

Deforestation around Chiwamba EPA (Stefan Heilscher, SIWI).

The second field visit was to Eswazini EPA in the Northern Region west of Mzuzu. The sites visited included (1) Wuyile Farmer Field School and (2) Farmer practicing Deep Bed Farming – K Zuma. The rationale for the exercise was based on field visit was held using participatory approaches which included group discussions, question and answer, discovery learning and observation.

The delegation set off early in the morning to Mzuzu and arrived at Tiyeni Offices for familiarization. While at the offices, the team was briefed that Tiyeni Organisation was founded by Mr John M Crossley and it mainly focused on Soil and Water Conservation Agriculture. Mr Crossley, is retired and lives in the United Kingdom. From the Tiyeni Offices we proceeded to Eswazini EPA which is one of the 13 EPAs in Mzimba. Eswazini has 7 sections. We were welcomed by Agriculture Extension Development Coordinator (AEDC), Mr MacDonald Mfune. Mr Mfune expressed gratitude to Tiyeni for complementing government programmes including ensuring food security while promoting

conservation and sustainable utilization of soil and water. He outlined the main agricultural activities in the area and the cordial relationship with Tiyeni According to the ADC, the concept of deep bed farming is cascaded through various activities such as field days and establishment of demonstration plots. As a result, the division has benefitted from inputs provision by SeedCo for the establishment of 3 demonstration plots.

SITE 1. Wiyule Farmer Field School

Wiyule FFS started practising DBF in 2022 and has a registered membership of 55 farmers (27 females, 28 males). Happy Phiri the Lead Farmer of the group, gave a detailed account of the activities, including challenges being faced. The plots are designed on a 0.8 Ha field and the main crops grown are maize, soy and beans. Tiyeni assisted the group with the provision of a tractor to till the land. One of the notable achievements so far is the increased production of maize. Prior to 2022 (before adopting to DBF) the farmers would harvest on average 43 bags but in the first season they managed to harvest 63 bags. However, in 2023/24 Season there was a decline in harvest to 33 bags mainly as a result of pest and diseases, and erratic rains. In this regard, the families of households engaged in DBF are now food secure, and have diversified livelihoods. The government of Malawi fully support deep bed farming as reflected by the close cooperation between Tiyeni staff and government extension officers. Women are actively involved in deep bed farming activities such as breaking the hard pan, gathering of mulch, making of box ridges, and planting.

Wiyuyu Farmer Field School (Noble Zvirevo, CTDT).

Mr Zuma in the deep bed plot explaining the land preparation process. (L, Noble Zvirevo, CTDT)
A deep-bed trench above the deep slope (R, Stefan Heilscher, SIWI).

A solar-powered tractor at the Tiyeni office in Mzuzu as a tool to ease the threshold of initial hard labour for Deep Bed Farming (Stefan Heilscher, SIWI).

5. Initial learnings and outcomes

As the evaluation of the TIARA Capacity Exchange in Malawi clearly shows (see annex 3), the event was much appreciated by the participants. Interaction during a week together led to strengthened collaboration, offers for support, clarity on the advantages of the enhanced rainfed agriculture practices implemented in the Zambezi region, as well as detailed ideas for next steps. Tiyeni and FACHIG started discussing the possibility of a combined DBF-Pfumvudza concept, that could provide improved food security to farmers against droughts and erratic rains. Mr. Mundondwa from ZAMCOM was after the field visits very impressed by the effectiveness of the DBF methods, and promised to advocate for enhanced rainfed agriculture and landscape management in the Zambezi region.

Participants discussed the similiarities and differences between Malawi and Zimbabwe, and noted, that the much lower literacy rate in Malawi probably is one of the factors hindering faster uptake of DBF and other improved practices. Similar to the support of the Pfumvudza pothole technique by the Zimbabwe government, DBF also needs to be supported by governments in the region. The need for more investments was clearly noted, but also documenting the effects of enhanced rainfed agriculture. Most notably, a farmer near Lilongwe transited from subsistence farming into nearly commercial farming. The need to reduce cumbersome labour in the DBF was highlighted by many participants.

Reflections, observations & additional information as citations from the Cap ex participants:
• *It is a couple managing the fields and practicing Deep Bed Farming – I would like to hear the input of the farmer's wife (Evelyne, FACHIG)* • *The third plot showed terrible degradation, the landscape was denuded, almost desert like. Already very serious soil erosion is visible (Anna, Siwi)* • *The river down in the valley used to be perennial, and the hills were covered in forest some 10 years ago (Isaac, Tiyeni)* • *The landscape does provide very little shade, the farmers crowd in the shadows of the few trees remaining (Stefan, SIWI)* • *If livestock eats the crop residues that protect the soil, why aren't there fences or bylaws preventing livestock from entering farmers' fields? (Anna, SIWI)* • *If the farmers at the first site have become prosperous through Deep-Bed Farming, moving from subsistence to nearly commercial farming, why aren't more farmers in the vicinity copying the approach? (Stefan, SIWI)* • *Demand for fuelwood, and charcoal from city dwellers and unsustainable cultivation practices contributed to the formation of desert-like condition of the area (Isaac, Tiyeni, at second site).*

6. Next steps

After an intensive week with a mix of training sessions on the landscape approach, management of green water and field visits to demonstration farmers and other adopters of Deep Bed Farming in degraded landscapes, the TIARA partners, including CTDT, FACHIG, Tiyeni, SIWI and ZAMCOM agreed on the following:

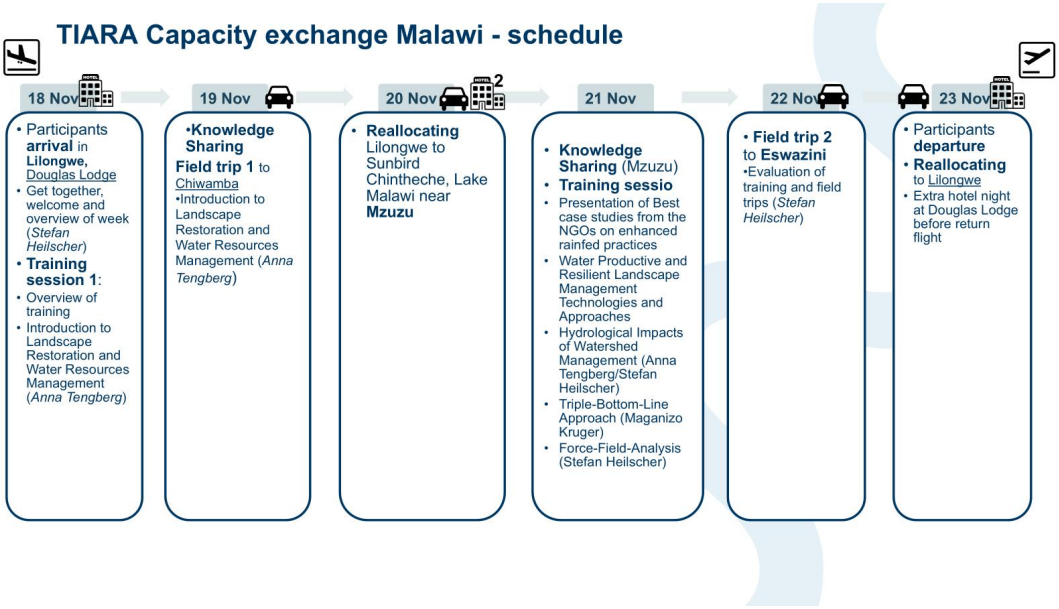
- SIWI will consolidate the information on the business case for enhanced rainfed agriculture in the Zambezi region in two papers:
    - TBL assessment framework for TIARA – lead by SIWI's PostDoc Maganizo Kruger Nyasulu with co-authors from FACHIG, CTDO and Tiyeni

    - Metric for monitoring and assessing watershed benefits of enhanced rainfed agriculture: the example of the Lunyangwa basin, Malawi – Maganizo, Tiyeni and others as relevant.
- Continue the efforts to access finance through the TIARA innitiative.
    - Following the success of mobilising funding from the Global Innovation Fund (GIF) to Tiyeni for Deep Bed Farming, the partners will develop short concept notes and send to SIWI for review and further development.
    - SIWI will continue to look for funding opportunities, such as the GEF, climate finance, bilateral funding, etc. to scale up enhanced rainfed agriculture in the Zambezi region.
- Continue the knowledge exchange and capacity development in the Zambezi region under TIARA:
    - Explore opportunities for the NGOs to visit each other during the cropping season (e.g. February-March) to promote learning and south-south technology transfer
    - Start planning for a larger Knowledge Exchange meeting in Zimbabwe in a years time, with a possible focus on Forest Landscape Restoration (FLR) where SIWI can share its work on water-smart forest landscape restoration (W-FLR) and LoCoFoRest[1]. The NGOs can share more experiences on implementing enhanced rainfed practices at the watershed and landscape scale and approaches to scaling up. The meeting could also have a working session on revewing and refining new concepts for funding.
- SIWI to bring up the issue of a second phase with donors, such as Sida and Leopold Bachmann Foundation (LBF). As SIWI no longer has an office in South Africa, ZAMCOM could take on a stronger role in regional coordination and knowledge sharing in a possible next phase, while SIWI still supports resource mobilisation and link up with new knowledge and research on green water management.
- Tiyeni expressed interest in having an event at the next World Water Week (WWW) presenting their new project funded by the GIF to scale up Deep Bed Farming in the Lunyangwa basin. SIWI will explore the opportunities to organise a WWW event on innovative funding to watershed management together with the TIARA partnership, including Tiyeni and ZAMCOM and also look for other interested partners.

[1] https://www.skogsstyrelsen.se/en/locoforest

7. Annexes:

7.1. Workshop programme



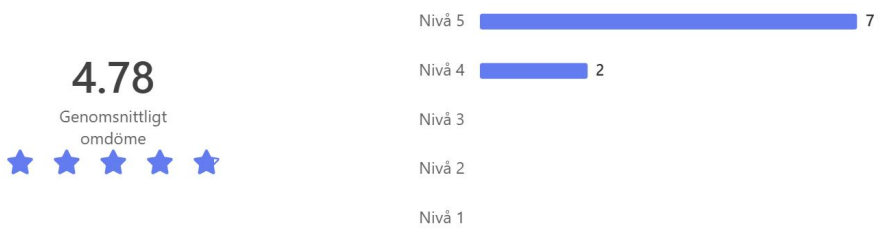
7.2. 7.2. List of participants

From:

- **TIYENI (Malawi):**
  - Isaac Monjo Chavula
  - France Gondwe
  - Godfrey Kumwenda
  - Chance Mwenitete
- **C.D.T.O (Zimbabwe):**
  - Edson Dhlakama
  - Noble Zvivero
- **FACHIG (Zimbabwe):**
  - Thomas Muputesi
  - Runyararo Evelyn Motsi
- **ZAMCOM (Zimbabwe):**
  - Gerald Mundondwa
- **SIWI (Sweden):**
  - Anna Tengberg
  - Stefan Heilscher
  - Maganizo Kruger (online video)

7.3. Evaluation of workshop and field trip

1. How satisfied overall were you with the capacity exchange in Malawi?



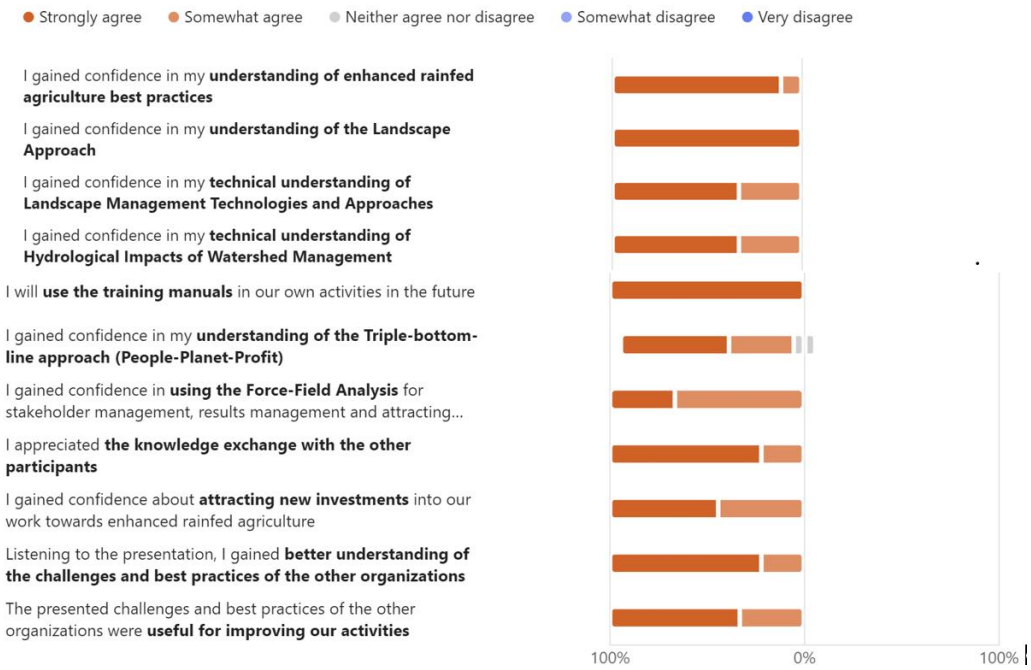
2. Please indicate how strongly you agree or disagree with each statement on the **logistics of the event**!

3. From a **logistics** perspective, what could be **improved for future events**?

- Each activity on the itinerary should have allocated time for example travelling- 1hr, interaction with farmers- 30mins, refuelling vehicles-15 minutes and so on 2. Visibility- of the donor and partners 3. Provision of refreshments for farmers
- Location of field sites to be near each other so that time is not wasted in traveling
- Current arrangement was adequate
- Each activity on the itinerary should have allocated time for example travelling- 1hr, interaction with farmers- 30mins, refuelling vehicles-15 minutes and so on 2. Visibility- of the donor and partners 3. Provision of refreshments for farmers
- more time allocated for discussions with farmers
- Reducing the element of full board -Increase per-diem.
- Distances Between Project sites

- It was successfully done.
- Add per diem to attendees and add more days

4. Please indicate how strongly you agree or disagree with each statement on the **knowledge exchange**.



5. What was the **best part of the presentations** and why?

- Different techniques used in water conservation and how NGOs are ensuring farmers have good harvest
- Calculations to demonstrate the benefits of the technologies a.g. DBF & Pfumbvudza
- Water and Landscape Governance - how to integrate water resources management and landscape approaches (this is a contested issue)
- The field visits provided a lot of learning on the deep bed farming method
- Force-field Analysis. The practical part was so enlightening.
- Triple Bottom line approach-New concept to me
- All the presentations were good and brought possible solutions to the challenges rain fed agriculture is facing.
- what I learnt about new ways of funding opportunities

6. Do you have **suggestions for improving future presentation events**?

- If time allows, more group work
- No
- Videos should be used more
- Consider inviting experts in other disciplines such a s forestry, land-use planning, civil engineering, political science, gender, policy and advocacy.
- More time needed for discussions with farmers
- Room conditions should be comfortable
- Consider giving staff Dinner allowances

- Possibly bringing in more impactful stories from video documentaries.
- Allocate more time (days) on presentations

7. Which **subjects** do you want to learn more about in **future knowledge exchanges?**
   - Best practices from other regions/continents than just from the Zambezi water course - if applicable. Proposal writing examples
   - GIS in collection of data
   - Formulation of sub-regional project proposals for reparian states. There should a day for the task because we are looking for funding.
   - Irrigation, water harvesting technologies, renewable energy, regenerative agriculture, transboundary natural resources management, how to access financing for policy and advocacy on water governance
   - Land scape approaches, Hydrological impacts of Watershed Management
   - Landscape approach
   - Triple-Bottom-line Approach and Force-Field Analysis
   - Technical understanding of landscape management Technologies and approaches

8. Please indicate how strongly you agree or disagree with each statement on **building relationships with other part icipants**.

9. What was the **best part** of the **knowledge exchange** and why?
   - The field trips really showed why landscape management and enhanced rainfed agriculture are needed
   - Sharing of best practices and how to produce best results
   - Field visit because that provides practical situations for learning and interaction with farmers.
   - Meeting and engaging with the farmers were especially enriching. Hearing their stories, challenges and achievements offered invaluable perspective and reinforced the importance of our work. Field observations clearly proved the need for collaborative and multi-stakeholder participation to reverse environmental degradation. Having Anna and Stefan to share ideas and experiences from Europe and other parts of the world added so much depth to the experience.
   - Field visits and theoretical presentations
   - Sharing field presentation, this because it helped us understand the various roles and activities of our partner organisation eg SIWI or ZAMCOM
   - Presentations and field trips
   - How to develop business cases. It will help to enhance the adoption of the rainfed practices if well developed.
   - During presentations, because I learnt more new things

10. Do you have suggestions for improving future **knowledge exchanges?**
    - Time to work together to develop solutions

- Exchange to be done during the season when crops are still in the field
- Period was not enough. Of course I am aware of limiting factors such as resources.
- Field Practical and demonstration of the technologies.
- Technology transfer and appropriate training
- Capacity Development and Internship Programmes for the implementors.
- Visits should be done during the growing season to see the impact of innovations
- Regular meetings
- Conducting exchange visits while crops are in the fields to allow participants to appreciate the impact of the technologies on rain-fed agriculture. Additionally, involving farmers in one of the exchange visits to enhance farmer-to-farmer knowledge sharing
- Add more days

11. Any additional **comments?**
    - Thanks to SIWI and Tiyeni
    - The learning experience was wonderfully beneficial.
    - Partners to develop joint concepts notes for wider dissemination to potential funders.
    - Farmer-farmer exchange visit
    - Well done TIARA for the exchange learning let's continue interacting
    - Thank you for the good program