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Assessing the adaptation relevance of soil protection and rehabilitation

A participatory multi-stakeholder approach for monitoring and evaluation

Implemented by

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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Foreword

Climate change is one of the defining challenges of our time. Its consequences have already become a dire reality for farmers around the world and threaten to erode food security in many of our partner countries. Prolonged droughts, more erratic or heavy rainfalls are just some of the challenges for agricultural production and food systems. Smallholder farmers are really on the forefront of this; given their resource constraints, they are particularly vulnerable to the adverse impacts of climate change.

Soils are a crucial piece in the fight against climate change. On one hand, they are the second largest carbon sink after the oceans. Better soil management, including agroecological practices, offers the potential to increase carbon storage in agricultural soils. On the other hand, healthy and fertile soils are the foundation for resilient farming systems. Soil protection also counters further land degradation caused by climate change. Hence, soil protection and rehabilitation (SPR) technologies often offer several benefits: mitigation and adaptation benefits, while also matching farmers' interests to increase and secure their yields.

Since 2015, more than 1.4 Mio people in six African countries and India have benefited from SPR with the support of the Global Programme Soil Protection and Rehabilitation for Food Security (ProSoil). The Programme promotes SPR at large scale to improve food security and resilience against the effects of climate change.

Understanding and evaluating the effectiveness of these SPR technologies regarding the specific climate risks for small-holder farmers in the project regions has increasingly gained in importance. It enables us to provide targeted support and better advisories to farmers, inform public extension services and advice our partner ministries on sectoral strategies for addressing the impacts of climate change.

This guide presents a systematic approach to identify relevant climatic risks and evaluate the effectiveness of SPR technologies regarding these risks as well as the local feasibility of these technologies. The presented methodology strikes a balance between rigor and practicability. The multistakeholder approach and the participatory elements offer opportunities for networking and sensitization of local experts, policy makers, extension officers and most important - farmers themselves. First experiences demonstrate that opening this space allows for fruitful and empowering exchanges.

Let's harness the potential of soil protection and rehabilitation for climate resilience.

Dr. Anneke Trux
Head of Programme
Global Programme Soil Protection and Rehabilitation for Food Security (ProSoil)

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List of abbreviations

BMZ	Federal Ministry for Economic Cooperation and Development
CID	Climatic Impact Driver
Effectiveness Analysis	Analysis of climate adaptation effectiveness, technical assessment of certain technologies against specific climate risks
Feasibility Analysis	Analysis of socio-economic feasibility, evaluation of the local feasibility of certain technologies using social and economic indicators
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IPCC	The Intergovernmental Panel on Climate Change
M&E	Monitoring and Evaluation
PIK	Potsdam Institute for Climate Impact Research
ProSoil	GIZ Global Programme Soil Protection and Rehabilitation for Food Security
RCP	Representative Concentration Pathway
SPR	Soil Protection and Rehabilitation
SSP	Shared Socioeconomic Pathway

①

1 Introduction

Agricultural production in many regions of the world is directly and indirectly impacted by climate change, in the worst case resulting in acute food insecurity (IPCC, 2022). The livelihoods of smallholder farmers and agro-pastoralists are particularly sensitive to climate change. They also face a multitude of barriers for effective adaptation, e.g., limited access to finance as well as lack of alternative income sources and are thus particularly vulnerable (GCA, 2019).

Many of the climate risks that smallholder farmers and agro-pastoralists in the tropics and sub-tropics face manifest themselves on the nexus between soils and water. These include crop damages caused by drought or flooding or the loss of productive topsoil resulting from water erosion driven by increased rainfall intensity. In addition, progressing land degradation further increases the vulnerability to adverse climate impacts (IPCC, 2022).

Soil protection and rehabilitation (SPR) plays a key role for climate change adaptation in this context. It focuses on maintaining and improving soils as a productive resource preventing and reversing land degradation. On one side it thus halts the further increase of vulnerability through further degradation, on the other side it improves natural capital and ecosystem services and ultimately the adaptive capacity of rural households.

Soil fertility, soil functioning and productivity are associated with soil organic carbon (SOC) (UBA, 2016). Many SPR practices focus on increasing the content of organic material in soils. Organic matter improves soil water infiltration and retention buffering crops against damages from flooding and water shortages. In addition, SOC enhances the function of soils as a carbon sink contributing to climate change mitigation (UBA, 2016). Soil and water conservation is another key element in SPR, which i.e., reduces the direct impacts from heavy rainfall events by reducing water erosion.

Adaptation Monitoring and Evaluation (M&E) is important to leverage SPR for enhanced climate change adaptation as it makes its impacts visible and provides feedback for learning and adjustments. Evidence is also important for accountability and thus a condition for adaptation finance. But adaptation M&E is also challenging. Adaptation is context specific: an effective adaptation action needs to respond to the specific climate risks and must be suitable to the local conditions. There is no one size fits all solution.

This guidebook enables its user to implement a participatory adaptation M&E approach. It puts an emphasis on discovering the climate risk context and evaluating the adaptation effects of SPR by drawing from the knowledge and experience of a wide range of stakeholders. It is primary geared towards rural development projects, who want to optimize their effectiveness regarding climate change adaptation, develop policy advice and recommendations for using

SPR in the context of climate change adaptation and develop robust adaptation impact chains. This more qualitative assessment can easily be combined with additional data, e.g. on adoption rates of SPR practices to harness quantitative conclusions, such as the number of households applying adaptation effective practices.

The guidebook has been developed by Global Programme *Soil Protection and Rehabilitation for Food Security (ProSoil)* implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). ProSoil is used throughout as an example. Nevertheless, the approach and criteria can easily be adapted to the context of other agricultural development projects.

1.1 Objective of Adaptation M&E Approach

The aim of the adaptation monitoring and evaluation (M&E) is to create a system that is as comprehensive and universally applicable as possible and that can be used to not only record adaptation effects and the local feasibility of specific technologies, but also to compare technologies and their impacts between countries with the overall goal to identify best practices and share experiences.

The approach consists of two parts: Analysis of climate adaptation effectiveness (Effectiveness Analysis) and Analysis of socio-economic feasibility (Feasibility Analysis). While the Effectiveness Analysis assesses the adaptation effectiveness of technologies in response to specific climate risks (which will be also analyzed as part of this analysis), the Feasibility Analysis evaluates the local feasibility of technologies with social and economic indicators. the Effectiveness Analysis is conducted by local experts and scientist in the field of adaptation in agriculture, environment etc. and the Feasibility Analysis is conducted by actors implementing field activities including farmers themselves and representatives from extension services. In the Analyses every technology is assigned a score on how relevant it is to climate change adaptation and how feasible the implementation is on local level. The adaptation M&E is a management tool that helps to identify barriers in implementation of technologies. Combined with more quantitative figures such as adoption or application rates, the assessment allows to derive conclusions, e.g. on the number of households benefiting from the application of technology packages relevant for adaptation in the specific context.

1.2 Objectives and content of this Manual

The manual provides guidance for implementing the adaptation M&E for both analyses and offers tools and blueprints for important process steps. It will first explain important terms as a prerequisite for the approach (Chapter 2 – Glossary), which is followed by an elaboration of climate impact driver assessments, which were undertaken by the Potsdam Institute for Climate Impact Research (PIK) as part of the project (Chapter 3 – Assessment of climatic impact drivers). The framework, terms, and indicators, on which both analyses are built are described in Chapter 4 (Monitoring & Evaluation framework). The fifth chapter (Adaptation effectiveness and local feasibility of relevant SPR technologies) is dedicated to the practical implementation of both analyses and explains methods and the individual process steps. By means of examples, it guides the responsible persons step by step through the assessment.

Climate monitoring within ProSoil

The Global Programme Soil Protection and Rehabilitation for Food Security (*ProSoil*) is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) in seven partner countries: Benin, Burkina Faso, Ethiopia, India, Kenya, Madagascar, and Tunisia. The objective is that approaches to promote lasting soil protection and rehabilitation are implemented at scale and shared in selected partner countries.

The programme works in coordination with the relevant ministries in the partner countries. It promotes sustainable land use, based in particular on the involvement of the affected smallholders. They are the primary target group and receive advice on agroecological practices. These practices help in building up organic matter (humus), as well as in enhancing soil fertility and capacity to absorb water. The immediate advantage is rising crop yields. This improves the food situation of smallholders and creates new sources of income.

Besides small farming businesses and the relevant state institutions, other players from the academic and research communities, the private sector and civil society, as well as from other state bodies, engage in these measures.

In addition, the programme advises the partner governments on how to improve the political and institutional framework. The governments need to create incentives for farmers to use land in a more sustainable way. To support the sharing of knowledge and experience, the programme organises national and international fora where the relevant stakeholders can meet.

Since 2020 ProSoil has been working increasingly on the intersection of soil and climate protection with the aim to optimize the climate impacts of SPR. As part of this effort a climate monitoring system is operationalized throughout the programme in all partner countries covering both mitigation and adaptation.

The adaptation monitoring has the goal to assess the climate adaptation relevance of the SPR technologies promoted by ProSoil. The conceptualization and implementation of this task was awarded externally and is led by the scientific and Berlin-based consultancy HFFA Research. The mission runs from December 2020 to September 2022. In 2021 and 2022 the adaptation monitoring is conducted for the first time and is foreseen to be repeated in 2024 or 2025. The mitigation monitoring evaluates the effect of individual CO_2-mitigating measures and is led by UNIQUE Forestry and Land Use.

In conjunction with this guidebook an Excel tool is published which can be used for the overall process – the SPR adaptation M&E tool. The tool calculates a range of scores based on the results and structures the process. It contains all the necessary matrices and lists to implement the approach. The tables which are displayed throughout this guide have been adapted from the tool.

2

② Glossary

The scientific and conceptual basis for the climate related assessment described in this manual is the latest IPCC assessment report from September 2021 (IPCC, 2021). In this revised definition, **climate risk** refers to the potential for adverse consequences for human or ecological systems recognising the diversity of values and objectives associated with such systems. Relevant adverse consequences are those on lives, livelihoods, health and wellbeing, economic, social, and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species (Figure 1)

Climate risks result from dynamic interactions between climate-related hazards and/or climatic impact drivers with the exposure and vulnerability of the affected human or ecological system to hazards.

Hazards:

The term hazard refers to a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (IPCC, 2021). In any case, it represents an external climate signal, which cannot be influenced by the adaptation action (IPCC, 2018).

Climatic impact drivers:

With climatic impact drivers (CID) IPCC (2021) introduces a new terminology to express physical climate system conditions (e.g., means, extremes, events). Depending on the respective system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each (IPCC, 2021).

IPCC (2021) uses the term CIDs to describe changes in physical systems rather than 'hazards', because the term hazard already assumes an adverse consequence. The terminology of 'climatic impact-driver' therefore allows to provide a more value-neutral characterisation of climatic changes that may be relevant for understanding potential impacts, without pre-judging whether specific climatic changes necessarily lead to adverse consequences, as some could also result in beneficial outcomes depending on the specific system and associated values. Although CIDs can lead to adverse or beneficial outcomes, focus is given to CIDs connected to hazards, and hence inform risk.

Vulnerability:

Vulnerability is the propensity or predisposition to be adversely affected. It encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (IPCC, 2021). Vulnerability has two relevant elements: **Sensitivity** is determined by those factors that directly affect the consequences of a hazard. It includes physical attributes of a system (e.g., building material of houses, type of soil on agriculture fields), social, economic, and cultural attributes (e.g., age structure, income structure). **Capacity** refers to the ability of societies and communities to prepare for and respond to current and future climate impacts (IPCC, 2018).

Exposure:
Exposure is the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected by a hazard (IPCC, 2021).

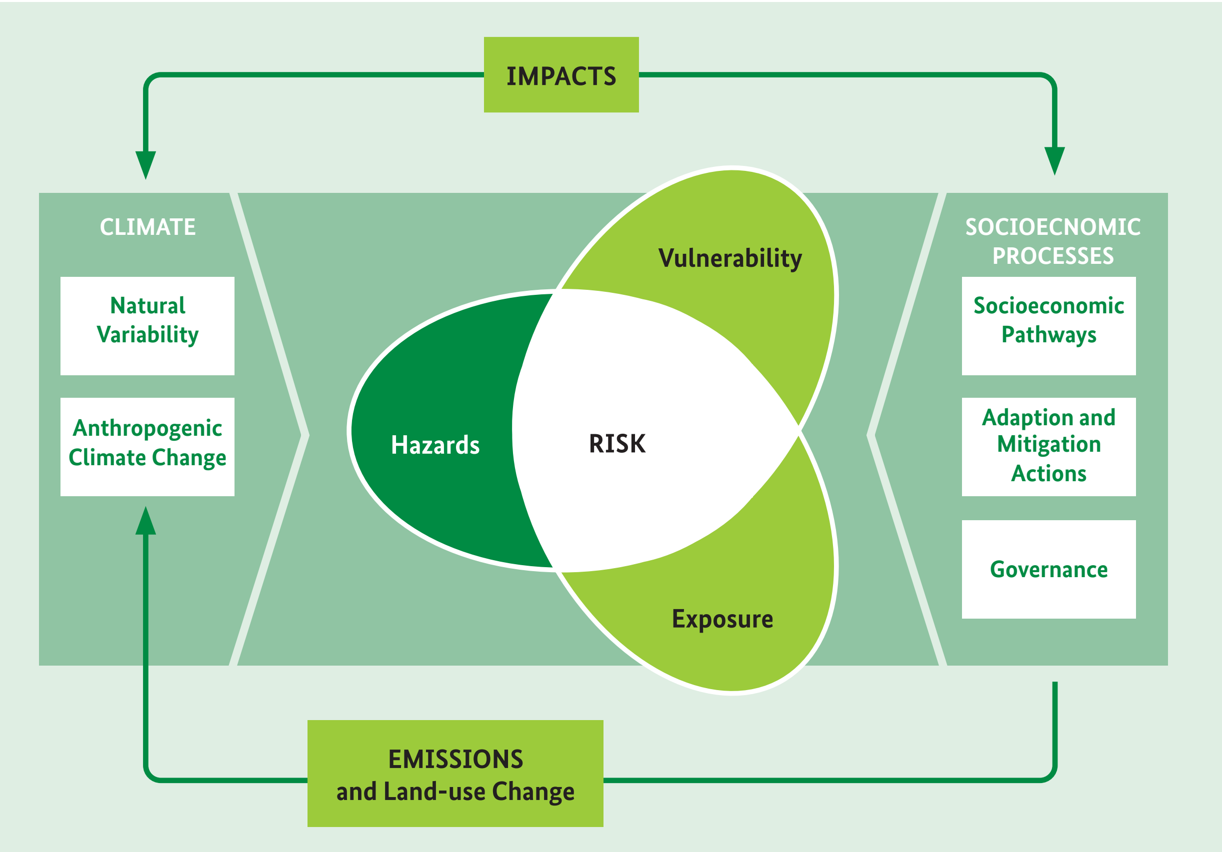

Figure 1: Climate Risk Concept, source: IPCC (2014).

3

3 Assessment of Climatic Impact Drivers

3.1 Introduction

In the following section selected CIDs are explained and presented which support identifying climate risks in the intervention zones of agricultural development projects. For an easier usage of the manual, we also explain the assumptions behind the modelling, how to read and interpret common figures and how the drivers are defined. Hence, this section shall facilitate the interpretation and usage of the regional modelling results.

The assessments of the CIDs in the ProSoil intervention areas in Benin, Burkina Faso, Ethiopia, India, Kenya, Madagascar and Tunisia, which were conducted during HFFA Research's mission to conceptualize the climate change adaptation monitoring, can be downloaded.[1] Similar publications for more sub-Saharan countries are also available through the AGRICA Project.[2]

The assessments present the modelled CIDs in figures that show the differences of future projections to historic conditions represented by the year 2000. Projected changes are shown for 2030, 2050 and 2080[3]. We show the model median of an ensemble of ten climate models, as well as the range of the full ensemble, where applicable.[4]

Further, the projections follow two trajectories which show possible outcomes considering the current scientific knowledge on climate change. These are defined by two pathway categories. The first category is called Shared Socioeconomic Pathway (SSP). The scenarios of this category have distinct assumptions on the future economic and social development of all countries. The second category is Representative Concentration Pathway (RCP). Different RCP scenarios have distinct assumptions on the future concentration of greenhouse gas emissions, which influence the climate. These two categories are closely linked. For example, strong mitigation policies and actions can reduce the greenhouse gas emissions. To portray a broad spectrum, we show two trajectories. The first one is a combination of RCP 2.6 under SSP1, and the second portrays RCP7.0 under SSP3. The specific scenarios are defined as follows:

SSP1 is called the sustainability pathway as it envisions relatively optimistic trends for human development, with substantial investments in education and health, rapid economic growth, and well-functioning institutions.

SSP3 is more pessimistic in its future economic and social development, with little investment in education or health in poorer countries coupled with a fast-growing population and increasing inequalities.

1 https://www.adaptationcommunity.net/news/new-publications-assessment-of-climatic-impact-drivers-for-subregions-in-benin-burkina-faso-ethiopia-india-kenya-madagascar-and-tunisia/
2 https://agrica.de/downloads/
3 Generally, the drivers are shown as long-term (29-year) averages. Hence, the maps show the 29-year averages around the center years 2000 (historic conditions), 2030, 2050 and 2080. This means that the average around the center year 2000, shows the climate signal from 1986 to 2014, 2030 for 2016 to 2044 and so on.
4 The assessments were calculated with a model ensemble which consists of biased-adjusted data from the Coupled Model Intercomparison Project Phase 6 (CMIP6) models from the Inter-Sectoral Impact Model Intercomparison Project 3 (ISIMIP3) generation. Hence, the number of models on which the here presented projections are based exceeds the number used in other analyses such as "Climate risk analyses for adaptation planning in sub-Saharan Africa" (AGRICA) for Ethiopia, Kenya, and Burkina Faso. Using this larger model ensemble, we can gain more information on the robustness of the climate change signals. The ten models are GFDL-ESM4, IPSL-CM6A-LR, MPI-ESM1-2-HR, MRI-ESM2-0, UKESM1-0-LL, CNRM-CM6-1, CNRM-ESM2-1, CanESM5, EC-Earth3 and MIROC6.

RCP2.6 is a stringent scenario which adheres to the targets of the Paris agreement. Global warming of more than 2°C in 2100 is not exceeded. This is achieved by drastically reducing emissions. This scenario is called *mitigation scenario* in the text.

RCP7.0 is a no-policy baseline emission scenario, where no mitigation is employed. Hence, the status quo regarding emissions is projected in the future. This scenario is called *no-mitigation scenario* in the text.

3.2. How to read the figures

3.2.1 Maps

The maps show the spatial distribution of the CIDs. Future changes in these drivers are shown in comparison to the historic conditions around the central year 2000. Here we will explain how to read the example figure (Figure 2) for Ethiopia. The baseline conditions around the year 2000 are shown on the left-hand map. All maps to the right show projections under the two trajectories. In the example figure (Figure 2), the top row maps show median values[5] under SSP1 and RCP2.6, and the bottom row maps SSP3 RCP7.0. The projection years are shown subsequently from left to right: 2030, 2050 and 2080. The colors show the differences to the baseline period 2000.

Depending on the CID, the praojections show the absolute (unit) or relative (%) differences of a CID to the baseline. The example figure below shows absolute differences. Therefore, we can answer the following question: By how many degrees Celsius will the mean temperature likely change in 2030, 2050 or 2080 compared to 2000? To show the agreement between the ten climate models on the projected changes, dots indicate grid cells where at least 9 out of 10 models agree on the sign, i.e., increase or decrease in temperature. As dots are present in each grid cell (50km x 50km) of the below shown example map, there it is very likely that temperatures will increase in the whole region.

5 The mean is calculated from all ten models in the model ensemble.

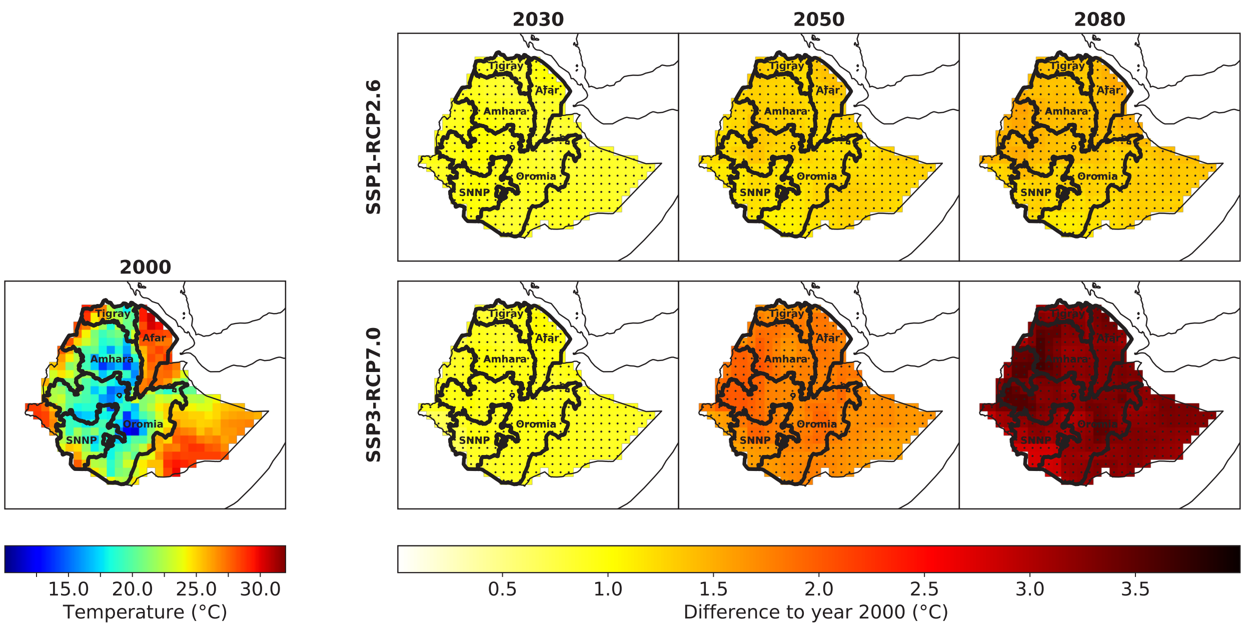

Figure 2: Example map - Projected change of mean temperature across Ethiopia

3.2.2 Line plots

Line plots (Figure 3) show the timeline of a CID. To capture climatic changes and not interannual variability, we also show 29-year averages for each year (this means a 29-year running average time series). In the example plot it is the air temperature change from 2000 to 2080. For each region where ProSoil is working, the projected change is given in an individual plot. Again, the projections show two possible trajectories: SSP1-RCP2.6 and SSP3-RCP7.0. For each trajectory, the best estimate[6] is displayed as a blue or red line. The shaded areas around the line show the so-called model spread. This means that the shaded area shows the likely range of projections as they spread from the highest and lowest values of the ten models with which the projections are calculated. Such a spread can be for example well observed in the plot for Afar, where for RCP 7.0 in 2050 the model that projects the smallest change shows a temperature increase of 0.8°C, and the model that projects the strongest change shows an increase of 2.7 C. All other models show value within the shading.

6 Mathematically, the best estimate corresponds to the median of all ten models in the model ensemble.

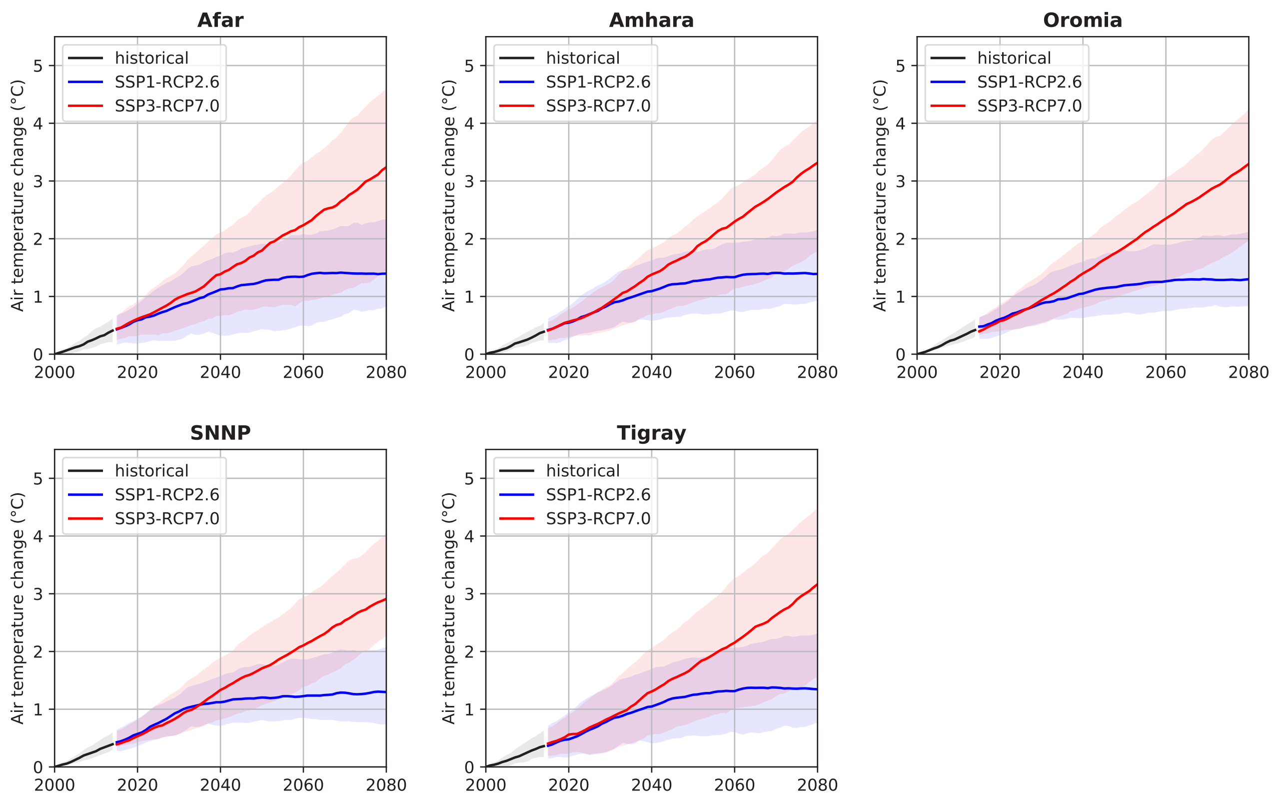

Figure 3: Example line plot - Projected temperature time series on individual regions for the model medians (lines) and range of the model projections, which show the highest and lowest values (shading)

SSP1 – RCP2.6

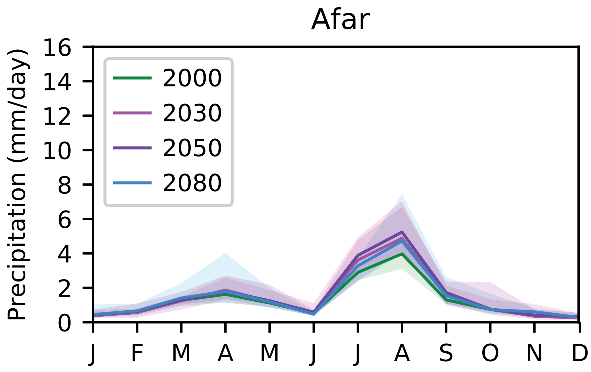

Figure 4: Example precipitation cycle chart showing the monthly precipitation for the model medians (lines) and range of the model projections, which show the range of projections(shading). Different colors indicate the year.

3.2.3 Precipitation cycle chart

The precipitation cycle charts (Figure 4) show changes in the precipitation rates (mm per day) for each month. Hence, they show the distribution throughout the year. These figures are also shown for all the ProSoil regions individually. As for the line plots, the figure shows the median value of all ten models as a line. Different colors indicate different years (see legend in the top left corner of the figure). The shading around these lines indicates the full range of projections, i.e., possible outcomes, for each projection year in the same way in the line plots.

3.3 Description of climatic impact drivers

The following definitions explain how the CIDs were calculated.

Mean temperature refers to annual mean near-surface (2m) air temperature in degree Celsius. We show the projected absolute changes mean temperature in degree Celsius.

Mean precipitation refers to annual precipitation sums in mm. As regional comparisons of precipitation changes are more meaningful in comparison to the average conditions of a larger area, we show relative precipitation changes in %. For example, when considering absolute changes, a precipitation change of 100 mm in the desert is a major change in comparison to a 100 mm change in the rainforest, where the general precipitation level is much higher.

Precipitation cycle projections show average daily precipitation rate for each month in mm/day for the different time periods.

Very hot days are defined as days with a maximum near-surface air temperature above 35 °C. We show the change in the number of such days.

Heavy precipitation frequency refers to the number of heavy precipitation events. A heavy precipitation event is defined as a day on which the precipitation sum exceeds the 98th percentile of the daily precipitation sums of all wet days from 1861 to 1983, where a wet day is a day with a precipitation sum of at least 0.1 mm. So, the thresholds are defined based on a historical period and local conditions. The nature of the driver's definition with percentiles leads to a similar amount of heavy precipitation events in all grid cells in the historical period (generally about 6-9 days). Therefore, the historical figures are not meaningful and consequently not shown.


Construction of check dam in India

Heavy precipitation intensity is defined as the value of the 98th percentile of the daily precipitation sums in mm within the 29-year period. The change, however, is indicated in percentage change, because total values are often not very meaningful in showing changes in precipitation and comparing different areas.

Extremely dry months are defined as months with a Standardized precipitation-evapotranspiration index (SPEI) of less than -2. The SPEI describes the deviation of the precipitation-evapotranspiration difference from the long-term conditions (1986 to 2014). The calculation of the SPEI is based on monthly precipitation anomalies and evapotranspiration, which are accumulated over 6 months. Evapotranspiration is approximated by the Thornthwaite method from monthly temperature data. SPEI values below – 2 can be interpreted as below 2 standard deviations. This means that, like heavy precipitation events, these events are considered extreme due to their low frequency. As such the frequency in the historical period is not meaningful, as all grid cells show similar values between 0 and 0.3 months per year. Therefore, we do not show the historical figures. The maps show the projected changes in the annual number of extremely dry months

4

4 Monitoring & Evaluation framework

The following content on climate risks, SPR technologies and socio-economic indicators provides the basis for the Adaptation M&E. Definitions and concepts were developed in a participatory process, but do not claim to be complete. This system represents the status quo of the implemented technologies within ProSoil and the identified climate risks in the intervention areas. The socio-economic indicators to assess the local feasibility of SPR technologies were also selected according to the priorities of ProSoil at that time. All components can be adapted to the specific needs of the using entities. Technologies, climate risks and socio-economic indicators can be added or deleted and their weights adjusted.

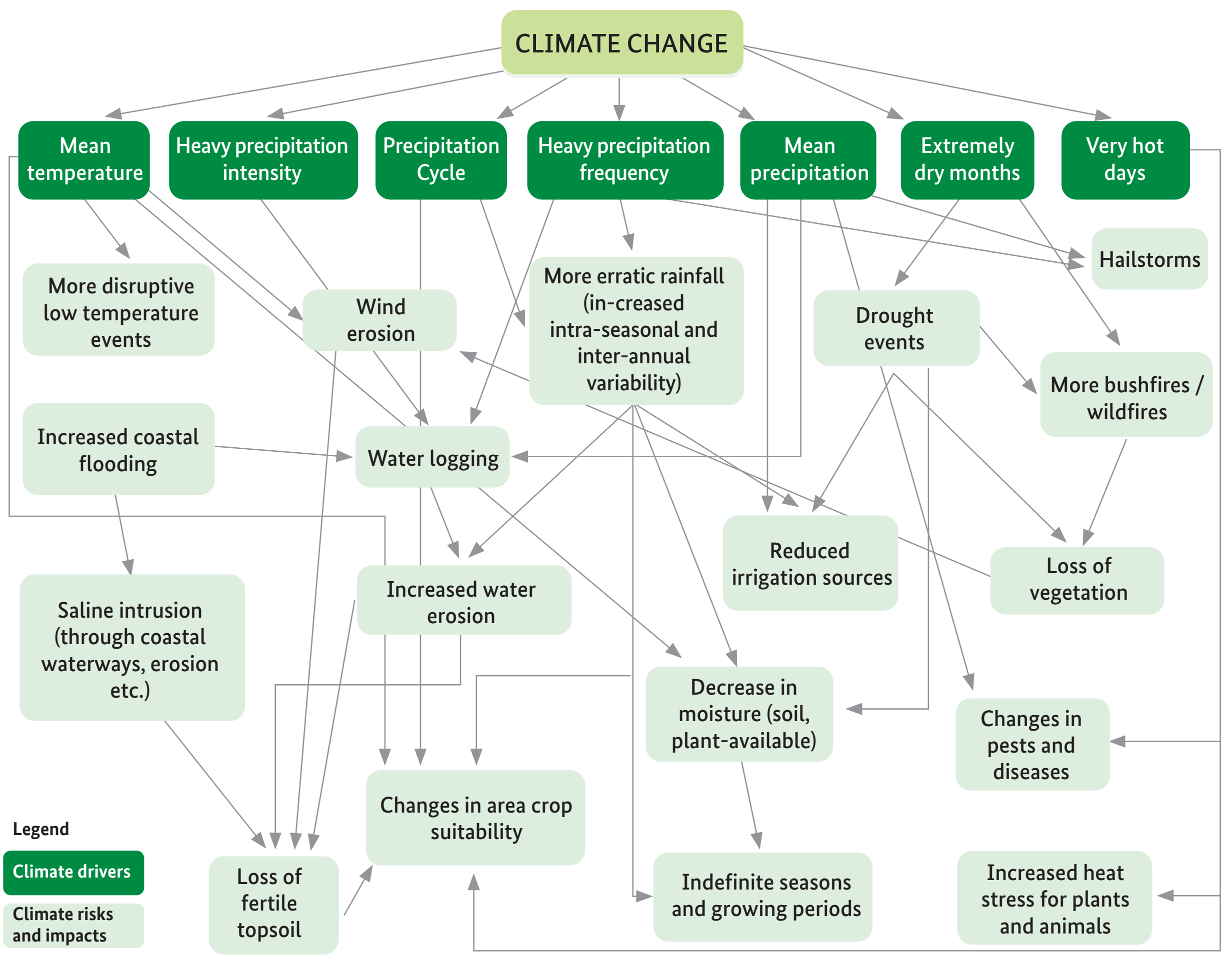

Figure 5: Network of CIDs and risks, source: own illustration, based on Dawson (2015)

Mobile soil testing service in western Kenya

4.1 Linkages between climatic impact drivers and risks

For the identification of prevailing climate risks, we refer to the concept of CIDs and risks as explained in the glossary. Figure 5 presents the climate risks identified as most relevant for ProSoil and the seven CIDs, modelled by the Potsdam Institute for Climate Impact Research (PIK). Risks and CIDs are depicted as a network of linkages and interdependencies. The changes in CIDs can cause certain risks, which can result in different impacts. This network provides the means to understand the causalities between changes in CIDs and the risks that may arise from them. The network is intended to support the identification of the relevant climate risks during the Effectiveness Analysis, based on the *Assessments of Climatic Impact Drivers* or other climate risk information.

4.2 Definitions of climate risks

The following table provides general definitions of climate risks. These risks were named, selected, and clustered according to the needs of the ProSoil projects. New risks can be added to the analysis to fit the needs of other projects. Please note that these climate risks cannot be clearly distinguished from each other, as they are caused by the same two climate signals temperature and precipitation (and the CIDs derived thereof). The risks also occur at different stages in the network of CIDs and risks (see Figure 5) and partly influence each other. Therefore, we suggest to primarily concentrate on each risk's focus and only secondarily on its distinction to other risks. It can be also interesting for the analysis to link back the risks to changes in the climate as there might be multiple causes, which contribute to a risk.

CLIMATE RISK	DEFINITION
Increased heat stress for plants and animals	Climate change causes temperatures to rise and increases and intensifies temperature extremes. Therefore, the plants and animals might be negatively influenced in their growth and wellbeing. With higher temperatures they can experience an increased level of distress which can reduce the quantity and quality of their produce. For example, limp leaves or brown spots can be signs of heat stress by plants. For animals such a sign is lethargic behaviour.
More disruptive low temperature events	Climate change can cause low temperature (extreme) events which can have negative impacts on plants, animals and soil health, especially when not expected (e.g., during flowering of crops).
Hailstorms	Hail is a type of solid precipitation. The frozen water droplet can cause severe damage to agricultural production and the infrastructure connecting the overall value chain.
Drought events	A drought is characterised by the absence of precipitation. One possible repercussion of such extremely dry conditions is that plants and animals experience drought stress as the water availability is reduced to a critical point where growth and wellbeing are negatively affected. Also, soil organic matter and soil organisms can be affected which can cause a decrease in soil quality.
Reduced irrigation sources	Irrigation can be used to provide water during the dry season or supplementarily during the wet season when crops and animals require more water then naturally available through rainfall. There are different sources of water used for irrigation (e.g., grey water, ground water, surface water), and a reduction or depletion of these sources can have diverse reasons.
More erratic rainfall	Climate change increases the frequency and intensity of extreme events and affects general rainfall patterns. Therefore, rainfall might occur at times when it is not expected according to traditional agricultural calendars or practices.
Water logging	When soils are saturated with water, they cannot absorb any more water and the remaining water stays on top of the affected soil. This inhibits that the soil and all the organisms it contains receive oxygen.
Indefinite seasons and growing periods	Agricultural production is planned by seasons and a certain combination of temperature and rainfall levels must be met to produce well. Climate change can alter traditional agricultural calendars, as typical weather events, e.g., last frosts, onset of rains, and plants' growing periods, e.g., seed germination and flowering, are affected. Also, the occurrence of specific pests and diseases and other factors can alter the season which is suitable to produce a certain product.
Changes in area crop suitability	This risk focusses on how well a specific crop can be grown in a specific area. Climate change can alter the conditions in an area in such a manner that crops which were traditionally grown there, do not produce well anymore, or reversely that crops that could not be planted in the past, are now suited to that area.
Changes in pest and diseases	With climate change, not only the conditions for animals and crops change, but also the conditions for pests (e.g., locust, potato beetle) and diseases (e.g., fungi) which harm agricultural production.
Decrease in soil moisture	Soil moisture is generated by different parameters such as soil organic matter and rainfall. Through changes in the CIDs the soil moisture can be reduced which negatively affects plants and hence production.
Loss of vegetation	This risk refers to the removal of plants which cover the ground caused by climate hazards. But it can also refer to loss of trees, forests, and other larger plants.
Loss of fertile topsoil	This risk puts the focus on the removal of the uppermost soil layer due to climate hazards, no matter what process (e.g., erosion) caused this loss.
Increased water erosion	Erosion by water can be caused by rainfall, runoff, melting snow or ice, and irrigation. It can have severe damage to soils.

CLIMATE RISK	DEFINITION
Increased wind erosion	Erosion by wind is an aeolian process, in which wind at high-speed lifts and transports soil particles and therefore removes the topsoil layer
More bushfires or wildfires	Bush or wildfires pose a great threat to the inhabitants, flora, fauna, and soil in the regions where they occur.
Salinization	Salinization describes the process of an increasing salt content in the soil. As a result, plants can dehydrate when they are not tolerant to permanent or temporal increases in salinity. This has tremendous consequences for soil health and agricultural productivity.
Increased coastal flooding	Climate change causes sea levels to rise. This rise causes areas at the coast to be more often submerged by seawater. Saline intrusion, pollution, erosion, loss of crops and livestock as well as fertile soil can be consequences for the agricultural sector.

4.3 Definitions of soil protection and rehabilitation technologies

The designation of names to the technologies serves the purpose of grouping and therefore do not reflect the exact technologies implemented within ProSoil. The list can be adjusted for use in other projects. The respective technologies in the projects are to be assigned to the groupings. The examples shall support the process of assignment.

TECHNOLOGY	EXAMPLES	DEFINITION
N-fixing plants and cover crops	N-fixing plants such as legumes, oilseeds, cover crops	Growing nitrogen fixing cover crops benefits subsequent crops. Once grown, they are usually incorporated into the soil shortly before sowing the next crop. They also provide permanent surface cover between growing seasons of main crops to reduce runoff and water erosion. After termination, residues from cover crops continue to protect the soil from erosion. Legume crops bring the additional advantage of fixing nitrogen.
Mixed cropping	Intercropping, double cropping, crop rotation, relay cultivation, crops with different root systems, beans and peas	Simultaneous planting or crop sequences of crops in the same piece of land to allow for better and effective use of soil resources such as water and nutrients. Depending on the system, planting is done in specific patterns or without following specific patterns. The same accounts for the treatment of seeds etc. Multiple techniques exist e.g., crop is seeded into standing second crop.
Compost production and application (composting)	Vermicomposting, basket compost, anaerobic composting	Breakdown of organic material, which are mostly wastes, by microorganisms to give a humus product.
Nutrient application	Manure fertilization, bio slurry, microbial inoculants, biofertilizer, mineral fertilizer refinement, olive press cake, silt application	Optimized and need oriented collection, treatment, storage, and application of nutrients to soils. Can include mineral fertilizer, animal manure or microorganisms. When manure is anaerobically digested to produce biogas, the residue of manure digestion, bio-slurry, can also be used as fertilizer.
Improved seed management	Improved varieties (short growth cycle), seed priming, collecting and reserving seeds for the next season	Treatment of seeds or usage of better seeds for improvement, e.g., short growth cycle varieties or seed priming (pre-sowing technique). Also includes management practices such as seeds banks.

TECHNOLOGY	EXAMPLES	DEFINITION
Pest and disease management/ plant protection	Biopesticides, integrated pest management, invasive species control, push and pull, seed treatment	Products and long-term strategies for the minimization of pest and disease, including the use of disease- and pest-resistant crops, rotation of crops to provide disease breaks for susceptible crops, push and pull crops, apply non-chemical control practices (thermic, mechanical), e.g., natural organisms or substances derived from natural materials (such as animals, plants, bacteria, or certain minerals), including their genes or metabolites, for controlling pests.
Improved sowing	Line sowing, staggered sowing, dry sowing, early sowing, adapt seed rate	Different sowing practices that are adapted to the specific needs of crops and cropping systems.
Soil preparation methods	Contour ploughing, Ridges and furrow methods, zero / reduced tillage, Crop residue management	Soil preparation includes methods which involve extreme soil working as well as weak soil working. Ploughing across a slope following its contour lines to create a water break which reduces the formation of rills and gullies during heavy precipitation. The ruts made by the plough run perpendicular rather than parallel to the slopes. When no or reduced tillage is practiced the crop is mostly sowed directly into the soil without tillage.
Mulching	Soil cover, residue mulching	Placing mulch or maintaining crop residues in irrigation furrows to reduce erosion. If available, previous crop residues should be used as mulch, but straw from off-site can also be used.
Agroforestry	N-fixing trees and shrubs, hedges and life fences	Land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence, sometimes with an fertilizing effect.
Contour bunding	Stone bunding, earth bunding, dry stone measures	Small structures that control erosion, retain organic matter reduce speed of run-off and improve infiltration. The bunds or stones are usually built on hillsides along contours. Can be made of stone, soil etc. Some arrangements can be used to deliver a water spreading effect.
Dams and dikes	Check dams, gabions, gully plugs, filter dikes	Temporary or permanent earth or stone constructions across a drainage ditch, or channel to lower the speed of flows of storm events and to conserve soil moisture. Small earth fill dams are also built to store water. In arid and semi-arid areas, dams they are designed to catch and retain runoff water and hold it until it infiltrated into the ground.
Small scale mechanisation (machinery)	Tur pinching, solar pumps	Covers all levels of farming and processing technologies, from simple hand tools to sophisticated motorized equipment, including land preparation, seeding, planting, weed control, integrated pest management, precise fertilizer application, harvest, storage, on-farm processing, transport, and marketing.
Vegetation strips	Grass strips, grass bundles	Vegetated area set-aside from the main cropping regime within or around a field. Due to aboveground vegetation, roots, and soil complexity, they contribute to a reduction in water flow and off-site sediment transport.
Controlled grazing	Fenced grazing, grazing by rotation	Fences or grazing by rotation are used to manage the forage with grazing animals. Grazing exclusion seasonally or year-round allows for self-restoration. Fenced degraded grasslands limits access to grazing by subdividing pastures with permanent and temporary fences.

TECHNOLOGY	EXAMPLES	DEFINITION
Climate Information	Advisory	Farmers receive timely advisories on weather or seasonal forecasts to plan their growing season accordingly, e.g., to determine the best time for sowing.
Water management	Watershed management, water spreading weirs	Applied to an area of land that drains to a defined location along a stream or river. As each watershed is unique in physiography, ecology, climate, water quality, land use, and human culture, watershed management must be customized to each setting when put into practice. E.g., water-spreading weirs are low retentions walls made from stones developed to reduce runoff and erosion and are often built-in series behind each other. They slow the flow of water in valleys and spread it over a wider area where it can infiltrate into the soil.
Small scale irrigation	drip irrigation, sprinklers	Low-cost irrigation technologies on small plots where farmers have the major controlling influence and use a technology which they can effectively operate and maintain, including e.g. rainwater harvesting, bucket irrigation, gravity fed sprinkler and drip, treadle and pedal pumps, rope and washer, motorized pumps, wind power.
Fodder management	Cut and carry, fodder banks	Fodder management implies additional feeding practice to grazing in which forage for animals is cut beyond their boundaries and carried to them when needed. It also includes forage banks with napier grass, alfalfa etc.
Biochar /Terra Preta	On farm preparation and application to crops	Thermochemical conversion of agricultural wastes, but also wood wastes from forestry, wastes from agro-processing industries, aquatic weeds and municipal solid wastes and sewage sludge into a stable solid, rich in carbon. To produce terra preta, biochar and compost are mixed and processed into very fertile soil.
Water harvesting/ storing/holding technologies	Micro basins, farm ponds, trenches, ditches (drainage), cut off drains	Several technical means to harvest, store and hold water. Micro basins are surrounded by earth bunds, which can also be reinforced with stones. Micro-catchments can also be used for irrigating trees or bushes in surrounding them. Trenches and ditches are used for trapping rainwater and can also be installed to reduce waterlogging.
Temporary area closure (fallowing)		Restoration of degraded pasture or agricultural lands, by taking them out of production or usage through fallowing for 1 or several years under natural vegetation. The natural vegetation can be enriched with leguminous trees.
Lime application		Application of calcium- and magnesium-rich materials in various forms, including marl, chalk, limestone, burnt lime or hydrated lime. In acid soils, these materials react as a base and neutralize soil acidity.
Rehabilitation of degraded land	Permanent area closure, re- and afforestation, marking and pegging of riparian lands	Marking and pegging of riparian lands, afforestation to rehabilitate riparian degraded lands, which suffered over-exploitation and intensification using native tree species able to tolerate the local conditions.
Fire management		Includes various management practices of e.g., vegetative nature, that aim to prevent and reduce the risks of damage and danger from wild- and bushfires.
Terraces on slopes	Terracing, step farming	Terraces are usually developed on steep slopes (15-55 percent) to stop water runoff, control erosion and increasing water stored in the soil profile. They are often reinforced with stones and/or vegetation cover.

TECHNOLOGY	EXAMPLES	DEFINITION
Assisted Natural Regeneration		Restoration method that aims to accelerate, rather than replace, natural successional processes by removing/reducing barriers to natural regeneration and recurring disturbances (e.g., fire, grazing and wood harvesting). It involves the protection of naturally regenerating woody vegetation by farmers on agricultural land.
Fertility and water management techniques	Zai and halfmoon techniques	Digging pits (20-30 cm) in the soil (field) during the pre-season to catch water and collect organic matter (compost, manure, dry biomass).
Destocking of livestock	Reducing number of livestock	Reducing the number of animals per grazing area, e.g., by changing herd composition, selling old and sick animals to prevent or halt rangeland degradation.
Desiltation	Nalla desiltation	Desiltation refers to the reduction of accumulated silt in ponds and watersheds to support groundwater recharging capacity of water reservoirs and to prevent flooding.
Promotion of pollinator plants	Endemic plants	Helps carry pollen from the male part of the flower (stamen) to the female part of the same or another flower (stigma) to become fertilized.

4.4 Indicators for the local feasibility and co-benefits of soil protection and rehabilitation technologies

INDICATOR	GUIDING QUESTIONS AND EXPLANATIONS	SUPPORT QUESTIONS (SIMPLIFIED TO APPROACH TARGET GROUP)
Access of women and vulnerable groups	Is the technology available for women and/or other tending to be more vulnerable groups in the intervention area with regards to needed investment, input, tradition, etc.? What vulnerable groups are present in your intervention area? Apart from women, vulnerable groups may include the young (lacking the means of production), the elderly (lacking the labour force), the landless who are forced into sharecropping, and migrants. The access is, among others, determined by the participation of these groups in the decision making of implementation, by the access to and control over land / other productive resources, and the access to goods and services relevant to the implementation of the technologies. Availability of the technology is also affected by physical factors or traditional believes and rules.	*Who benefits from SPR technologies? Does the project involve all social groups? Can women or vulnerable groups also use this technology? How many women are in the group / are implementing the technology?*
Social acceptance	Is the technology socially accepted with regards to traditional and/or cultural habits? Farming is part of a community culture and therefore influences, and is influenced, by other aspects such as food preferences, land tenure and family relationships. For example, could the transformation from communal land to enclosure limit land access and therefore create conflicts? Changes in farming practices can have implications for other aspects of culture, which could make it difficult for individual farmers to adapt. In various settings it is important to respect the authorities of traditional leaders. Also, religion could impose behaviour patterns which may affect farming. Certain times of the day, particular days or seasons of the year may be dedicated to ceremonies, which means that farmers are not available for farm work.	*Did anything change in the community after the implementation of the technology? Are there any negative effects, if so, please give examples? Could there be problems of acceptance of the technology? Does the technology hinder you to pursue your traditions and religious believes?*

INDICATOR	GUIDING QUESTIONS AND EXPLANATIONS	SUPPORT QUESTIONS (SIMPLIFIED TO APPROACH TARGET GROUP)
Direct benefits for food security and/or nutrition diversity	Is there a direct benefit for food security on household level or in terms of increased diversity in nutrition? Does the technology contribute to an increase in yield (quantity) for food or livestock fodder and/or to a better crop quality (higher nutrient content, better durability etc.)? Or does the technology facilitate the cultivation of cash crops to increase household income and therefore the household`s ability to buy more nutritious and healthy food? In general: has the food situation improved thanks to this technology?	*Does the technology increase yield or food diversity? Specific example on fodder production: how many days can you remain on the field to create fodder for livestock compared to before the technology?*
Job creation benefit	Is there a direct job creation effect for skilled and unskilled labour (coming along with a (broad) adoption of the technology)? Labour intense technologies might require more than the families` labour force, necessitating the hiring of external labour, which has a direct positive effect on job creation. A low level of expertise needed for the implementation of the technology or certain steps also favours the creation of jobs for unskilled labour. Complex technologies, however, could benefit the emergence of up- and downstream businesses, e. g. production of material, distribution of inputs (e. g. human waste) or marketing/sale of products, e. g., biochar or compost and therefore create jobs along the whole value chain.	*Can the technology create new jobs or employment opportunities for local people/daily labourers?*
Affordable initial investment costs	Is the direct investment need for the technology realistic and affordable for the target group? This category refers to the costs of the technology and its implementation for individuals and the community. It includes costs for material, equipment, and labour force. If the technology is implemented on community level, for example irrigation schemes or watershed management systems, the costs reduce as they are shared among several users. Please assign high values to indicate affordable investment costs. Please note that this indicator refers to the actual costs of a technology, disregarding the availability of financial support. In case the technology reduces the costs for e.g., inputs, this will be assessed under the indicator "cost-benefit-ratio".	*Are the costs affordable for local producers to start with?* *Does the farmer have sufficient financial means to buy the necessary equipment?* How many goats do you have to sell to pay for this technology?
Affordable maintenance costs	Are the maintenance costs realistic and affordable for the target group in the long-term? Maintenance costs are understood as costs that are used to maintain the technology for future use. It includes renewal of certain parts or materials or the regular reinstallation of the technology. Please assign high values to indicate affordable maintenance costs.	*Is the technology easy to maintain during the season and are the costs affordable for the adopting households, e.g., for equipment?*
Good access to finance	Are there subsidy/credit/policy schemes to support direct investment and/or maintenance costs? Access to finance and inputs includes the presence of financial means and inputs in the first place and the access to it in the second place. If monetary or material support is existent, the second step is to check whether the target group can make us of it. Is the target group well informed about the funding opportunities? Is the funding procedure practicable and feasible? Are funds accessible for women and vulnerable groups, too? Are the interest rates adequate for the region and affordable for the target group? If no official credit or subsidy programmes exist, are there other funding possibilities, e. g., community saving groups etc.?	*Do farmers have access to finance? Could they get a loan from a local bank?*

INDICATOR	GUIDING QUESTIONS AND EXPLANATIONS	SUPPORT QUESTIONS (SIMPLIFIED TO APPROACH TARGET GROUP)
Cost-benefit ratio	Considering the broader picture, what are the costs of the technology and what are potential benefits? How do these compare? Would you consider the costs to be higher than the benefits or are the benefits so positive that they outweigh the costs, e.g., higher costs for improved seeds, compared to higher yields? Another way to look at it is "value for money". This indicator also includes benefits which are not monetizable, e.g., psychological, health or aesthetical benefits. Please consider the whole lifespan of a technology. For example, the technology agroforestry needs some years until trees grow bigger, bear fruits etc. and only then the full potential of the technology is reached. Please assign a high value if benefits outweigh the costs and a low value when costs are higher.	*Is the financial investment worth it for the farmer? Do they get more money from sales at the end of the season?*
Low level of expertise required	What is the level of expertise needed for the correct application of the technology? Is there scientific and/or context knowledge needed? Does the technology introduce a completely new concept of farming to the target group or is it rather a well-known technology which was modified with new aspects or new findings? Can it be embedded in existing practices? Is the target group able to implement the technology itself or are external experts needed? How skilled must the implementers be? How much training, support or guidance must be provided to the target group to implement the technology? Is a one-day workshop sufficient or is constant support required? Please assign high values to indicate low levels of required expertise.	*Is it easy? Can illiterate people implement the technology?* *Can the necessary knowledge be conveyed in simple language or in pictures and drawings?*
Availability and accessibility of knowledge and training	Is the required (expert) knowledge and training on the technology available in the country/intervention zone? Has the technology already been implemented somewhere in the intervention zone or the region and if so, can this knowledge be tapped and exchanged with the implementers, can trainings be received? If the technology is completely new in the region, are there other sources of knowledge, institutions, experts available for support? Whether the technology is integrated into the national extension system can also provide information about the availability of trainings and knowledge. If knowledge and trainings are not available, but the technology requires only little or even no expert knowledge, still award a high score.	*Have you received training on the technology?*
Availability and accessibility of farm equipment and inputs	Is the technology and/or the materials needed for the technology available in the country/intervention zone and for your target group/households/communities? Please think of the input intensity of the technology first: What kind of material and equipment is needed? Must the material be manufactured or constructed (concrete, tarpaulins, pipes, pumps etc.) to be usable or is the material readily available for collection (e.g., smaller stones, wood)? Is the equipment needed already available, because it is used for farming anyways (e.g., shovel, wheelbarrow) or must the machinery first be obtained somewhere else (e.g., highly mechanised, or costly machinery)? If no or little equipment and materials are required, please rate the category with a high score?	*Do you have the materials for the implementation?* *Are the necessary materials available in the communes?* *Are the necessary materials available on the local markets?*

INDICATOR	GUIDING QUESTIONS AND EXPLANATIONS	SUPPORT QUESTIONS (SIMPLIFIED TO APPROACH TARGET GROUP)
Adequate labour intensity	How intensive would you rate the required labour input needs? Please consider the labour input needed for installation and maintenance of the technology. This refers not only to the amount of work, but also to the working conditions and heaviness and difficulty of work. If for both, installation and maintenance, the labour input is high, please rate with a low value. If installation effort is high, but comes with low labour input for maintenance, please rate in the middle value range. If the technology must be renewed every year, but requires only little labour input, please rate in the higher value range.	*Is the technology easy to implement? How hard/ exhausting is the work to be done? Is it worth the effort?*
Availability of labour	Is the required labour available for your target group / households / communities? This category refers to the specific situation of the target group and the intervention zone: How is the employment situation in the target region? Is skilled and unskilled labour available for the agricultural sector? Are family members available for the implementation of the technology? Please assign a high value if sufficient labour is available. When there is little labour force available, but the technology does not require much labour, please assign a high value.	*Availability of sufficient labour and manpower at household level, and if not, do households have the means to hire external workers to implement the technology?*
Upscaling potential (context specificity)	In this category, it is considered how much further potential there is for the technology to be exploited in the same region, but also how applicable it is for other regions. The indicator indicates the context specificity of a technology and how easy it can be adapted to and implemented in other regions. Could knowledge about the technology and its implementation be passed on in a cascading / peer learning approach in which farmers learn from other farmers?	*Can the technology be easily replicated in time and space by any farmer? Can it be used in other communities, too or are the requirements regionally specific?*
Low requirement of institutional support	Depending on their concrete design, a distinction can be made between adaptation technologies which generally require high institutional support and those that can be initiated by farmers themselves. You can make use of the above assessed criteria on the level of expertise needed, the availability of material, equipment and labour to assess, whether the technology can be initiated by the target group or if high external institutional support will be required.	*Can this be used without close supervision? Are you autonomous in carrying out the technology? Does a farmer need support from the municipality / state /other organisations to implement this technology?*
No negative side effects	Are there any risks of negative side effects with regards to competing needs, e.g., downstream communities, rights violations for specific groups, interest conflicts for resources, land and others, etc.? In the case of water usage or the connection to irrigation, for example, competition and scarcity of the resource can create conflicts. The indicator also applies to trainings, materials and financial support that might be limited to a specific number of farmers and therefore have the potential to exclude others, or the problem of invasive species if rehabilitated areas not used productively. This indicator is related to the indicator "social acceptance", as often the perception that there will be no negative side effects affects social acceptance. Please indicate no or little negative side effects with high values.	*Does the technology have a negative impact on you, your family, other farmers or the community?*

5

5 Adaptation effectiveness and local feasibility of relevant soil protection and rehabilitation technologies

The adaptation M&E will be carried out by the help of two multi-criteria-analyses. While the goal of the Effectiveness Analysis is to assess the *adaptive effectiveness* of SPR technologies, the aim of the Feasibility Analysis is to assess their *feasibility in the local context*. The foundation of both analyses is an evaluation matrix, in which the climate adaptation technologies are assessed quantitatively on a scale from 1–10 against relevant climate risks and specific socio-economic indicators. The evaluation matrix can be easily transferred to an analogue pinboard or similar mean to facilitate the assessment process. The results will be backed up by qualitative information and argumentation during the assessment.

The analyses will be conducted in the form of participatory workshops, one individual workshop for the Effectiveness Analysis and the Feasibility Analysis, respectively. The participants are composed of local experts in the field of climate adaptation and agriculture and representatives of the target groups. It is recommended to carry out the analyses at distinct points in the programme or project life cycle, e.g., before a project ends or after changes in the approach have been introduced. The main reason is that impacts from adaptation and the adaptation process itself need more time to become visible and measurable at all. Another reason is that both analyses require time and other resources. Reducing the frequency of the analysis will therefore reduce the workload and still allow a meaningful assessment of technologies.

The results can be used to identify the most effective and feasible options and to improve the technologies and the overall project impact. The outputs will contribute to an evidence base how relevant SPR is for climate change adaptation. Beyond the usage within the project, the results must be useful for the respective country context to be distributed to various local partners. For that purpose, a compilation of the quantitative and qualitative results of both analyses can be produced after each workshop round. These results should be discussed within the project or across a programme to facilitate learning.
In the following, the individual steps for the implementation of both analyses are presented and provided with detailed instructions.

Both analyses can be carried out offline and online (in case of travel restrictions etc.), but to further facilitate networking and knowledge transfer, we recommend an offline workshop if possible.

5.1 Overarching preparatory task for both analyses

5.1.1 Climate change adaptation knowledge data base

To better analyze and reflect on the analyses, it is necessary to have knowledge of the climate risks present and relevant in your intervention region. One source for these are the climate risk assessments elaborated by the Potsdam Institute for Climate Impact Research and HFFA Research or similar climate risk information. Additionally, we recommend creating a Annex 1– Knowledge data base with further sources.

To ensure that all workshop participants and involved project team members have the same understanding of the technologies, please create a technology encyclopaedia where you describe in detail each technology implemented in your project. Here it is crucial to describe the technology in their local context, as the adaptation M&E tool contains rather general technology groups. The document should also name this category from the adaptation M&E tool. Ideally, they are described with pictures. The encyclopaedia can be provided to the experts prior to the workshop and be used during the workshops to describe the technologies before assessing them. A template for an encyclopaedia can be found in Annex 2 – Technology encyclopaedia. In case there has been already a technology compendium for your project, this can be used or referenced.

Please discuss this encyclopaedia and possible updates once a year (Are there new technologies? Has the implementation of some changed? Are there new pictures?).

5.1.2 Climate Change adaptation stakeholder list

Please use your project stakeholder map to create a stakeholder list with all stakeholders, who are relevant for the climate change adaptation M&E. This will be very helpful to select possible workshop participants for both analyses.

5.2 Effectiveness Analysis

The goal of the Effectiveness Analysis is to carry out a technical assessment of SPR technologies implemented in a particular project against relevant climate risks. The Effectiveness Analysis is a method to assess the adaptation effectiveness of SPR technologies. Further the workshop shall facilitate capacity development and networking amongst experts and other project stakeholder.

The final product of the Effectiveness Analysis is a filled-out matrix (see Figure 6). Therefore, invited experts/scientists will carry out several steps (see section 5.2.2 on the implementation of the Effectiveness Analysis). All steps are described in the Excel-based SPR adaptation M&E tool.

	Climate risk 1	Climate risk 2	…
Adaptation Technology 1	Adaption effectiveness score		
Adaptation Technology 2			
…			

Figure 6: Simplified matrix/scheme of the Effectiveness Analysis

The following sections will describe the overall process for the Effectiveness Analysis.

The worksheet in Annex 3 – Worksheet contains a checklist, which supports you in following up on the steps to be undertaken during the Effectiveness Analysis process.

Farmer group in India inspecting cover crop

5.2.1 Effectiveness Analysis – Preparatory steps

Define goals and system boundaries

- What are expectations and needs that should be met with the Effectiveness Analysis? E.g., to obtain an information basis, on which adaptation technologies can be prioritized and on which arguments can be formed to e.g., promote certain technologies in politics and advocate for more political and financial support (e.g., for rather costly technologies).

- How will the results of the Effectiveness Analysis be used for future project work? What would be interesting to know or assess? E.g., is there are specific technology or risk you are most interested in?

- Which intervention zones (or differently defined regions) shall be assessed? Please, insert this information in the introductory tab in the adaptation M&E tool which will be used for the workshop.

- Please be aware that the workshop can also be used as an opportunity to raise awareness regarding climate change adaptation and to facilitate networking of relevant stakeholders and experts. Therefore, you can create an enabling workshop environment and sufficient breaks for opportunities to engage in talks.

Determine internal resources to prepare and facilitate the workshop

- For how long can the workshop be? E.g., one full day or two half days? Please choose an appropriate setting according to your experience and local customs. We recommend two workshop days with shorter sessions and hence more time for networking etc. Please insert the key data in the worksheet in Annex 3 – Worksheet.

- Who will be responsible for the workshop? Can other project team members or external consultants facilitate the workshop? If yes, how many?

- Determine roles and responsibilities for workshop facilitation and document them in Annex 3 – Worksheet. We recommend having one or two moderators (= person responsible for the workshop, they will present the tasks, keep time and moderate the discussions), one or two documenters (documenting the discussions during the workshop), and one technical facilitator helping with technical issues (projector etc.). The number of experts who can be invited should be limited by the number of facilitators. We recommend a group of 5-10 people for the Effectiveness Analysis. But please adjust this number if you think that it better fits the local conditions.

Select experts

As the Effectiveness Analysis is a technical assessment, experts such as scientists and extension service officers should be identified and invited to the workshop. Table 2 in Annex 3 – Worksheet provides guidance on how to identify and select appropriate experts. It gives an orientation what expertise is needed and were it could be possibly sourced. Please make also use of the stakeholder map or list of your project, if available.

Chose date and location of the workshop

Considering the selected experts' availability and the availability of other workshop facilitators, choose a date and an appropriate location. Decide whether the workshop should be carried out virtually or in-presence.

Draft workshop plan (internal use)

The document Annex 4 – Workshop plan provides a template for a detailed planning of the event. It contains the different implementation steps, which you can refer to in chapter 5.2.2. In the plan you can insert the detailed time plan of the event, envisaged breaks, the tasks, and the persons responsible for it.

Draft workshop agenda and participant list (external use)

Based on the prior created workshop plan, please also draft a shortened workshop agenda for the participants of your workshop. The agenda shall further contain a list of participants and their expertise (see Annex 5 – Workshop agenda).

Select technologies in survey expert sheets

To conduct the Effectiveness Analysis, it is necessary that you select the technologies which are implemented in the adaptation M&E tool (see example in Figure 7). The first tab in the sheet is named "Preparatory task" and contains a list of SPR technologies and what is understood by them. Please select all technologies you want to assess during the analyses. Depending on the number of technologies you work with, it is helpful to prioritize e.g., which are most relevant in terms of scale or promising regarding their adaptation effects or critical regarding negative side effects. The ticked technologies will now appear in the assessment tab "Step 2 – the Effectiveness Analysis". After completing the task described, please hide this sheet as it shall not be amended by the workshop participants (In the Excel tool: right click on the sheet > Hide).

Preselect climate risks

To simplify the work process of the workshop and to save time, please preselect the climate risks, which are relevant to the intervention areas, and which shall be scored during the workshop. If you are not entirely sure, which climate risks to select or if you would like to leave the selection to the participants, you can also reduce the number of climate risks by deleting those, which you know are certainly irrelevant.

Please keep in mind, that the climate risks for the climate change adaptation monitoring were named, selected, and clustered according to the needs of ProSoil. In case new risks might occur in the future, or you face different risks in your project, these can be added to the analysis. Please

Technology	Includes for example
☑ N-Fixing plants or cover crops	legumes, oilseeds, cover crops
☑ Mixed cropping	intercropping, double cropping, crop rotation, relay cultivation, strip cropping
☑ Composting	vermicomposting, basket compost, anaerobic composting
☑ Nutrient application	animal manure, bioslurry, microbial inoculants, biofertilizer, mineral fertilizer refinement, silt application, use of olive press cake
☑ Improved seed management	improved varieties (short growth cycle), seed priming, collecting and reserving seed for the next season
☑ Pest disease management/ plant protection	biopesticides, integrated pest management, invasive species control, push and pull, seed treatment
☑ Improved sowing	line sowing, staggered sowing, dry sowing, early sowing, adapt seed rate
☐ Soil preparation methods	Contour ploughing, Ridges and furrow methods, No/reduced tillage, Crop residue management
☑ Mulching	Soil cover
☐ Agroforestry	n-fixing trees and shrubs, hedges and life fences
☑ Contour bunding	stone bunding, earth bunding, dry stone measures
☑ Dams and dikes	check dams, gabions, gully plugs, filter dikes

Figure 7: Technology selection based on SPR adaptation M&E tool

further note that these climate risks cannot always be clearly distinguished from each other, as they are caused by the same two climate signals temperature and precipitation (and the CIDs derived thereof). Therefore, we suggest to primarily concentrate on each risk's focus and only secondarily on their distinction from each other.

Invite experts and send preparatory documents

Prior to the workshop, your project sends preparatory instructions, such as encyclopaedia, and the agenda to the workshop participants (*see* Annex 3 – Worksheet).

Team briefing on workshop implementation

To best prepare the workshop, organize a briefing with the project team members to familiarize yourself with the expert survey sheet and discuss it with your co-workshop facilitators. Please also go through the workshop plan and the process of workshop implementation.

Further read the following sections on workshop implementation and following steps. The following steps and instructions focus on the workshop itself. They will provide guidance on the individual tasks to be undertaken on the day(s) of the workshop.

5.2.2 Effectiveness Analysis – Implementation

Introduction

The introduction into the workshop forms an integral part of the implementation. It will be decisive for the process success and strongly determine the quality of results. The purpose of the introduction is to create a common understanding among the participants on the process, the rating system, and the technologies to be assessed. Furthermore, the introduction shall be laying the foundation for a trusting workshop atmosphere. Therefore, the introduction should include at least the following aspects (which can also be found in Annex 4 – Workshop plan):

- Welcoming and introduction of the participants and their backgrounds
  – *Round of introduction*

- Introduction of the project and adaptation M&E

- Present workshop agenda and explain individual tasks and steps
  – *Either use the Excel-based adaptation M&E tool to explain process (share your screen (for online), use beamer, or print working sheets for each participant) or prepare an analog version e.g., on a pinboard*
  – *Explain scoring exercises (goal maximum of objectivity, and global comparability)*

- Clarify goal of the workshop

- Present the respective technologies to be assessed by the participants
  – *Use Annex 2 – Technology encyclopaedia as information base*
  – *Make sure that there is a common understanding among all participants*

Step 1: Present climatic impact drivers' assessments or other climate risk information

When the process and goals are clear, start to lay the foundation for the evaluation of climate risks. The selection and/or scoring of climate risks can be based on the Assessment of Climatic Impact Drivers (see chapter 3), the other resources identified and stored in the knowledge data base and most importantly on the expert´s knowledge (and their sources). If desired, the Assessment of Climatic Impact Drivers or a similar product can be presented and discussed with the participants to create a first common knowledge foundation.

Step 2: Score climate risks according to their importance

The next step is to score the preselected climate risks. If the climate risks have not yet been preselected by the project team, it will be the first step to discuss which climate risks should be selected as relevant for the project intervention zone. You can use hand signs to indicate the expert`s agreement or not. If participants cannot agree whether a certain climate risk shall be included or not, the better solution is to integrate the risk, than leaving it out. In the later step it can be still evaluated as little relevant.

The scoring shall reflect the severity and frequency of a particular risk in the specific intervention zone. This means that e.g., the risk which has the largest (negative) impact or one of the largest impacts on agricultural production, soil rehabilitation or protection in the intervention zones and occurs relatively often, should receive the highest score. The assessment shall be done on a five-level scale of "1 = very low, 2 = low, 3 = average, 4 = high and 5 = very high" in the form of qualitative expert judgement (see Box on Delphi Method). If it facilitates the process, severity and frequency can also be scored separately and then combined.

Task: Please explain the risk assessment scale from 1-5 to the experts.

Delphi Method:

The Delphi method is a method for determining group judgements. In the Delphi method, the aim is to find a consensus or other result of expert opinions through voting and discussion processes. Individual answers or assessment results are aggregated and fed back into the group. Then the group members can review their answers and, if desired, discuss and revise them. This process continues until a predefined outcome is reached (for example, consensus. (*Zartha Sossa et al. 2019*).

For the assessment we recommend applying the Delphi Method (see Info box 2), which can be done following the steps below:

1. Read the first selected climate risk.

2. Ask every expert to write their risk assessment from 1–5 on a paper card WITHOUT allowing DISCUSSION.

3. Collect the cards and pin them on wall (anonymously), so that everyone can see them.

4. For this step there are two options:
   Option A: If the scores differ not or only marginally, please use the mean value as final risk score and the scoring is completed.
   Option B: If the scores are highly different, the experts are asked to reconsider their scores depending on the other results. In this case the following steps should be taken:
   – Please encourage the experts to reveal and discuss their scores and opinions (the documenter writes down arguments and points of discussion in the justification tab of the adaptation M&E tool).
   – Every expert is now asked to write their new (old) score on a card again.
   – Built the mean value of all expert scores to define the final score of the respective climate risk: even though the goal of this method is that the scores converge, it might happen that the expert scores are still very different. Please also calculate the mean value in this case.

Please repeat the procedure for each selected climate risk.

To capture the individual scores and make them visible to the participants, you can either create a evaluation matrix in Excel (based on Figure 8) and project it to the wall, or you can make use

		Participant 1	Participant 2	Participant 3	...	Participant 10	Participant 11	Final Group climate risk rating (average)
Climate risks	Drought events							
	Soil erosion by water							
	Loss of protective Vegetation							
	Increased heat stress for plants and animals							
	Water logging							

Figure 8: Evaluation matrix for capturing individual participants´ scores

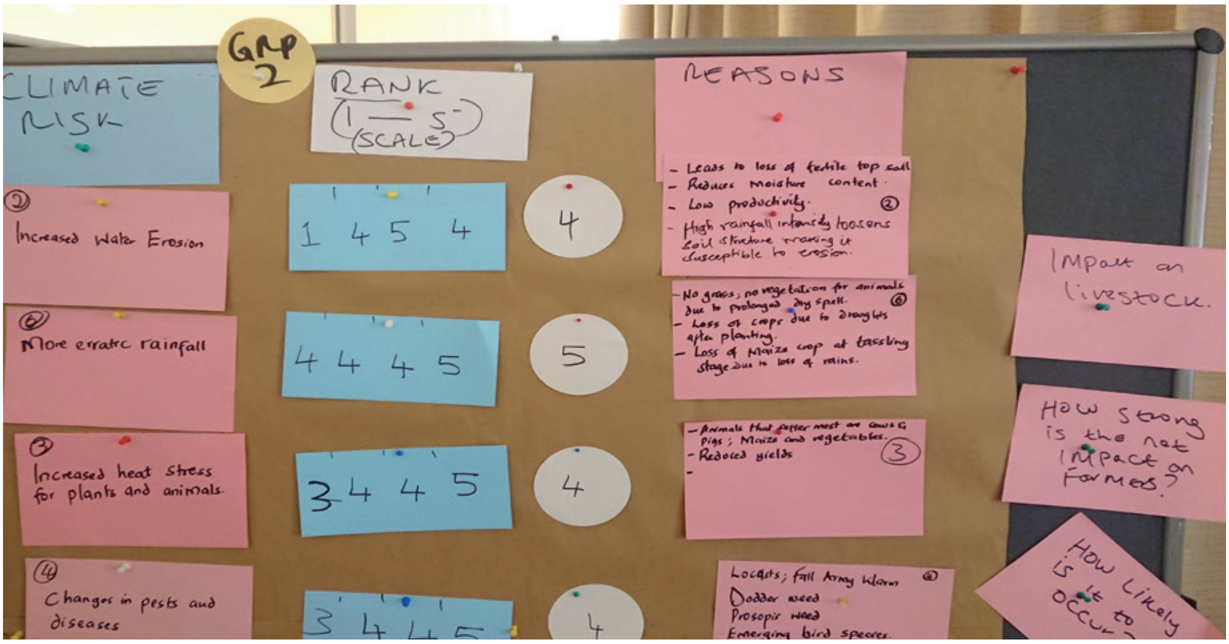

Figure 9: Analog capturing of participants' scores

Climate risks	Scoring 1-5
☑ Drought events	4
☑ More erratic rainfall (in-creased intra-seasonal and inter -annual variability)	2
☑ Decrease in moisture (soil, plant-available)	4
☐ Increased water erosion	
☑ Wind erosion	4
☑ Soil erosion	5
☑ Loss of protective vegetation	1
☑ Loss of fertile topsoil	2
☐ Increased heat stress for plants and animals	
☐ Indefinite seasons and growing periods	
☑ Changes in area crop suitability (shifts of agro-ecological zones)	2
☑ Reduced irrigation sources	2
☑ More bushfires/ wildfires	2
☐ Water logging	4
☐ More disruptive low temperature events	
☐ Saline intrusion /through coastal waterways, erosion etc.)	
☐ Increased coastal flooding	
☑ Changes in pests and diseases	5

Figure 10: Example of Climate risk assessment/scoring based on SPR adaptation M&E tool

of analogue boards, cards etc. (see Figure 9). *The average group score shall be then inserted into the adaptation M&E tool (see Figure 10).*

Step 3: Assess adaptation effectiveness of technologies

In this step the actual effectiveness assessment of technologies against the prior scored climate risks takes place. Open the respective tab in theadaptation M&E tool (see Figure 12 for comparison). . Start with the first technology and assess this technology against every single climate risk, which appears. Make sure that every participant is informed about the particularities of each technology. If necessary, make again use of the encyclopaedia. The main question to be answered should be: *What impact does the technology have in reducing the specific climate risk?*

As for the assessment of climate risk, we recommend again applying the Delphi Method. The effectiveness scale also ranges from 1–5 (1 = very little effective, 2 = little effective, 3 = medium effective, 4 = rather effective and 5 = very effective).

You can follow the steps below to reach the adaptation effectiveness score:

1. Distribute enough paper cards to all experts.

2. Display the assessment tab of the expert survey sheet with a beamer visible to all experts.

3. Read the first adaptation technology, which you pre-selected in the adaptation M&E tool.

4. The experts are now invited for each risk to write a score on a paper card, which they attribute to the respective climate risk (one card per risk). Please make sure that each score can be attributed to the respective risk.

5. Collect all score cards, pin them on the front board (see Figure 11) and assign them to the corresponding risk (the cards should remain anonymous).

Go step by step through all climate risks.
There are two options for this step:
Option A: If the scores differ not or only marginally, please use the mean value as final score for the climate risk. Enter the final score into the adaptation M&E tool (see Figure 12).
Option B: If the scores differ greatly, ask the experts to reconsider their scores depending on the other results.
Therefore, please encourage them to reveal and discuss their scores and opinions (the documenter writes down arguments and points of discussion in *the justification tab).*

Support Questions:

Supporting questions, in the case the discussion falters, could be:

- **Has the technology a short medium or long-term effect in reducing the climate risk? (Only visible after several seasons or immediately?)**
- **Does the technology reduce the climate risk directly or indirectly?**

Every expert is now asked to write their new (old) score on a card again. Display the results again on the front board. You can decide whether a second (third) discussion round is required or if you want to build the mean value of all expert scores to define the final effectiveness score for each climate risk. For an example how to capture the participants´ scoring please see Figure 11.

6. Enter the final score into the adaptation M&E tool. (see Figure 12)

7. Please repeat the procedure for each adaptation technology.

ADAPTATION EFFECTIVENESS (1–5)												
Adaption technology	Drought events	More erratic rainfall	Decrease in moisture (soil, plant-available)	Wind erosion	Soil erosion	Loss of protective vegetation	Loss of fertile topsoil	Changes in area crop suitability	Reduced irrigation sources	More bush-fires/ wildfires	Changes in pests and diseases	Average Adaptation effectiveness
Importance ranking (Weighting 1-10)	8	6	9	0	9	6	9	4	9	1	5	
N-fixing plants and cover crops	3	6	7		8	9	3	6	8	2	9	3,7

Figure 12: Example assessment of technologies against climate risks based on SPR adaptation M&E tool

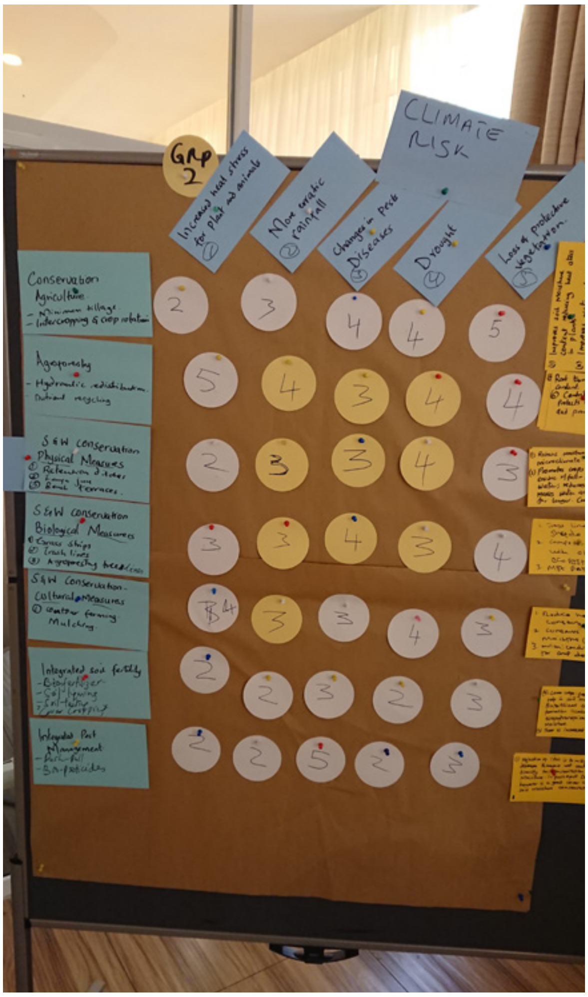

Figure 11: Evaluation matrix for capturing participants´ scores

8. FINAL: after all technologies have been assessed, you can discuss the results (average adaptation results), which are displayed in the adaptation M&E tool and compare technologies.

Overarching step: documentation of results

In addition to the quantitative documentation of results in the excel sheet, the underlying reasons for the specific assessments must be documented in the justification tap of the of the SPR adaptation M&E tool. Only if the rationale behind each assessment is clear, the results are fully useful. The following questions should be covered and documented by the protocol writers:

- What is the expert's reasoning and argumentation for specific scoring?
- Why is the technology so effective or not effective?
- What would be needed to make it more effective? Or is this technology only not helpful for the specific risk

Step 4: Feedback and closing

Get feedback from the participants on the workshop and the process. Document the learnings in the Annex 6 – Workshop learnings. You can make a flashlight round to gather the perspective of each participant, but you can also ask for written feedback. Ask the participants what they learnt during the workshop and what they would like to keep or improve. The feedback round should not discuss the methodology but the implementation of it. We also encourage you to share the results, after the analysis (see next step), with the participating experts.

5.2.3 Effectiveness Analysis – Analysis of results

Depending on your workshop goals, the analysis can have different focusses. To identify the average climate change adaptation effectiveness of each technology, the adaptation M&E tool contains a column "*Average adaptation effectiveness of technology",* which is the arithmetic mean of all scorings for one technology. It provides information on the most effective adaptation technologies.

The row *"Average climate risk coverage"* gives insights on how well a certain climate risk is covered by adaptation efforts.

The values in the excel sheet and observations in the justification tab can be analyzed according to the following questions:

- What climate risks are the most relevant ones?
- Do the technologies cover all relevant climate risks?
- What technologies most effectively cover the most important risks?
- What important climate risks are insufficiently covered?
- How can climate risks that are not sufficiently covered yet, be covered in the future?
- For each technology, what are the risks that are best covered? And which are not covered? Why? Focus on the technologies which are most important for your project.

5.2.4 Effectiveness Analysis – Reflection and archiving

In order to use the results later on, a compilation of quantitative and qualitative results of the Effectiveness Analysis can be produced by the project after each workshop round. We recommend that all workshop facilitators come together, reflect on the workshop implementation, and look at the filled out excel sheets. Further, everyone should read the workshop documentation notes and complement. Based on these outcomes, draw recommendations on how to improve the adaptation effectiveness of your specific project. Please document the learnings and experiences from the workshop implementation in sheet Annex 6 – Workshop learnings We recommend discussing the results and recommendations within the wider project team to draw conclusions on how to best integrate the results and adjust the technology implementation. Further we recommend sharing the workshop experiences and results amongst other projects to facilitate cross-learning.

5.3 Feasibility Analysis

The Feasibility Analysis forms the second part of the adaptation M&E approach. The goal is to carry out an assessment of SPR technologies implemented in a particular project against certain socio-economic indicators. It is a method to assess the local feasibility of SPR technologies. As for the Effectiveness Analysis, the workshop shall further facilitate capacity development and networking amongst experts and other project stakeholder. The process and the steps to be undertaken are very similar for both analyses.

	Socio-economic indicator 1	Socio-economic indicator 2	…
Adaptation Technology 1	Score		
Adaptation Adaptation Technology 2			
…			

Figure 13: Simplified matrix/scheme of the Feasibility Analysis

The final product of the Feasibility Analysis is a filled-out matrix (see Figure 13). Therefore, invited participants will carry out several steps (see Feasibility Analysis – Implementation). All steps are described in the Excel-based SPR adaptation M&E tool.
The following sections will describe the overall process for the Feasibility Analysis.

The worksheet in Annex 3 – Worksheet contains a checklist, which supports you in following up on the steps to be undertaken during the Feasibility Analysis process.

5.3.1 Feasibility Analysis – Preparatory steps

Define goals and system boundaries

- What are expectations and needs that should be met with the Feasibility Analysis?

- How will the results of the Feasibility Analysis be used for future project work? What would be interesting to know or assess?

- Which intervention zones (or differently defined regions) shall be assessed? Please, insert this information in the introductory tab in the Adaptation M&E tool which will be used for the workshop.

Determine internal resources to prepare and facilitate the workshop

- For how long can the workshop be? E.g., one full day or two half days? Please choose an appropriate setting according to your experience and local customs. We recommend two workshop days with shorter sessions and hence more time for networking etc. Please insert the key data in the worksheet in Annex 3 – Worksheet

- Who will be responsible for the workshop? Can other project team members or external consultants facilitate the workshop? If yes, how many?

Determine roles and responsibilities for workshop facilitation and document them in Annex 3 – Worksheet: We recommend having one or two moderators (= person responsible for the workshop, they will present the tasks, keep time, and moderate the discussions), one or two documenters (documenting the discussions during the workshop), and one technical facilitator helping with technical issues (projector etc.). The number of experts who can be invited should be limited by the number of facilitators. We recommend a group of 5-10 people for the Feasibility Analysis. But please adjust this number if you think that it better fits the local conditions.

Gather useful project documents and information to support the workshop

A core challenge for the Feasibility Analysis is to capture the perspective of the target group within the process and the evaluation. Ideally, representatives from the target group participate directly in the workshops. If this is not feasible, making use of existing data and information from other sources within the project, such as household and individual surveys (e.g., see example on application survey from Kenya) can be a valuable input to the process. Particularly information on benefits and barriers from the application of technology packages can be used as an input for discussions, to make sure these aspects are reflected in the scoring. The input can be prepared in advance and the moderation can keep an eye that these aspects are considered in the evaluation.

Select experts

As for the Effectiveness Analysis, the assessment shall be conducted by external stakeholders, which should represent the perspective of the target group of the project. According to what is feasible, these stakeholders can be representatives of the target group or intermediaries such as extension providers. Please make sure, that stakeholders are represented for each SPR technology, who, for example is either involved in its implementation, application or consultation. The practical knowledge about the operating principles and local impact is necessary for the proper assessment. Table 2 in Annex 3 – Worksheet provides guidance on how to identify and select appropriate experts. It gives an orientation what expertise is needed and were it could be possibly sourced. Please make also use of the stakeholder map or list of your project, if available.

Chose date and location of the workshop

Considering the selected experts' availability and the availability of other workshop facilitators, choose a date and an appropriate location.

Draft workshop plan (internal use)

The document Annex 4 – Workshop plan provides a template for a detailed planning of the event. It contains the different implementation steps, which you can refer to in the chapter Feasibility Analysis – Implementation. In the plan you can insert the detailed time plan of the event, envisaged breaks, the tasks, and the persons responsible for it.

Draft workshop agenda and participant list (external use)

Based on the prior created workshop plan, please also draft a shortened workshop agenda for the participants of your workshop. The agenda shall further contain a list of participants and their expertise (see Annex 5 – Workshop agenda).

Soil samples taken for mobile soil testing service in western Kenya

Technology	Includes for example
☑ N-Fixing plants or cover crops	legumes, oilseeds, cover crops
☑ Mixed cropping	intercropping, double cropping, crop rotation, relay cultivation, strip cropping
☑ Composting	vermicomposting, basket compost, anaerobic compostinga
☑ Nutrient application	animal manure, bioslurry, microbial inoculants, biofertilizer, mineral fertilizer refinement, silt application, use of olive press cake
☑ Improved seed management	improved varieties (short growth cycle), seed priming, collecting and reserving seed for the next season
☑ Pest disease management/ plant protection	biopesticides, integrated pest management, invasive species control, push and pull, seed treatment
☑ Improved sowing	line sowing, staggered sowing, dry sowing, early sowing, adapt seed rate
☐ Soil preparation methods	Contour ploughing, Ridges and furrow methods, No/reduced tillage, Crop residue management
☑ Mulching	Soil cover
☑ Agroforestry	n-fixing trees and shrubs, hedges and life fences

Figure 14: Technology selection based on SPR adaptation M&E tool

Select technologies in survey expert sheets

To conduct the Feasibility Analysis, it is necessary that the project selects the technologies they implement in the adaptation M&E tool (see example in Figure 14). The first tab in the sheet is named "Preparatory task" and contains a list of SPR technologies and what is understood by them. Please select all the technologies you want to assess during the analyses. Depending on the number of technologies you work with, it is helpful to prioritize e.g. which are most relevant in terms of scale or promising regarding their adaptation effects. The selected technologies should be consistent with the list from the Effectiveness Analysis. The ticked technologies will now appear in the assessment tab. After completing the task described, please hide this sheet as it shall not be amended by the workshop participants (In the Excel tool: Right click on the sheet > hide).

Invite stakeholders and send preparatory documents

Prior to the workshop, your project sends preparatory instructions, such as expert survey sheet, encyclopedia, agenda) to the workshop participants (see Annex 3 – Worksheet).

Team briefing on workshop implementation

To best prepare the workshop, organize a briefing with project team members to familiarize yourself with the expert survey sheet and discuss it with your co-workshop facilitators. Please also go through the workshop plan and the process of workshop implementation.

Further read the following sections on workshop implementation and following steps. The following steps and instructions focus on the workshop itself. They will provide guidance on the individual tasks to be undertaken on the day(s) of the workshop.

5.3.2 Feasibility Analysis – Implementation

Introduction

The introduction into the workshop forms an integral part of the implementation. It will be decisive for the process success and strongly determine the quality of results. The purpose of the introduction is to create a common understanding among the participants on the process, the scoring system and the technologies to be assessed. Furthermore, the introduction shall be laying the foundation for a trusting workshop atmosphere. Therefore, the introduction should include at least the following aspects (which can also be found in Annex 4 – Workshop plan):

- Welcoming and introduction of the participants and their backgrounds
  - Round of introduction
- Introduction of the project and adaptation M&E
- Present workshop agenda and explain individual tasks and steps
  - Use Excel-based adaptation M&E tool to explain process (share your screen (for online), use beamer, or print working sheets for each participant) or create an analogue version e.g., on a pinboard
  - Explain scoring exercises (goal maximum of objectivity, and global comparability)
- Clarify goal of the workshop
- Present the respective technologies to be assessed by the participants
  - Use Annex 2 – Technology encyclopaedia as information base
  - Make sure that there is a common understanding among all participants
  - Here, you can integrate individual participants to benefit from their specific stakeholder knowledge

Step 1: Describe socio-economic indicators

Just as essential as the creation of a common understanding about the technologies, is the clarification of indicators and what aspects must be considered for their assessment. You can find extensive explanations in chapter 4.1 Linkages between climatic impact drivers and risks or in the adaptation M&E tool for the Feasibility Analysis. Go one by one through all indicators and make sure, that every indicator is well understood and interpreted the same way by each participant. This is very important for achieving an objective assessment. To make the indicators easily digestible, it can be helpful to leave out their technical definition and distil them down to one simple question such as: “How high are the costs to start this technology?”. This will be particularly relevant if you work directly with the target group. Please be aware that the way in which you phrase the questions might inverse the scale. If this is the case, you can correct it when documenting the results.

Step 2: Assess local feasibility of adaptation technologies

In this step the actual assessment of technologies against the socio-economic indicators is carried out. As for the Effectiveness Analysis, a five-level scale of “1 = very low local feasibility, 2 = low local feasibility, 3 = average local feasibility, 4 = high local feasibility and 5 = very high local feasibility” is used for the assessment of technologies, which is to be conducted in the form of qualitative participants judgements (see Annex 7 – Feasibility Worksheet).

Task: Please explain the local feasibility assessment scale from 1–5 to the participants.

Again, you can use the Delphi Method and follow the steps below to reach the local feasibility score:

Simplified scoring instead of Delphi method (if required)

Depending on the stakeholders, that will finally attend the workshop, the approach must possibly be adapted, and a simplified scoring will be needed. Instead of assigning numbers on a scale from 1-5 for each technology, they could be printed on pictures, and you could think of putting them into order according to certain criteria. E.g., you could ask: What is the most expensive one? Or: Which technology is most often used by women? Or: Which one requires the hardest work?

Subsequently, you can "translate" the order of technologies into the final scoring from 1–5.

1. Distribute enough paper cards to all stakeholders.

2. Display the assessment tab of the adaptation M&E tool with a beamer visible to all participants.

3. Read the first adaptation technology, which you pre-selected in the adaptation M&E tool .

4. The participants are now invited to write a score on a paper card for each indicator (one card per indicator). Please make sure that each score can be attributed to the respective indicator.

5. Collect all score cards, pin them on the front board and assign them to the corresponding indicator (the cards should remain anonymous).

6. Go one by one through all indicators. Now, there are two options:
   - Option A: If the scores differ not or only marginally, please use the mean value as final score for the indicators. Enter the final score into the adaptation M&E tool (see Figure 16).

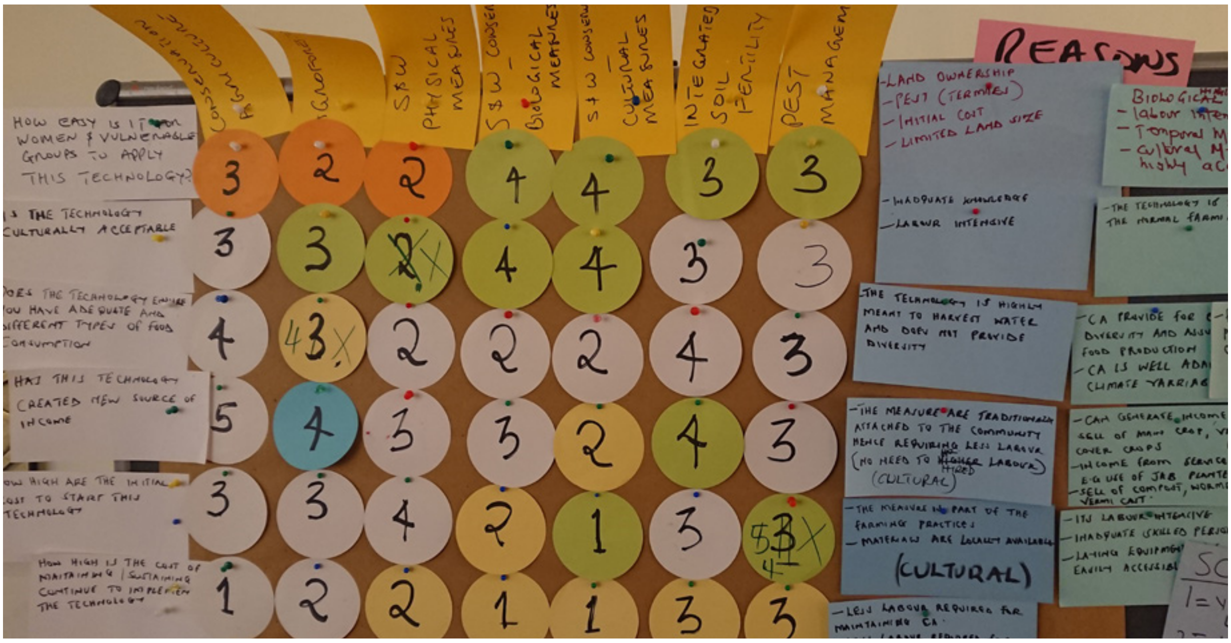

Figure 15: Analog capturing of participants´ scoring

– Option B: If the scores differ greatly, ask the participants to reconsider their scores depending on the other results. Therefore, please encourage them to reveal and discuss their scores and opinions (the documenter writes down arguments and points of discussion in the justification tab).

Every stakeholder is now asked to write their new score on a card again. Display the results again to the front. You can decide whether a second (third) discussion round is required or if you want to build the mean value of all scores to define the final local feasibility score for each indicator. Please see Figure 15 *for an example on how to capture the individual expert scores.*

7. Enter the final scores into the adaptation M&E tool (see Figure 16).

Please repeat this procedure for each adaptation technology and insert the values into the sheet accordingly.

Overarching step: documentation of results

In addition to the quantitative documentation of results in the the adaptation M&E tool, the underlying reasons for the specific assessments must be documented in the justification tap of the expert survey sheet. Only if the rationale behind each assessment is clear, the results are fully useful.

LOCAL FEASIBILITY (1–5)										
Adaptation technology	Socio-economic indicators	Social acceptance	Access of women and vulnerable groups	Direct benefits for food security and/or nutrition diversity	Job creation benefit	Affordable initial investment costs	Affordable maintenance costs	Good access to finances/ inputs	Cost-benefit-ratio	Low level of expertise needed
indicator ranking (Weighting 1–10)		0	0	0	0	0	0	0	0	0
N-fixing plants and cover crops										

LOCAL FEASIBILITY (1–5)										
Adaptation technology	Socio-economic indicators	Availability of knowledge and training	Availability of technologies and materials	Adequate labor intensity	Availability of labor	Upscaling potential	Low requirement of institutional support	No negative side effects	Average local feasibility per technology	Weighted socio-economic indicator
indicator ranking (Weighting 1-10)		0	0	0	0	0	0	0	0	0
N-fixing plants and cover crops										

Figure 16: Example assessment of technologies against socio-economic indicators based on SPR adaptation M&E tool

The following questions should be covered and documented by the protocol writers:

- What is the reasoning and argumentation for specific scoring?
- Why are specific technologies locally more feasible than others?
- What would be needed to make them more feasible? Or is this technology only hindered with respect to specific indicators?

Step 3: Feedback and closing

Get feedback from the participants on the workshop and the process. Document the learnings in the Annex 6 – Workshop learnings. You can make a flashlight round to gather the perspective of each participant, but you can also ask for written feedback. Ask the participants how they learnt and felt during the workshop and what they would like to improve.

5.3.3 Feasibility Analysis – Analysis

Depending on your workshop goals, the analysis can have different focusses. To identify the average local feasibility of each technology, the adaptation M&E tool contains a column "Average local feasibility of technology", which is the unweighted average of all indicator ratings for one technology. The results under "Weighted average local feasibility of technology" calculates the averages by also accounting the weighting of indicators. Both provide information on the most feasible adaptation technologies. The row "Average indicator coverage" gives insights on how well a certain indicator is covered by adaptation efforts.

5.3.4 Feasibility Analysis – Reflection and archiving

As for the Effectiveness Analysis, a compilation of quantitative and qualitative results of the Feasibility Analysis shall be produced by after the workshop to be of later use. We recommend that all workshop facilitators come together, reflect on the workshop implementation, and look at the filled out excel sheets. Further, everyone should read the workshop documentation notes and complement. Based on these outcomes, draw recommendations on how to improve the adaptation effectiveness of your specific project. Please document the learnings and experiences from workshop implementation in sheet Annex 6 – Workshop learnings. We recommend discussing the results and recommendations with the wider project team to draw conclusion on how to best integrate the results and adjust the technology implementation. Further we recommend sharing the workshop experiences and results amongst other projects to facilitate cross-learning.

6

⑥ References

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7

7 Annexes

Annex 1– Knowledge data base

Please complement and add to the following tables.

Scientific sources for climate change risks assessments

Source	Insert relevant information from sources for both analyses for your intervention zones
CGIAR Climate change, agriculture and food security: https://ccafs.cgiar.org/resources/publications	
CSA Country Profiles: https://ccafs.cgiar.org/resources/publications/csa-country-profiles	
PIK AGRICA Country Climate Risk Analyses: https://www.pik-potsdam.de/en/institute/departments/climate-resilience/projects/project-pages/agrica/downloads	
WOCAT: https://www.wocat.net/en/	
Adaptation Gateway: State and Trends in Adaptation Knowledge Exchange: https://adaptationexchange.org/	
Hazard and Risk identification https://thinkhazard.org/en/	
Adaptation Community	
Evidence for Resilient Agriculture | Agricultural Decisions, Rooted in Data. (cgiar.org)	
For Ethiopia: EDACaP-AgroClimate Advisory – Ethiopian Digital AgroClimate Advisory Platform (ethioagroclimate.net)	
For Ethiopia: Climate-Smart Agriculture in Ethiopia (cgiar.org) climate smartness index of different technologies	
Climatic Impact Driver Assessments https://www.adaptationcommunity.net/news/new-publications-assessment-of-climatic-impact-drivers-for-subregions-in-benin-burkina-faso-ethiopia-india-kenya-madagascar-and-tunisia/	

Relevant ProSoil project sources and documents

Source	Relevant information for both analyses for your intervention zones
Gender Survey	
Adoption survey	

Annex 2 – Technology encyclopaedia

The technology encyclopaedia is an important tool to convey the functioning and possible impact of each ProSoil technology to experts and stakeholders. The understanding of the technologies is the precondition for the assessment of their effectiveness or local feasibility. The descriptions should be as comprehensive as possible, but contain at least the following aspects:

- Name (locally used) & ProSoil term of technology (please refer to refer to the excel-based SPR adaptation M&E tool),
- One or more pictures,
- General description,
- Purpose and benefits,
- Establishment and maintenance: activities, inputs, and costs,
- Further relevant information.

The following example technology descriptions can be helpful to create your own encyclopaedia. The necessary information can be gathered from local implementation partners or public sources such as WOCAT, which is the *Global Database on Sustainable Land Management* and contains many descriptions on different technologies and approaches from all over the world. Maybe there is also a technology compendium available in your project.

Handling of soil samples for mobile soil testing service in western Kenya

Name of the technology	GABION CHECK-DAM

General Description

Gabions are rectangular boxes of varying sizes and are mostly made of galvanized steel wire woven into mesh. The boxes are tied together with wire and then filled with either stone or soil material and placed as building blocks. Gabions are filled in situ and as they are very heavy they will not be washed away provided they have been correctly installed. The purpose is to stabilize and rehabilitate gullies and convert gullies into productive land.

The main advantages of gabion check-dams are that they are tough and long lasting provided that the wire has been well galvanized. Furthermore, they are somewhat flexible and can be installed where the surface is uneven. They can be used to stabilize gully sides, gully heads, roadside embankments, river banks and even landslips.

Fig. 1 Gabion Checkdam – Somali karamara

Geographical Extent of Use

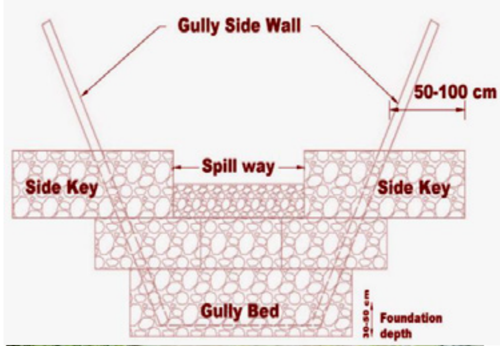
Gabion check-dams are suitable in all kinds of agro-ecologies where gullies are formed and extended. Gabions can be constructed with stone in area where stone is available. In areas where stones are not available it can also be made with soil/sand filled bags together with plantations. Installing gabions is not a substitute for land misuse and, if the land is denuded, installing gabions will not solve the problem unless vegetation cover restored. Gabion-check dams are commonly used to check large gullies on highly eroded grazing and cultivated lands and hillsides combined with catchment treatment and protection. Gabion check-dam could be used in a wide range of conditions: to treat big gullies, to construct retaining walls on gully/river banks, to make fords for access roads and to strengthen irrigation structures.

Design Considerations to Build a Gabion Check-dam

- Gabion check-dams are built usually not higher than 1.5 m spillway height in the first year. After sediments have been deposited behind the structure, it is possible to raise the spillway height by adding additional gabion boxes. The foundation, apron, side key and spillway are the important parameters to be considered during designing of gabion check-dams.

The sele ctio	Gabion size (m3)	2.5 mm wire	3.5 mm wire	Tying wire (kg)	Share of each size during
1.	2 x 1 x 1	12.0	2.3	0.6	60
2.	2 x 1 x	8.5	1.7	0.5	20
3.	1 x 1 x 1	7.0	1.5	0.4	15
4.	1 x 1 x	3.4	0.9	0.3	5

- If stone is not available in close proximity, the gabion boxes can be matted (covered) in the inner part with plastic sheet and then filled with soil material. This will serve the purpose of stone filled gabion check-dam if properly constructed following design specifications (see picture on the right).

Layout and Construction Procedures	
• The foundation depth (key trench) should not be less than 30 - 50 cm • The foundation width is 1m and the structure should be plugged 0.5 - 1 meter to each side of the gully wall /abutment/ right up to the height of the dam. • Construct apron from downstream side of the structure with a foundation of 30cm from a dry stone or with a gabion box with a width of 1.5 times the reservoir level. • The spillway should be adequate to allow the peak flows, without overtopping the dam (see annex 6 for details). • Stones to be used for filling the gabions should be, hard and of sufficient size and should be placed tightly together • Gabions should be constructed on spots where the soil depth is higher, preferably in a wider part of the gully next after a series of loose stone check-dams • It is neither necessary nor economical to build a series of gabion check-dams to control channel erosion along the gully beds. • Gabions need to be closed by using large spanners (closers) and should be wired together • If there is more than one layer of boxes in a gabion-check dam, the ones in the upper layer must be laced to those below. A strong inter-connection of all units is an important feature of the technique. Therefore, it is essential that the lacing is done correctly.	 

Period of Implementation Across Season	Planning and Mobilization Requirements
The construction of gabion check-dam is labor demanding. Therefore, the construction time should fit to the time when pastoralists properly settled so that they can avail labor as required. The preparation of various sizes of gabion boxes, tie wire and closing equipment should be prepared in time in order to ensure smooth implementation process during the actual work. There may be small maintenance works that could be undertaken during the rainy season.	The collection of stone and the whole construction process demands mobilizing of the available local labor. As a result, the community members: those who have land around the gully and those who will be getting direct and indirect benefit from the rehabilitation work shall discuss together and agree on the labor contribution. To manage the rehabilitation work efficiently, a community-based gully rehabilitation action plan need to be prepared and communicated to all concerned.

Cost elements and Work Norm	Integration and Management Requirement
The work norm includes stone collection, foundations/key excavation and proper placement of gabion boxes, stones filling and construction of drop/apron structures. The placement of stones in the gabion box requires skill and experience. Hence the overall work norm is 1.25m^3/7PD. In terms of labor, gabion structure is expensive. Cost of materials (gabion box and tie-wire) have to be considered here.	The gabion structures are stronger compared to other types of check-dams. But their effectiveness depends on the overall upper catchment treatment and integration of technologies in a gully. In this regard, planting the gully sections with appropriate species is vital for successful rehabilitation of a gully.

Benefits and Acceptability	Limitations
The gabion check-dams are beneficial particularly for rehabilitating medium and large gullies. As such check-dams are going to be constructed in locations where there is a good pounding area upstream, patches of lands can be created on which economical crops and vegetation can be planted. The contribution of gabion-check-dams for recharging streams and water harvesting in a gully is also an important benefit to be considered.	• The major limitation of these types of check-dams is their high cost in relation to the gabion boxes which cannot be afforded by small holder Farmers. • On the other side, if such structures are destroyed by runoff (running water in the gully) the damage could be even worse than before treatment.

Name of the Technology	DRY STONE MEASURES (DSM)

General Description

Dry Stone Measures (DSMs) follow a catchment approach and reduce degradation while preventing gully erosion over large areas of land. They reduce the speed of the water, retain organic matter and must have a limited water spreading effect.
DSM is semi-permeable and made of stones only. They are built in a right angle to the water flow forming a horizontal line. A DSM can either span a whole valley or it can be constructed in small gullies.

Fig 1 Dry stone measures Afar - Chifera

Geographical extent of use

DSMs are generally best suited in drier areas and terrains with slight lateral slopes. Especially in the early stages of degradation such as decreasing yields and biomass or biodiversity. Furthermore, the selected gully should not be deeper than 1 to 2 meters. Applicable in a broad range of land uses, particularly in rangeland area with some level of stoniness.

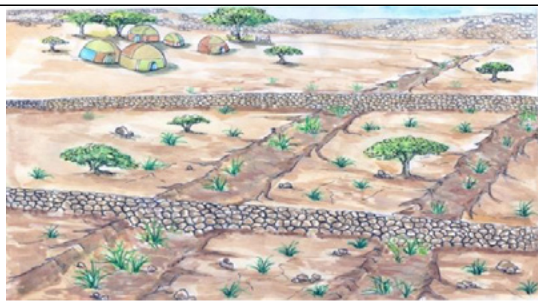


Fig.2: Sequence of two dry-stone dams. Sediment and water infiltrate, enriching the land above and below the dry-stone dams

Technical Design Requirements

Technical standards:

- DSMs are constructed in a straight line, 90° towards the gully
- The ratio between height and width of the structure is 1:3, however in difficult cases where high water flows are expected in can be up to 1:5
- For the front and back wall, the minimum diameter of stones is 25 cm

Filling can be done with smaller gravel and smaller stones with a diameter of maximum 10 cm. Cover stones should preferably be large and flat

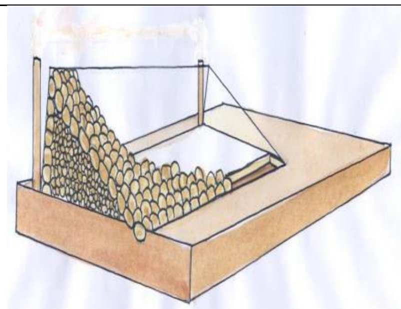
Layout and Construction Procedures

Layout:

- Site selection should be done together with the community; Training of communities on DSM necessary.
- Preparation for follow-up on maintenance; Preparation for land use plan
- The distance between two DSMs depends on the level of degradation and slope gradient.
- The height of the DSM should correspond with the bottom level of the upstream DSM.
- Drystone structures are built like a triangle, forming a low wall with a slight inclination towards the hillside and decreasing height downstream as figures below show
- Skills in using and placing stones are required. Follow-up on maintenance
- For layout making: Long rope and wooden poles, measuring tape or marked string and spirit level
- Tools: Crow bars, shovels, pick axes, spirit level, sledge hammers and equipment to carry stones like stretcher "barella"

Construction Steps:

1. Demarcating the position of the DSM that is planned in a straight line, at 90° to the gully and using a spirit level. Low and short DSM can be done by eye
2. Before the construction begins at least 50 % of the stones should be on site.
3. Start construction by placing big stones below the rope that is demarcating the upper border line of the structure. Big stones have an approximate size of 30 by 30 cm. Excavate a small ditch and place the big stones into it at the downstream end of the structure. Consider for the ditch a distance to the up line with the ratio between 1:3 and 1:5 (height: width).



Fg.3: Dry Stone Measures under construction

4. Smaller stones should be used to fill the structure
5. Once the planned height is reached cover it with big flat or round stones from the top to the bottom

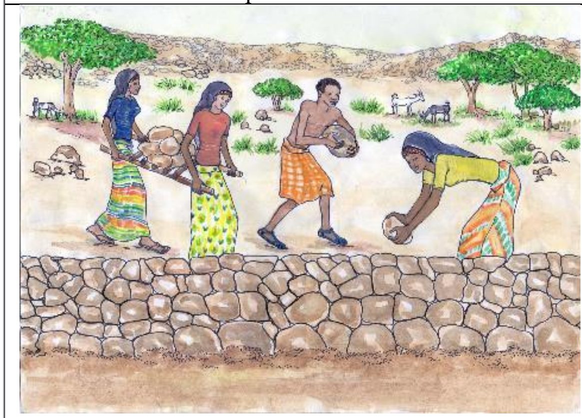


Fig. 4: Drystone Structure, almost finalized. Community team members bring big flat stones to cover the small stones

Fig. 5: Women are part of the construction as well

Fig. 6: Transportation of big stones needed for the construction

Fig. 7: Organic matter will sediment and water infiltrates, enriching the land above and below the drystone structure

Cost Elements and Work norm

Work norms for stone bund construction is applicable for DSM. 350 PD/km (includes from stone collection up to construction).

Limitations

Availability of stone near by the construction site and the possible destruction by livestocks.

Name of Technology	STRIP CROPPING

General description

Strip cropping is a cropping practice where strips of two or more crops are alternately established on a contour, or it is a system of establishing more than one crop in alternate strips following a contour pattern for the purpose of erosion control, crop diversification and control of diseases associated with the use of single crops. This cropping system is designed as a defense mechanism against soil erosion in areas where the cropping system is dominated by row/sparsely grown crops that expose the ground to erosive forces. Crops are sown in strips following row planting techniques, one being a soil depleting crop and the other soil conserving/fertility restoring crop. If the main crop is maize or sorghum, the second crop can be a legume (e.g. beans, cowpea, chickpea, etc.) that forms good groundcover. In this case, maize is regarded as soil depleting/degrading crop while the legume is soil conserving crop. Erosion is largely limited to the cereal row-crops and the soil removed from these strips is trapped in the next strips, down slope, planted with the legume-row soil conserving crops.

Purpose and benefits

This measure is intended to control soil erosion and if well designed can effectively conserve soil on slopes<5% and is best suited to well drained soils. This practice is useful for soil conservation on slopes <5% without additional conservation structures and needs to be combined with other conservation measures above such range.

Agro ecology	Design and method of application
The practice can be applied to most of agro ecological zones on gentle slopes, particularly in areas where sparely grown crops such as maize and sorghum cultivated. Different forms of strip cropping exist in some areas but rarely done in an organized way. This practice can be adapted if strips are developed using flexible modalities and do not follow rigid patterns of distances.	Strip width vary with the degree of erosion hazard but are generally between5, 10, 15 and 20m with narrower strips on steep slopes and wider strips on gentle slopes. Planting technique is traditional except that it is along the contour. To increase effectiveness of the strip cropping for erosion control, the density of the legume crops should be higher than under normal conditions. However, on steeper slopes it may be necessary to add grass buffer strips of 2 to 4 m wide, placed at 10 to 20 m interval.

Complementarities and integration opportunities	Management Requirements	Acceptability and sustainability
The potential to increase productivity results from the combined effects of soil conservation and soil fertility improvement as well as from the value of the crops chosen for strip cropping. Integration with grass strips and other moisture conservation structures can reduce runoff and increase moisture conservation in moisture stress areas resulting in higher production. In general, integration of other moisture conservation, soil fertility improvement and suitable agronomic measures are recommended for optimization of both the economic and ecological benefits.	When legumes are harvested, residues and roots should be left on the field and eventually incorporated. The protection of livestock interference is the major and most important aspect to optimize the ecological and economic benefits from the practice.	Indeed, this technology can grant both ecological and economic advantages if properly designed and the right type of legume species used. Therefore, its level of acceptability and sustainability depends on the competence and commitment of technical staffs providing the technical supports in particular and effectiveness of the agricultural extension system in general.

Constraints and limitations

The practice is not traditionally well known by Farmers in Ethiopia and Farmers could be reluctant to adopt it. However, the integration of appropriate moisture conservation in moistures stress areas and soil fertility management techniques in general can encourage Farmers to adopt the practice from practical benefits demonstrated.

Source: MoA, 2020: Community Based Participatory Watershed and Rangeland Development: A Guideline. Ministry of Agriculture, Addis Ababa, Ethiopia.

Annex 3 – Worksheet (for both analyses)

This worksheet can be used to follow up on the preparatory tasks prior to the workshops. The sheet contains the relevant steps and information for both analyses and can be used for both workshops.

1. Workshop design (online/offline): ....
2. Intervention zones to be considered: ....
3. Date(s) and length of workshop: ....
4. Workshop location: ....

Checklist – What needs to be done prior to the workshop?

- ☐ Compile or update climate risk data base (only necessary for the Effectiveness Analysis)
- ☐ Compile or update technology encyclopaedia
- ☐ Define goals with your team
- ☐ Select experts and stakeholders for workshop participation (Table 2: Lists of possible workshop participants)
- ☐ Chose date and workshop location
- ☐ Determine personal for workshop implementation and define roles and responsibilities (see Table 1: Roles and responsibilities)
- ☐ Prepare workshop agenda
- ☐ Pre-select adaptation technologies in the Excel-based adaptation M&E tool
- ☐ If necessary: reduce or pre-select climate risks (only necessary for the Effectiveness Analysis)
- ☐ Invite experts and send preparatory documents:
- ☐ (1) Assessment of Climatic Impact Drivers (only for the Effectiveness Analysis)
- ☐ (2) Technology encyclopaedia
- ☐ (3) Workshop agenda + participant list
- ☐ Insert relevant adaptation technologies in justification sheet

Table 1: Roles and responsibilities (for both analyses)

ON-SITE WORKSHOP	TASKS AND BEHAVIOUR	NAMES
Moderator	Lead process and discussions, encourage, keep everyone involved and motivated	
Visualizer	Insert values in the expert survey sheet	
Documenter	Document statements and arguments of experts in justification sheet	
Tech. Responsible	Keep time, make sure that the necessary IT is working	

Table 2: Lists of possible workshop participants

Effectiveness Analysis – List of possible workshop participants

When selecting the experts, the proven expertise is the main criteria that should be considered. However, also other criteria such as the experience with similar workshop formats, public speaking, or science communication can play a role to ensure a fruitful discussion and workshop.

AREAS OF EXPERTISE						
Institutions	**Stakeholder names**	**Climatology & climate change**	**Agriculture and Soil**	**Environment**	**Water resources**	**Other**
Research institutes						
Universities						
Ministries of Agriculture and Environment						
Civil society organizations and NGOs						
Climate and weather stations						
Funding bodies						
Local representatives of international organisations						
Representatives of administrative units						
Related GIZ projects and programmes						
Service providers						
Private companies						
Other						

Feasibility Analysis – List of possible workshop participants

AREAS OF EXPERTISE					
Institutions	**Social, gender equality**	**Economical and financial**	**Technical**	**Farming and agriculture**	**Others**
Male representatives of target group					
Female representatives of target group					
Community leaders					
Extension service providers					
Representatives of farmers organizations (e. g. cooperatives)					
Local NGOs					
Representatives of administrative units					

Annex 4 – Workshop plan

This workshop plan can be used as a template, to structure the workshop implementation, assign tasks and responsibilities to the team members, and keep the overview of time and processes. The structure is a suggestion and can be adapted to the individual needs regarding time lengths and days. The structure can be used for both analyses and needs only be adapted accordingly.

WORKSHOP WITH EXTERNAL STAKEHOLDERS– ELABORATED BY HFFA RESEARCH GMBH			
Time	What	**Content**	**Who?**
	Welcoming & Introduction	- Welcoming words from project team - Make brief introduction round (name + institution + position + area of expertise) - Present the agenda - Explain roles and responsibilities (moderator, visualiser, documentation, etc.) - Explain workshop rules (e. g. for online workshop: log in with your real name; minimize use of chat; rather ask in person during Q&A and debriefings; turn on your camera; muting when in the big hall; in case of technical problems, write in chat)	
	Briefing	**Describe the monitoring system and the evaluation process of the analysis** - What do we want to achieve by the end of the workshop? Results? - Describe the detailed evaluation process by going step by step through the Excel-based SPR adaptation M&E tool - Describe focus of the Effectiveness Analysis (technical expert evaluation) and the Feasibility Analysis (target group) - Goal is to fill the matrices for all relevant technologies by finding a group consensus or by forming an average - Q&A session: Is the rating system understood?	
	Familiarisation with technologies	- Go step by step through all technologies and explain them and how they are implemented, use pictures from encyclopaedia - Before you start with the next steps Make sure that there is a mutual understanding about the technologies among participants	
BREAK (suggested)			

WORKSHOP WITH EXTERNAL STAKEHOLDERS– ELABORATED BY HFFA RESEARCH GMBH			
Time	What	**Content**	**Who?**
	Step 1: Selection and scoring of climate risks	- Open SPR adaptation M&E tool and show tab "Step 1" which contains the climate risks, or use simplified excel sheet, a table on a whiteboard etc. - Go through all risks and discuss whether they are relevant for the intervention zone. - Select the relevant ones in the adaptation M&E tool. - After the selection, please score all selected risks (Make sure, that all participants are involved and get the opportunity to speak)	
	Step 2: Assessment of adaptation technologies	- Open tab "Step 2" - Assess all appearing technologies against the appearing climate risks (Make sure, that all participants are involved and get the opportunity to speak)	
BREAK (suggested)			
	Analyses	- In tab „Step 2", you can immediately see the results for the average effectiveness and risk coverage - Show and quickly present the results to the participants - Do not interpret the results, but explain, that the analyses and interpretation will be conducted after the workshop and compiling quantitative as well as qualitative results	
	Debriefing and feedback session	- Ask the participants on their impression regarding the workshop, what did they like most and what they would improve, what did they learn etc. - Explain next steps - Explain usage of results	
	Conclusion	- Concluding remarks	

Annex 5 – Workshop agenda

Climate Change Adaptation Monitoring and Evaluation – Workshop on the assessment of the [effectiveness/local feasibility] of adaptation technologies

WORKSHOP AGENDA	
Time	**What**
	Welcoming & Introduction
	Briefing on monitoring system and evaluation process
	Familiarisation with climate adaptation technologies
	Step 1: Selection and scoring of climate risks
	Step 2: Assessment of adaptation technologies
BREAK	
	Debriefing and feedback session
	Conclusion

WORKSHOP PARTICIPANTS		
Name	Institution	Expertise / Role in the workshop

Annex 6 – Workshop learnings

What went well? (Technically, organizationally, content wise etc.)	
What went not well? (Technically, organizationally, content wise etc.)	
What could be improved and how?	

Annex 7 – Worksheet Feasibility

Instruction: Please discuss in your group and indicate your level of agreement with the statements listed below for each indicator

		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Indicator	**Statement**	**1**	**2**	**3**	**4**	**5**
Access of women and vulnerable groups	The technology is easily accessible for women and vulnerable groups.					
Social acceptance	The technology is socially accepted with regards to traditional and/or cultural habits.					
Direct benefits for food security and/or nutrition diversity	The technology increases yield and/or food diversity.					
Job creation benefit	The technology creates new jobs or employment opportunities for local people/daily laborers.					
Affordable initial Investment costs	The necessary equipment and inputs to start implementing the technology are affordable.					
Affordable maintenance costs	The target group can afford the technology maintenance costs.					
Good access to finance	There are subsidy/credit/policy schemes to support direct investment and/or maintenance costs for the technology.					
Cost-benefit ratio	Considering investment and maintenance costs, farmers still get more benefit from implementing the technology.					
Low level of expertise required	There is Low level of expertise required to implement the technology.					
Availability and accessibility of know-ledge and training	The required (expert) knowledge and training on the technology is available in the country or region.					
Availability and accessibility of farm						
Equipment and inputs	The necessary materials needed for the technology implementation are available in the communities.					
Adequate labour intensity	The technology is easy to implement and not labor intensive.					
Availability of labour	There is availability of sufficient labor and manpower at household level.					
Upscaling potential (context specificity)	The technology can be easily replicated in time and space by any farmer.					
Low requirement of Institutional support	Farmers don't need support from the municipality / state /other organizations to implement this technology.					
No negative side effects	The technology has no negative impact on the farmers, their family, the community or the environment.					

Imprint

Published by the
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

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Bonn and Eschborn, Germany
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rehabilitation for food security
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Programme/project description:
Global programme Soil protection and rehabilitation for food security

As at
August 2022

Design
Iris Christmann (cmuk), Wiesbaden

Photo credits
Cover: Jörg Böthling/GIZ
Samuel Assefa/GIZ: page 32, 40,42, 48
Jörg Böthling/GIZ: page 8, 12, 23, 45, 51, 55
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