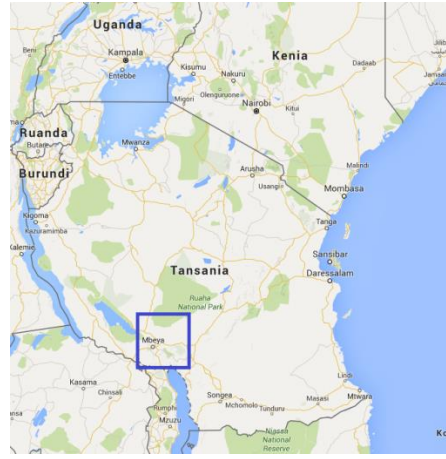


Case Study – Shade Management

Case Study Background Data			
Tool category: Adaptation on the farm		Detail: Planting Density: ☉ 0-1000 /ha Soil Type: Loamy soil Shade Regime: 0-10% Farming System: Traditional agro-forestry system Yield Range (kg cherry/ha): 2001-4000 ☉ rain : 900-1800 mm/year	
Variety: Arabica			
Climatic Hazard: <ul style="list-style-type: none"> • Wind • Drought • Prolonged rain 			
Expected Outcome: <ul style="list-style-type: none"> • Reduced flower abortion • Improved soil fertility • Increased soil moisture 			
Implementation Date: 22.10.2013 – ongoing	Altitude: 1647.4m GPS: 8°35'24.0"S 33°13'48.0"E	Slope of plots: <10% ☉ Age of trees: 5-10 years	
No. farmers: 320	☉ Area under coffee: 1.5 ha/farmer	Tested with smallholders	
Results			
<p>Proper shade tree management helps protect the coffee plant from excessive heat and reduces its exposure to direct sunshine. In addition, shade trees can act as windbreaks and also contribute to soil fertility by providing organic matter and nutrients from falling leaves and small branches. However, shade management is not just about planting shade trees, but about proper spacing and choosing the right species that will not compete for nutrients and water with the coffee plants.</p>			
Pros & Advantages + Learnings		Cons & Disadvantages + Things to take into account	
<ul style="list-style-type: none"> • Improved soil fertility and structure through nitrogen fixation. • Reduced flower abortion, resulting from high temperature. • Reduced soil erosion where shade trees also act as windbreaks. • Moreover, shade trees protect the coffee plants in case of extreme weather such as frost, storms or heavy rains, which may affect the coffee fruits and leaves. • Some shade trees provide further benefits (e.g. fruits, timber). 		<ul style="list-style-type: none"> • Shade trees take a long time to grow and show visible effects only after at least 5 years. • Choosing the right species needs to take into consideration additional benefits (e.g. fruits, timber). • Recommended spacing of shade trees needs to be taken into account. 	
Acceptability	High	Effectiveness	High
Affordability	High	Timing / Urgency	Low

What is the objective of applying the adaptation option and how do we expect the objective to be met?

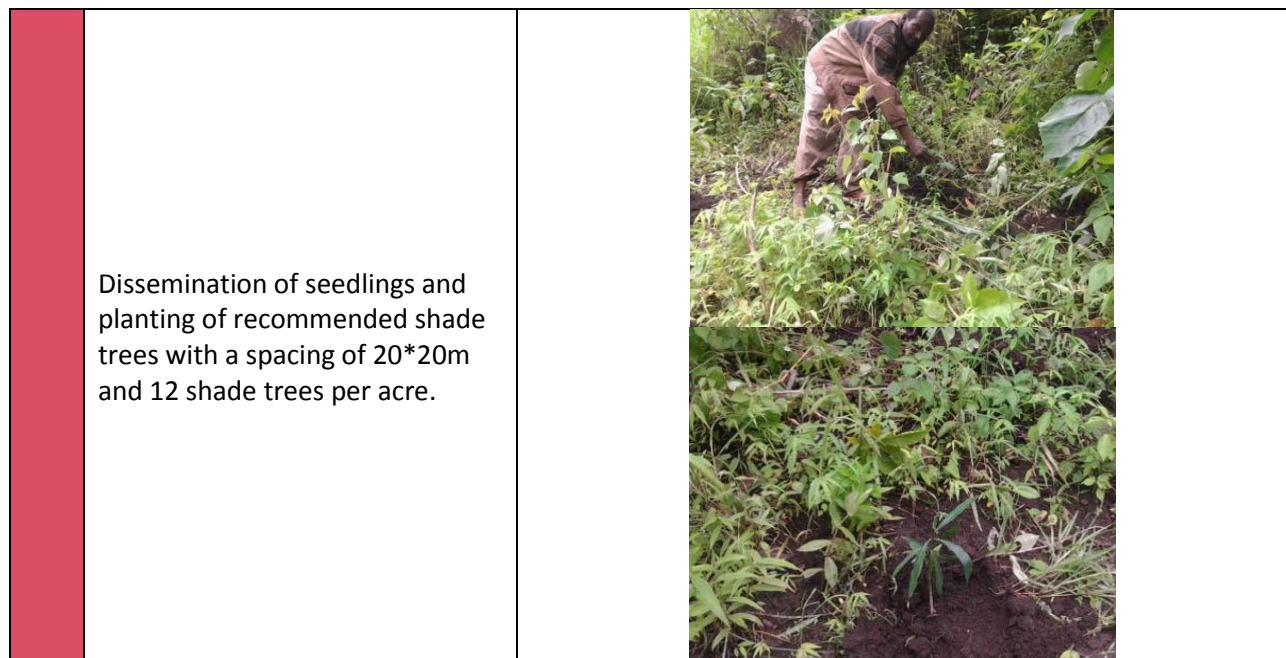
Description of climatic hazard and associated problem: A participatory climate risk assessment, the triangulation process (see also tool 'risk evaluation') has shown that extreme weather conditions such as excessive heat and drought, intermittent heavy rains and windstorms pose a serious challenge for smallholder coffee farmers in Mbeya rural, Tanzania. It is well known that coffee doesn't like extremes and is particularly vulnerable during the flowering phase.

Description of expected outcome: Using shade to protect the coffee trees is expected to reduce the crop stress and decrease the soil moisture loss caused by excessive heat. In addition, the organic matter from the shade trees should improve the soil fertility and structure.

How is the adaptation option applied?

Nr.	Step	Picture
1	<p>Training on shade management including:</p> <ul style="list-style-type: none"> • Sensitization on the negative impact of changing and extreme weather conditions on coffee • Training on importance of shade management • Discussion on suitable species for shading in coffee 	
2	<p>Field assessments showing different types of shade trees and their advantages on demonstration plots:</p> <ul style="list-style-type: none"> • Managed shade trees in the field, i.e. ficus sp. 	

<p>3</p>	<p>Field assessments showing different types of shade trees and their advantages on demonstration plots:</p> <ul style="list-style-type: none">• Intercropping coffee with food crops such as bananas	
<p>4</p>	<p>Field assessments showing different types of shade trees and their advantages on demonstration plots:</p> <ul style="list-style-type: none">• Shade trees planted to act as windbreaks spaced 3 to 4m, i.e. grevillea sp.	
	<p>Establishment of a tree nursery with seedlings of ficus sp, syzygium sp, and acacia sp close to a water source.</p>	



Implementation framework

The case study is implemented within the pilot project of the initiative for coffee & climate in Mbeya rural, Tanzania since end of 2012. As part of the national program implemented by the Hanns R. Neumann Stiftung (HRNS) in Tanzania, the c&c pilot project is targeting 1,300 coffee farming households. Besides facilitating discussions on the impact of climatic changes on coffee production, HRNS is supporting testing of different adaptation options on demo plot level. Demo plots are part of farmers' fields who are members of farmer groups, which use the demo plot as training grounds as well as show grounds for best agricultural practices.

Observations and discussions on benefits of shade trees and proper shade management were conducted on 6 demo plots as well as farmers' fields in the Mbeya rural district in season 2013/14. 320 farmers participated during the discussions on the impact of climatic changes on coffee production and shade tree management as potential adaptation tool. Since it takes time until newly planted trees can actually produce shade, systematic observations have been made on demonstration plots with existing trees during Farmer Field School sessions. In addition, a shade tree nursery has been established to meet the growing demand of seedlings.

Measurement strategy for effectiveness

Indicator	Level of crop stress
Definition	Occurrence and intensity of crop stress factors as observed by the appearance of the coffee plant.
Purpose	Since weather extremes have a very negative impact on the coffee plant, the overall appearance of the trees can give a good indication of how reducing their exposure to certain climatic hazards can improve their health and therefore result in better yields.
Target	Reduced crop stress and healthier looking coffee plants under shade trees compared to those who are directly exposed to climatic hazards.
Data Collection	The demo plot holders and their farmer group members observe the coffee trees on a field with sufficient shade (20-40%) and those on a field with shade trees covering less than 20% or more than 40% of the farm. The appearance of the coffee trees is compared based on pre-defined parameters. The project staff supports in systematizing the approach and defining the parameters to be observed and facilitates the discussion of the results.
Tool	Before starting with the observations the farmer groups discuss and come up with a list of parameters that in their experience indicate crop stress: <ul style="list-style-type: none"> • leaf rolling or orientation • leaf colour and texture • wilting • flower abortion • diseases
Frequency	During FFS sessions
Responsible	The 6 demo plot holders
Reporting	The results of the comparison are discussed during FFS meetings and c&c trainings within the farmer groups on the demo plots.
Quality Control	Although the data collection method is subjective, farmers are responsible by themselves to collect that information and do the direct comparison. During the discussion in the FFS sessions they become aware of the advantages of proper shade management.

Measurement strategy for acceptability, affordability, timing & urgency

The observations based on the defined criteria were facilitated on demo plots by the demo holders for their group members with support of HRNS staff. In addition, the discussions on effects of proper shade management were taken up during FFS sessions on the demo plots and farmers' fields. In total, about 320 farmers participated in these discussions.

The findings regarding the criteria acceptability, affordability and timing & urgency of the adaptation option shade have been collected during group discussion with farmers.

Main findings of case study

Although many farmers have trees in their fields or are willing to plant some, very few farmers were aware of proper shade management before they were trained and sensitized about correct spacing or suitable species. In the Farmer Field School discussions, farmers observed differences in appearance and yields estimates of coffee trees on fields with proper shade management compared to fields with either too much or not enough shade. They also shared experiences about best tree species in the respective areas depending on the local environmental conditions.

In Mbeya rural suitable shade trees include leucaena, calliandra, albizia, gravellia or sesbania and cordia (known as *muzingati*) especially in drier areas. Farmers have started to plan the improvement of the shade management on their fields. Since proper shade management is a long-term process and needs to be aligned with the overall farm rejuvenation, shade management needs to be properly planned before implementation.

Further participatory on-field research will be conducted based on the defined parameters to validate the advantages of proper shade management as part of the Farmer Field School sessions.

Acceptability	
Leading Question: To what extent did farmers readily accept this tool as useful for implementation and implement it as planned?	
High	Low
X	
High: Farmers readily accepted this tool for implementation and continue to implement it as planned.	Low: Farmers generally did not accept this tool; Or the tool was met with resistance later on, even though farmers initially accepted it.
Please Comment:	
If there was resistance to adopting this tool, why?	No resistance.

If farmers discontinued tool implementation later on in the process, even though they initially accepted it, Why?	After seeing the benefits on the demo plots, farmers have started to implement this adaptation option in their fields.
Did this tool have any external issues or impacts (positive or negative) which influenced its acceptability? (community, value chain?)	Some shade trees were planted to serve for other purposes such as wood and timber harvesting.
Any other comments:	Farmers have been sensitized on proper spacing and suitable tree species.

Affordability	
Leading Question: Are the costs of the tool affordable to farmers taking into account the initial investment, maintenance costs and the availability of inputs?	
High	X
Low	
Don't Know	
High: The initial investment and the maintenance costs of this tool are affordable to farmers from their regular operations and the time it takes to recover the investment is reasonable to farmers.	
Please Comment:	
Are there any external costs? (to society or environment?)	Costs for tree seedlings.
If costs are high because inputs are not available, what inputs? And why?	n.a.
Any other comments:	Some indigenous tree seedlings are not widely available. However, with the shade tree nursery that has been set up at group level, the demand could be met. With proper management this can be a sustainable business model and can be replicated in other regions.

Effectiveness	
Leading Question: Does the tool provide the expected benefits to farmers?	
High	X
Low	
Don't Know	
High: The objective of the tool has been met for the farmers.	
Please Comment:	
What benefits did farmers expect from this tool?	Reducing the level of crop stress through creating resilience against extreme weather conditions.
If the objective has not been met, why?	n.a.
Have there been any significant external issues which influenced the effectiveness (positive or negative) of this tool? Please explain.	n.a.
Any other comments about effectiveness:	Pruning material from the shade trees can be used as firewood.

Timing / Urgency	
Leading Question: Is the amount of time that this tool takes to implement (from starting implementation until benefits accrue) reasonable to farmers?	
High	Low X Don't Know
Low: It takes too long to implement this tool (taking into account the coffee growing season, inputs necessary, preparation time and implementation time); <i>Or</i> it simply takes too long for this tool to accrue benefits.	
Please Comment:	
If implementation takes too long, why?	It takes at least 5 years until the newly planted trees can actually act as shade trees.
Any other comments about timing:	Farmers have seen the long-term advantages of shade trees and start applying this technique despite the fact that the positive effects do not occur immediately.