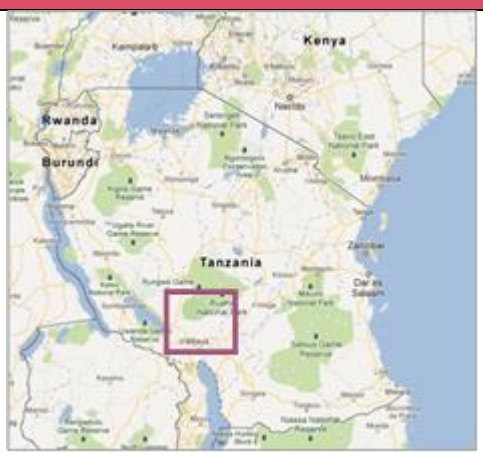
coffee & climate
enabling effective response

Soil Moisture Toll – Combining Dry Mulch

Case Study Background Data		
Tool Category: Adaptation on the farm		**Detail:** Planting Density ⃠ 0-1000 / ha Soil Type: Loamy soil Shade Regime: 11-20% Farming System: Traditional agro-forestry system Yield Range (kg cherry/ha) 0-2000 ⃠ rain : 900-1800 mm/y
Variety: Arabica		
Purpose: • Soil moisture • Water holding • Soil management		
Climatic Hazard: • Short term rain events • Intermittent rain • Drought		
Implementation Date: 26.10.2013- to date	**Altitude**: 1772 m **GPS:** 9°04'12.0"S 33°24'00.0"E	**Slope of plots**: Small inclination ⃠ **Age of trees:** 5-10 years
No. Farmers: 6 demo plots	⃠ **Area under coffee:** 1.5 ha/farmer	Tasted on demo plots

Results

The combination of dry mulch and cover crops is promising, since this ensures a continuous supply of mulch material. When the applied dry mulch has been decomposed, planted cover crops can be slashed that the soil is well covered with mulching material.
First observations show that coffee trees standing on the mulched plot look healthier and carry more and healthier cherries compared to rest.

Pros & Advantages + Learnings	**Cons, Disadvantages + Things to take into account**
• Some of the soil moisture is conserved and the trees are not so much affected by flower abortion • Soil structure and fertility is improved as mulch decomposes • Soil erosion is minimized as infiltration is improved • Increase in coffee production is expected due to less flower abortion and better soil characteristics	• There is competition between mulching materials for the coffee fields and livestock, since mulching materials are commonly used as fodder for livestock • Fire hazard when using dry mulch • Dry mulch creates a favorable environment for termites since they use it as fodder. This mitigates the positive effects of mulching and also exposes the coffee plant to further risks

Acceptability	High	**Effectiveness**	High
Affordability	High	**Timing / Urgency**	High

Description of fieldwork

Please provide a detailed description of the implementation of the tool in the field here.

Nr.	Step	Picture
1	Training on mulching: Farmers are first trained on - importance of application of mulch on coffee fields - required characteristics of mulch materials and - how to do mulching	
2	Collection of mulch: Before the implementation of live mulch, dry mulch was used. In most cases maize straw and other crop residues were collected and applied as mulch.	
3	Application of mulch: The mulch materials are spread to cover the soil leaving space around the plants of about 20cm in radius	

4	Planting of cover crops to get live mulch (Napier grass - Pennisetum purpureum): The Napier grass is characterized by: - early decomposition - shallow roots - fast growing - high nutritive to the crop plants when decompose	
5	Slashing the live mulch and covering the soil of the plot. After well establishment of live mulch, dry mulch will no longer be used, as it takes long time to decompose. These will be used as fodder for livestock and probably left in farms as required in conservation farming	

Appendix

Implementation Framework

The case study is implemented within the pilot project of the initiative for coffee & climate in Mbeya rural, Tanzania. As part of the national program implemented by the Hanns R. Neumann Stiftung (HRNS) in Tanzania, the c&c pilot project is targeting 750 coffee farming households. Besides facilitating discussions on the impact of climatic changes on coffee production, HRNS is supporting testing of different adaptation tools on demo plot level. Demo plots are parts 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.

The farmer groups use the Farmer Field School (FFS) approach that gives members the opportunity to exchange experiences, learn from each other, and get to know new practices. FFS is a capacity building method based on peer learning through observation and experimentation in the own field. This allows farmers to improve their management skills and gain knowledge on their own farms. The approach empowers farmers using experiential and participatory learning techniques rather than advising farmers what to do. Farmers are encouraged to make their own on-farm decisions based on previous experiences as well as to test new technologies according to the seasonal crop circle.

Since mulching is accepted by farmers as good agricultural practice, they are highly interested in the more comprehensive method of combining dry and live mulch. Within the c&c pilot project area 6 demo plots have been identified for testing and intensive monitoring.

Case Study Methodology

- On the identified demo plots meteorological data is collected on a daily basis (temperature and rainfall) to compare the environmental conditions
- Through observation the performance of the coffee trees regarding flower abortion and drought resistance is monitored
- The production will be compared to other demo plots, where this tool has not yet been applied. Yield data will be collected with Farmer Filed Books for the upcoming season.

Main Findings of Case Study

Since the implementation of the tool has only started and the production circle has not yet been completed, the analysis is still ongoing. First observations show positive effects of the mulch combination.

Acceptability					
Leading Question: To what extent did farmers readily accept this tool as useful for implementation and implement it as planned?					
High	☒	**Low**	☐	**Don't Know**	☐
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?			The tool implementation is still on demoplot level only, but farmers intend to implement it on their fields.		
Did this tool have any external issues or impacts (positive or negative) which influenced its acceptability? (community, value chain?)			Due to competition of dry mulching material with fodder for livestock, acceptance if affected. However, planting cover crops to get additional mulching material as well as fodder can solve this challenge.		
Any other comments:			The tool has only resently been implimented on demo plots, so the production cycle has not yet beed completed.		

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	☒	**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. *Inputs (e.g. labor, electricity..) are available when they are necessary so that no extra costs are incurred from timing related issues.*			**Low:** The initial investment or the maintenance costs of this tool go beyond what is affordable to farmers from their regular operations *or the amount of time it takes to recover the investments are unreasonable to farmers*.		
Please Comment:					
Are there any external costs? (to society or environment?)			The only occuring costs are for cover crop seedlings.		
If costs are high because inputs are not available, what inputs? And why?					
Any other comments:			There are several species of Napier grass. This tends to confuse the farmers. The suitable species		

	are scarce and expertise is needed to identify them. The farmers , who are growing Napier grass normally sell it to other farmers as fooder and for planting.

Effectiveness					
Leading Question: Does the tool provide the expected benefits to farmers?					
High	☒	**Low**	☐	**Don't Know**	☐
High: The objective of the tool has been met for the farmers.			**Low:** The tool did not fulfill its objective entirely.		
Please Comment:					
What benefits did farmers expect from this tool?			Increase of coffee production due to less flower abortion and better soil quality.		
If the objective has not been met, why?			Since this is the first season of implementation, the impact on productivity has not yet been analysed. However first observations show positive results.		
Have there been any significant external issues which influenced the effectiveness (positive or negative) of this tool? Please explain.			Planting of cover crops for live mulch also has a positive effect to prevent soil erosion. In addition spill over effects to other crops are expected, since the beneftis of mulching can be seen on other crops as well.		
Any other comments about effectiveness			The tool has just been implement but first benefit can be seen already. Dwarf Napier grass is preferred as live mulch (cover crop) because: -It releases nutritive elements to the soil when decomposing. -It has a characteristic of early decomposition. -It has shallow roots that have no effect on crop plants when planted between rows. -It is fast growing and thus ready for mulching during the recommended time.		

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**	☐	**Don't Know**	☐
High: The tool takes a reasonable amount of time to implement (taking into account the coffee growing season, inputs necessary, preparation time and implementation time); *And* this tool accrues the effects expected within a reasonable amount of time.			**Low:** It takes too long to implement this tool (taking into account the coffee growing season, inputs necessary, preparation time and implementation time); *Or* it simply takes too long for this tool to accrue benefits.		
Please Comment:					
If implementation takes too long why?			The implementation does not take too long. It is seasonal. If the Dwarf Napier grass is planted at the start of the rain season, at the end of the season it is ready for slashing.		
Any other comments about timing:			The tool takes reasonable time to implement. Mulching should be applied at the end of rain season. If the Dwarf Napier grass is planted at the start of the rain season, at the end of the season is ready for slashing and can be applied as mulch.		