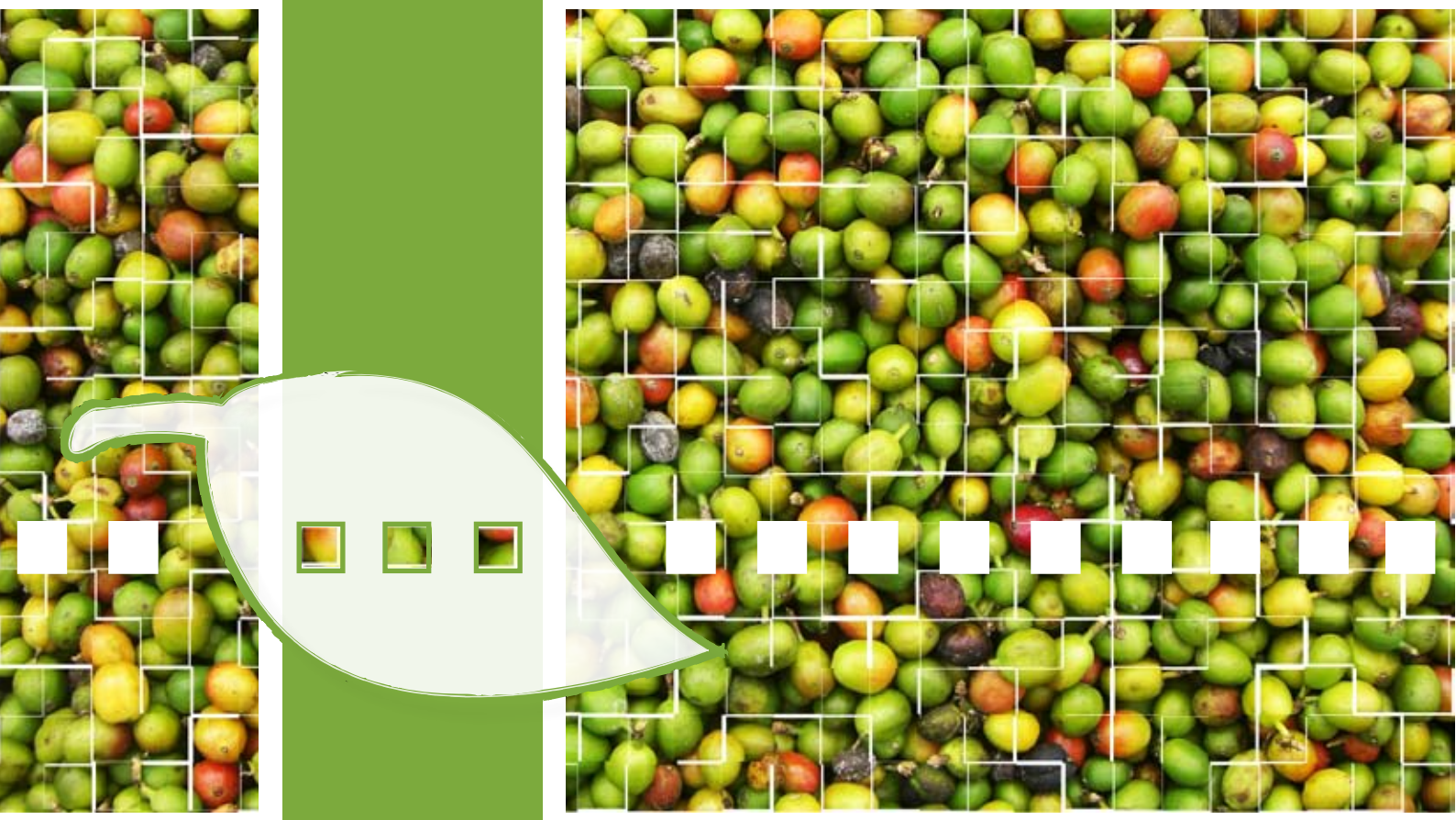


Climate Change Adaptation and Mitigation in the Kenyan Coffee Sector

Guide Book - Sangana PPP - 4C Climate Module

giz

On behalf of
Federal Ministry
for Economic Cooperation
and Development

Contents

> “ Due to changing weather patterns coffee zones are already affected. Adaptation is the key to securing production systems ... ”

...says CIAT the International Centre for Tropical Agriculture. Coffee production depends on stable climatic and environmental conditions. Rising temperatures are impacting negatively on coffee quality and are triggering, for example, more and new pest and disease incidents. Changes in rainfall patterns are disrupting flowering cycles and erratic rains are impeding maturation of coffee berries affecting quality and quantity.

This was the rationale behind a project assisting coffee producers in adapting to climate change: Climate Change Adaptation and Mitigation in the Kenyan Coffee Sector (Sangana PPP) between Sangana Commodities Ltd, the Kenyan subsidiary of the ECOM Group, the Deutsche Gesellschaft für Internationale Zusammenarbeit on behalf of the German Ministry for Economic Cooperation and Development, the 4C Association, Tchibo GmbH and the World Bank from 10/2008 to 09/2011.

Climate change is affecting all coffee actors along the supply chain and needs cooperation and joint efforts to find effective responses.

The Sangana PPP aimed to develop an additional component to the already existing 4C Code of Conduct considering climate change adaptation as well as mitigation: the 4C Climate Code. In the development of this additional component it became obvious that simply designing a Climate Code will not be sufficient for producer organizations to really find effective responses to climate change challenges.

Green coffee cherries

This is why the 4C Climate Code was backed up by trainings for producer organizations on climate change issues, verification instruments to support certification bodies in the audit of the 4C Climate Code and a collection of information on climate change impacts on coffee, information on adaptation and mitigation means and, where possible, regional climate data.
To test functionality of the developed outputs the project worked with two Kenyan smallholder coffee cooperatives: the KOMOTHAI Coffee Growers Cooperative Society Ltd and the Baragwi Farmers' Cooperative Society Ltd.

After its three years of duration the project can now offer its results and lessons learnt to a broader public. Within this guide book you will find a general overview on the Sangana PPP, detailed information on its results and how these were achieved, lessons learnt when working on climate change issues with smallholder producers and a first try to gather perceived impacts of the project at producer level and beyond. More detailed project information and all results are available at **www.4c-coffeeassociation.org/en/work-on-climate-change.php**.

Kerstin Linne I Sangana PPP Project Manager I GIZ I September 2011

1 I Project Overview

a) Background

Climate change is impacting on agriculture and agriculture contributes to climate change. Therefore the agricultural sector needs to adapt to climatic changes and at the same time it offers opportunities to reduce or remove greenhouse gases. These two sides of the same coin form the base of the Sangana PPP.

> “ Rains are changing affecting flowering and therefore distorting our whole production cycle...”

...says Mr. Nyaga, Chairman KOMOTHAI Coffee Growers’ Cooperative Ltd. What coffee producers perceive is also backed up by predictions of the Intergovernmental Panel on Climate Change (IPCC)[1]. Coffee is a vulnerable crop to changes in temperature and precipitation. Under the business as usual scenario, i.e. if everything continues as it is right now, the suitability of Kenyan coffee production zones is going to drop from 50 – 70% to 30 – 60%[2]. According to the same study carried out by the International Centre for Tropical Agriculture (CIAT) coffee currently grown in Kenya at 1300masl will suffer most under climatic changes by 2050 whereas coffee at 2200masl will benefit most. Photosynthesis of Arabica coffee drastically reduces with temperatures above 20°C and gets to a complete halt at 34°C. Even a few too cold or too hot days during flowering reduce coffee quantity and quality. According to the World Bank around 120mio people, mostly in Least Developed Countries, live on the income from coffee. These figures underline the need for suitable adaptation options to sustainably produce coffee in the future.

Around 31% of all global emissions come from the agricultural and forestry sector. Inappropriate agricultural practices such as burning or inadequate fertilizer application lead to emitting greenhouse gases (GHG) and therefore support the climate change phenomenon. At the same time the agricultural sector offers potential to reduce its emissions, e.g. through more efficient fertilizer application, and also to remove existing GHG out of the atmosphere and to store it. Agricultural ecosystems such as coffee can store GHG in trees, plants and soils.

The World Bank estimates that 5 tons of CO_2e per hectare per year can be stored additionally in a Kenyan smallholder coffee production system[3]. To address both, adaptation and mitigation, the “Sangana PPP” was formed in October 2008 between GIZ and Sangana Commodities Ltd. The 4C Association and the World Bank joined as additional partners and Tchibo GmbH entered the project in May 2010[4]. Total project budget was T€ 808.8 for the three years of project duration (10/2008 – 09/2011).

b) Approach

The aim of the Sangana PPP was to support coffee producers to adapt their production to the changing climate and to create and use synergies between adaptation and mitigation. To tackle this goal an additional component to the existing 4C Code of Conduct has been developed to enable coffee producers to respond to climate change.

The 4C Association counts three components (social, environmental, economic) in its Code of Conduct. The project developed an additional and voluntary component: any coffee producer group opting for verification under the 4C Code of Conduct will have to gradually comply with the existing three components whereas they can opt to comply with the fourth one: the Climate Code. This Climate Code consists of agricultural practices for adaptation and mitigation, trainings for producers and verifiers, verification instruments and a climate data base and was tested together with Baragwi Farmers’ Cooperative Society Ltd. as pilot group.

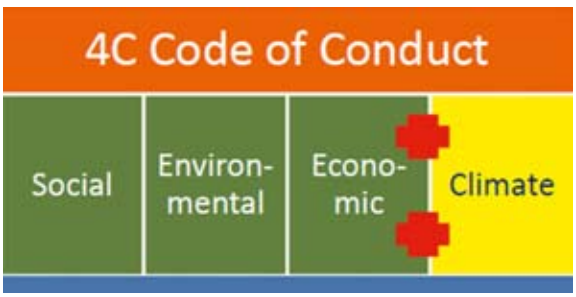


Figure 1: The 4C Climate Code as addition to the existing three dimensions

1 Climate Change 2007, United Nations Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4)
2 Study done by CIAT 2010 in the framework of the Sangana PPP
3 Study by J. Wölcke & T. Tennigkeit 2008
4 Further information on climate change impacts on coffee, adaptation and mitigation can be found in the Training Manual ”Climate Change and Coffee”, GIZ 2010

c) Partners

Sangana Commodities Ltd.

is the Kenyan subsidiary of the Swiss ECOM Agroindustrial Corporation Ltd. It is a major exporter of Kenyan coffee and bids its quality-checked coffee at the exchange auctions, handling all logistical issues of coffee under its ownership. Their role within the project was:

- To ensure active participation of the coffee growers
- To bring in expertise on Kenyan coffee production
- To train the coffee producers in sustainable production techniques
- To coordinate project implementation on the ground
- To disseminate findings and lessons learnt further in the coffee sector

Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH

is a federally owned enterprise supporting the German Government in achieving its objectives in the field of international cooperation for sustainable development. It assists people and societies in developing, transition and industrialized countries in shaping their own futures and improving living conditions. GIZ's role within the project was:

- To coordinate the overall implementation of the project
- To bring in expertise on adaptation to climate change in the coffee sector
- To design the add-on standard module
- To build capacities on sustainable production techniques to make coffee ecosystems more resilient to climate change impacts
- To disseminate lessons learnt and results to a broader audience

Baragwi Farmers' Cooperative Society Ltd.

is located in the Kirinyaga District in central Kenya and has 13,000 members delivering coffee cherry to 12 cooperative owned wet mills. Besides the 4C Climate Code, BFCS counts with certification under the SAN standards (standards set by the Sustainable Agriculture Networks). The role of BFCS was:

- To actively participate in project activities
- To include project activities and climate change work in their long-term planning

Common Code for the Coffee Community (4C) Association

is an independent membership organization that provides standards for sustainable economic, social and environmental practices in the coffee production. Within the 4C Association, producers, trade, industry and civil society from around the world work together for more sustainability in the entire coffee sector. Their role within the project was:

- To support GIZ in the design of the additional Climate Code to the 4C standards
- To ensure compliance of the Climate Code with 4C standards
- To verify the pilot group under 4C standards
- To train 4C auditors in the implementation of the new Climate Code

World Bank

is a vital source of financial and technical assistance to developing countries around the world. It is not a bank in the common sense, but made up of two unique development institutions owned by 185 member countries (IBRD and IDA). The World Bank's role within the project was:

- To bring in expertise on climate change mitigation in the coffee sector
- To analyse the amount of greenhouse gases already stored in coffee production systems
- To identify agricultural practices reducing or removing greenhouse gas emissions

Tchibo GmbH

was founded as a coffee-mail-order-firm in 1949 by Max Herz. It has gradually evolved into an international company and operates in many more business sectors than the traditional selling of coffee. Tchibo's role within the project was:

- To support preparation of certification under the SAN[5] standard
- To feed in expertise on carbon footprinting
- To disseminate findings and lessons learnt further in the coffee sector

5 Sustainable Agriculture Network

2 I Project Results

a) The BioCarbon Fund's Carbon Project

In mid 2007 the German International Cooperation (GIZ - then known as German Technical Cooperation GTZ [6]), was contacted by the World Bank, specifically their Agriculture and Rural Development Department, Africa Region (AFTAR). The World Bank's BioCarbon Fund (BioCF) had decided to insert two agricultural carbon projects into its portfolio. The Kyoto Protocol did not, and still does not, acknowledge agricultural carbon projects and the BioCarbon Fund wanted to create examples that agricultural carbon was real and measurable.

In April 2007 the Bank's first step was a scientific screening to identify potential greenhouse gas (GHG) mitigation activities in the agricultural sector. This preliminary screening concluded that commodity-based GHG mitigation projects, especially in the coffee sector, would be among the most promising options. In addition, it was concluded that GHG mitigation projects which would include a wide variety of sustainable agricultural land management practices and technologies would have a strong poverty focus and huge replication potential.

The second step was a workshop on "Carbon Finance Opportunities in Kenya's Agricultural Sector" held in June 2007 in order to introduce carbon finance projects to agricultural actors, to raise awareness on GHG mitigation within the agricultural sector and to identify potential stakeholders and projects. After this workshop interested parties were invited to hand in a Project Idea Note (PIN), being a short project outline. The most promising proposals were selected and further discussed in individual meetings. Selection criteria were financial viability and technical capacity to carry out such a project.

The Bank screened several agricultural systems in Africa and picked two – one in Western Kenya focusing on sustainable land management (SLM) practices throughout several crops such as maize and one in Kenya's Kiambu District, close to Nairobi, focusing on smallholder coffee production.

The BioCF sponsors technical support for its carbon projects, but usually does not offer further financial resources for project implementation. This is why the World Bank contacted GIZ in order to discuss possibilities of a joint project to explore the feasibility of agricultural carbon finance projects. GIZ, through its Development Partnership facility, then called Public-Private-Partnership (PPP) facility, was invited to participate in this ambitious approach in order to support project implementation on the ground with technical and financial resources. A three-year Development Partnership was agreed upon between GIZ and Sangana Commodities Ltd.- the Sangana PPP. Sangana Commodities Ltd. works with its private extension service, called Sustainable Management Services Ltd., who was responsible for implementing the carbon finance project together with KOMOTHAI COFFEE GROWERS COOPERATIVE SOCIETY Ltd. (KCGCS).

I. The Pilot Group

The KOMOTHAI COFFEE GROWERS COOPERATIVE SOCIETY Ltd. covers around 6000ha located in the Kiambu District and has about 10000 member farmers. The management board consists of 13 elected members, each representing one wet mill owned by the society. The board hires a full-time Secretary Manager to run the coop's daily business.

The farmers harvest ripe cherry from individual farms and deliver to the closest wet mill for pulping. KOMOTHAI has 13 wet mills where cherry delivered by individual farmers is weighed and pooled with the cherry from other farmers for pulping and further processing. Drying and grading of parchment is also done at the wet mill. Ready parchment is then delivered to a central dry mill owned by the coop. This is where dry milling, grading, bagging and labeling takes place before the green coffee is transported for marketing, which is done through the Nairobi central auction or direct contracts to multinational buyers overseas.

KCGCS member farmers had little knowledge about Good Agricultural Practices (GAP) when the Sangana PPP and carbon finance project started. Due to poor management practices and climatic changes, yields were down to 1 to 1.5kg per tree, compared to possible 3.5 to 5kg.

6 GIZ was formed on 1 January 2011. It brings together the long-standing expertise of DED, GTZ and InWEnt. For further information, go to www.giz.de

II. Implementing the Carbon Project

Due to the Kyoto Protocol regulating the Clean Development Mechanism (CDM) there are rigorous rules for carbon finance projects. Seeing agricultural carbon projects are not eligible under the Kyoto Protocol, the coffee carbon finance project was aiming for the Voluntary Carbon Market. There are several carbon standards in order to develop carbon credits for the Voluntary Carbon Market. The Verified Carbon Standard **(VCS I www.v-c-s.org)** was chosen for the coffee carbon finance project due to its orientation along CDM criteria and its acceptance of agricultural carbon projects. Carbon projects under the VCS have to comply with several regulations and follow strict project development and implementation guidelines and steps.

The World Bank's BioCarbon Fund developed a methodology focused on Sustainable Agricultural Land Management Practices (SALM). This methodology quantifies the GHG emission reductions of project activities that apply sustainable land management practices whereby carbon stock enhancement in agricultural areas in the aboveground, belowground and soil carbon pool are achieved.

The methodology uses input parameters to existing analytic models accepted in scientific publications for estimation of organic soil carbon density at equilibrium in each of the identified management practices in each of the land use categories and is publicly available.[7]

The starting point of the SALM methodology is the assumption that particular agricultural practices implemented in a certain area over a certain amount of time influence the carbon stocks in biomass and soil and the GHG emissions.

Measuring the diameter of a coffee tree

Looking into the technical and financial viability of the carbon project it was necessary to calculate the potential of the KCGCS area to sequester and to reduce GHG. Sequestration means to capture existing GHG out of the atmosphere and storing them, whereas reduction refers to less GHG released into the atmosphere.

7 http://www.v-c-s.org/methodologies/adoption-sustainable-agricultural-land-management-salm

In agriculture the following GHG occur:

	Emissions	Removals
CO_2 Carbon Dioxide	■ Biomass removal: - Land clearing - Tree cutting ■ Soils ■ Fossil fuel use	
CH_4 Methane	■ Manure ■ Biomass burning ■ Fossil fuel use	
N_2O Nitrous Oxide	■ Manure ■ Fertilizer use ■ N-fixing species ■ Biomass burning ■ Fossil fuel use	
CO_2 sequestration		■ Trees ■ Improved soil management

Table 1: GHG emissions and sequestration in agricultural systems

To be able to define the activities with the biggest potential to reduce emissions or to capture GHG, agricultural practices were analyzed according to their GHG mitigation potential. The Joanneum Research Institute **(www.joanneum.at)** came up with the following results:

Management practices		GHG Mitigation Potential $tCO_2e/ha/yr$
Agronomy	Improved crop varieties	0.5-1.5
	Cover crops and green manure	0.5-1.5
	Multiple cropping: - crop rotations - intercropping	0.5-1.5 0.5-1.5
Nutrient mgmt	Mulching	0-1.4
	Improved fallow	1.2-9.5
	Manure management	0-1.4
	Composting	0-1.4
	Improving fertilizer use efficiency	0-1.4
	Reduced tillage	-0.4-1.9
	Residue management	-0.4-1.9
Water mgmt	Terracing/Water harvesting	-0.55-2.8
Agroforestry	Various activities	2-15 (1.83 SOC)
Set-aside land	Various activities	1.2-9.5

Table 2: GHG emissions and sequestration in agricultural systems

Based on this analysis, the Sustainable Agricultural Land Management methodology includes aboveground biomass, belowground biomass and soil organic carbon as valid carbon pools, whereas the carbon pools dead wood and litter were excluded. The following emission sources are considered within the SALM methodology:

Source	Gas	Included / excluded	Explanation / Justification
Use of fertilizers	CO_2	Excluded	Not applicable
	CH_4	Excluded	Not applicable
	N_2O	Included	Main gas for this source. These are calculated using the A/R Working Group Tool "Estimation of direct nitrous oxide emission from nitrogen fertilization" [8]
Use of Nitrogen-fixing species	CO_2	Excluded	Not applicable
	CH_4	Excluded	Not applicable
	N_2O		Main gas for this source. These are calculated using the tool "Estimation of direct nitrous oxide emission from n-fixing species and crop residues"
Burning of biomass	CO_2	Excluded	However, carbon stock decreases due to burning are accounted as a carbon stock change.
	CH_4	Included	Non-CO_2 emissions from the burning of biomass. These are calculated using the tool "Estimation of non-CO_2 emissions from the burning of crop residues".
	N_2O	Included	Non-CO_2 emissions from the burning of biomass. These are calculated using the tool "Estimation of non-CO_2 emissions from the burning of crop residues".

Table 3: Emission sources included / excluded from the project boundary

8 For further information on the tools see methodology

Only included emission sources are taken into account for generating carbon credits under this methodology. Therefore monitoring of only these defined emission sources is necessary.

In terms of implementation of the carbon project at the level of KCGCS the first step was to set up a carbon baseline to define the current amount of GHG stored in the coffee systems. Data collection for the baseline was done by Sustainable Management Services Ltd. (SMS) and the cooperative with the support of further national and international consultancy agencies: Unique Forestry Consultants from Germany, the Kenyan Coffee Research Foundation (CRF) and the Kenyan Regional Center for Mapping for Development of Resources. Setting up the baseline was done using a grid line of a Mercator map. 296 permanent sample plots were established. These were assumed to represent 1 square kilometer and all the features therein were assumed as representative of this one square kilometer.

The establishment of the baseline took 5 months (April to September 2008) and was fairly difficult due to the terrain and the distances between way points. These distances were usually covered on foot and some sample points were difficult to access as they were located down in valleys, on top of a hill, in the middle of a river etc. For being able to collect all necessary data for the baseline, staff had to be trained and the cooperative had to be kept on board with all activities. Besides their daily business, producing and selling coffee, these project activities presented quite a challenge to the farmers. However, after adequate training, implementing the proposed agricultural practices was not considered too difficult by the cooperative.

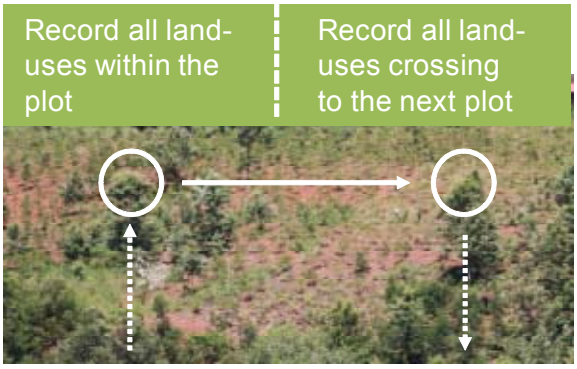


Figure 2: Monitoring carbon stock changes

For monitoring the changes in carbon stocks a Farmer Self Assessment was developed. It included an assessment of the producers' livelihoods, their economies and their production patterns. Changes in these parameters were expected with adoption of the proposed agricultural practices. Monitoring the carbon stock changes was to be done by re-visiting some of the defined sample plots and recording the present land uses.

Figures 2 and 3 show how this is done: Starting at a pre-defined coordinate (cluster point) the auditor measures the relative vegetation, perennial and annual crop coverage in percentage. Furthermore the nearest 6 trees to the cluster point are recorded (diameter at breast height, height and distance to cluster point). From there the auditor walks 100m to the north and applies the same procedure, then 100m to the east, 100m to the south and 100m to the west. This way a plot the size of 1 km^2 is monitored.

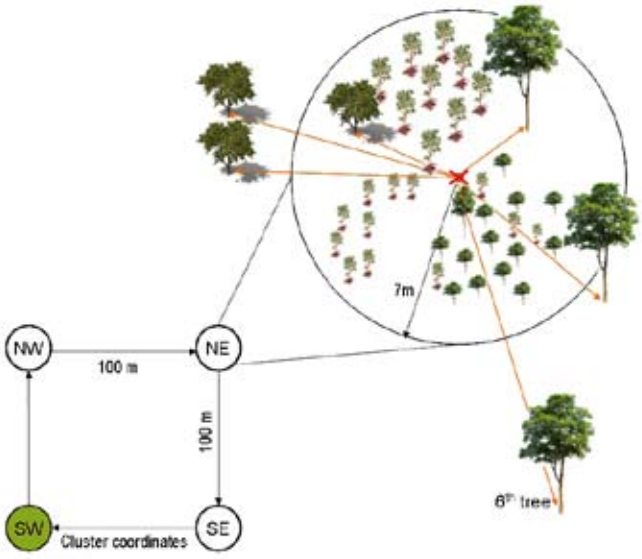


Figure 3: Monitoring carbon stock changes

The circular cluster point in Figure 4 shows groups of crop management systems whereas the most dominant crops in this plot are chosen. Each management system must be described as precisely as possible in order to be able to track changes over time. In order to issue carbon credits on a yearly basis, monitoring needs to take place once a year.

The estimated price for one ton of carbon equivalents (CO_2e) was USD 4. Per year and hectare it was calculated to mitigate around 3.5tCO_2e at KCGCS. In the beginning the BioCarbon Fund was calculating the whole 6000ha under KCGCS' management into the carbon project. Only after engaging deeper with the cooperative, it became clear that not the whole of the 6000ha were under coffee but around 1/3 of this area. Calculating with 6000ha the BioCarbon Fund expected to mitigate over 30,000 tCO_2e per year, when later on it turned out around 10,500 tCO_2e were more likely. Therefore financial feasibility of the project was questioned. Discussions between all project stakeholders lead to taking a step wise approach. The project was to be implemented with KCGCS first and then to be scaled up to another cooperative in order to have a bigger area and thus more mitigation potential. 10,500 tCO_2e multiplied with USD 4 would have meant USD 42,000 for KCGCS leading to USD 4.2 per farmer if 100% of this amount were to be passed down to the producers. It is questionable in how far this small amount would have covered implementation costs.[9]

In the end the carbon project failed in October 2009 due to several reasons. One certainly was the complexity of activities asked of the cooperative on top of their daily business. Another was the lengthy commitment being asked of KCGCS to a project, they possibly did not even fully understand. When it came to signing the Emission Reduction Purchase Agreement, the BioCarbon Fund asked for KCGCS to agree to sell them the generated carbon credits for over 20 years. KCGCS, as almost all Kenyan coffee cooperatives, has biannual elections for management staff and the position of the chairman. Therefore the cooperative was not willing to sign such a lengthy contract and as this discussion fell into the harvesting and marketing period, KCGCS potentially gave priority to their core business: producing and selling coffee.

9 Baseline and methodology development as sponsored by the BioCarbon Fund are estimated to have cost around T€ 150. Costs for implementing the necessary practices and for monitoring have not been estimated.

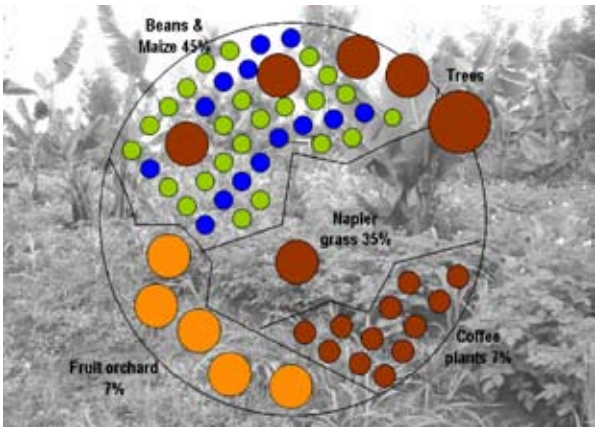


Figure 4: Land use estimation within 1 sample plot (7m radius)

b) Climate Module

Within the agricultural sector there is a lot more need for adaptation than potential for mitigation. Though 31% of global emissions are coming from agricultural activities and deforestation, coffee farmers, especially smallholders, are highly vulnerable to changing climatic conditions. Therefore the Climate Module developed within the framework of the Sangana PPP aims to support coffee producers to adapt to these changes in climate.

Due to its link with the World Bank's carbon project, the module also aims to explore mitigation effects achieved by the implementation of adaptation measures. An easy example for this double effect is the shade tree. From an adaption perspective: Planting a shade tree, where possible, reduces the temperature in that area, enhances water infiltration in the soil and generates organic matter for e.g. composting. From a mitigation perspective: Planting a shade tree generates biomass and therefore sequesters GHG. There are other examples where adaptation measures can generate mitigation effects and the Climate Module tried to look exactly into this link.

As mentioned before the Climate Module is additional and voluntary to the existing 4C Code of Conduct. As shown in Figure 5 it is based on four pillars:

1. The Climate Code
2. Trainings
3. Verification Instruments
4. Climate information

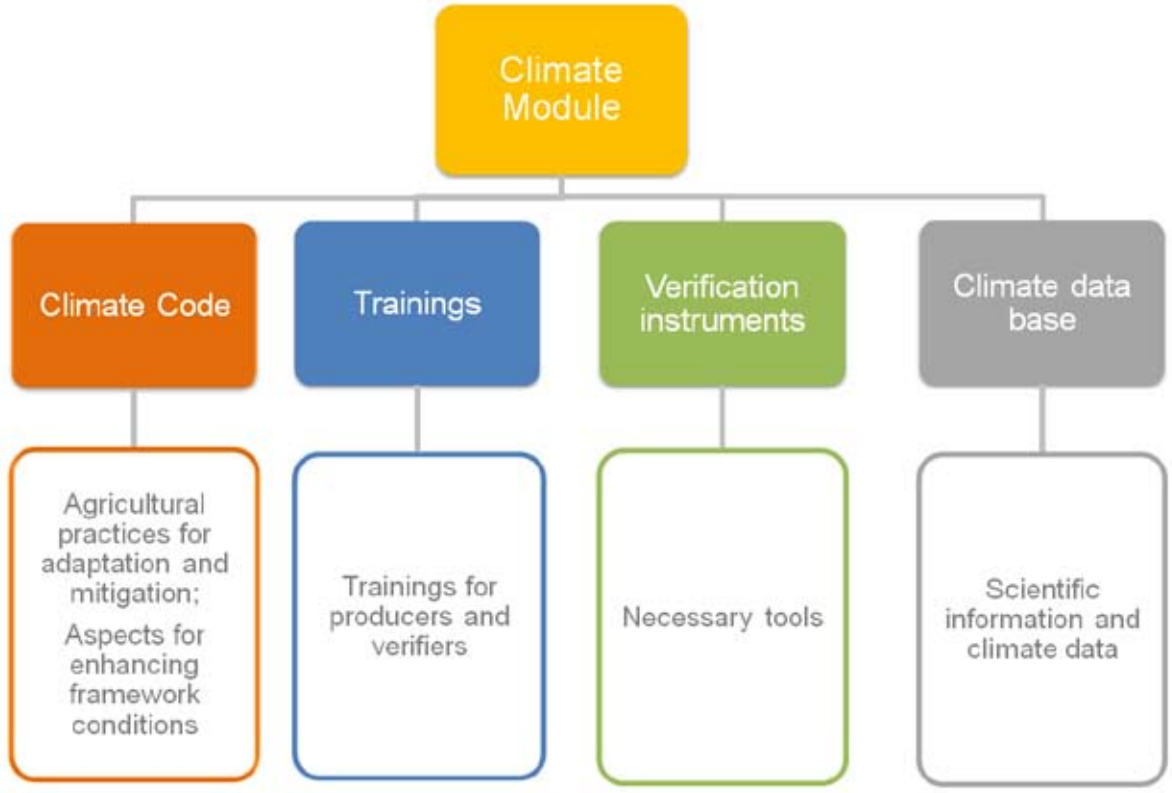


Figure 5: The structure of the Climate Module

Its core is the Climate Code stating principles, i.e. a desired status to be reached, broken down in criteria and indicators. This Climate Code is structured the same way as the other three dimensions of the 4C Code of Conduct using a traffic light system.

When developing the Climate Code it was realized that for implementation further guidance is necessary. This is why the project engaged in developing adequate training sessions for producer organizations and extension services and verification instruments for certification bodies. Furthermore the project collected scientific information on climate change and coffee, regional and national studies on climate change issues and other relevant information around climate change. These results are available at the 4C website[10] in order to create access for producer organizations, certification bodies and coffee industry players to relevant information for understanding climate change issues in the coffee sector.

10 http://www.4c-coffeeassociation.org/en/work-on-climate-change.php

I. The 4C Climate Code

As stated before the Climate Code can be considered the heart of the Climate Module. It defines the practices being asked to implement by the producer organization. Looking into adaptation options there are mainly three potential ways of action a producer organization can take:

- Enhance their framework conditions
- Adapt the production system
- Adapt the plant itself

The Climate Code was developed to include adaptation measures out of these three intervention options. As adaptation is just one side of the climate change coin, the code was designed to also look into mitigation aspects. Therefore the Climate Code resulted in four categories:

1. Enabling Environment
2. Natural Resource Management
3. Soil and Crop Management
4. GHG emissions and stocks

Category	Principle	Criteria / Indicator			Comments
		Green	Yellow	Red	
Enabling Environment	Capacity building on climate change adaptation and mitigation is accessible	Action plan to address climate vulnerabilities and risks is being implemented	Action plan to address climate vulnerabilities and risks has been elaborated, implementation has not taken place	Action plan to address climate risks and vulnerabilities has not yet been developed	See manual for participatory workshop on climate risks + vulnerabilities; New

Figure 6: The Climate Code

The category "Enabling Environment" looks into options on how to strengthen the producer organization (enhancing their framework conditions) e.g. via capacity building, via enhanced access to information or via setting up early warning systems. Within the category "Natural Resource Management" topics such as biodiversity, the extraction of timber, water and degraded land are covered. Soil conservation, looking into different coffee varieties, chemical pesticides and fertilizer use as well as organic matter are issues covered in the category "Soil and Crop Management". Therefore adapting the production system is covered in category 2 and 3 and adapting the plant itself is included in category 3. Category 4 on mitigation aspects is rather looking into data collection than asking for implementing pure mitigation measures. It is asking to monitor biomass on the farm as well as to identify emission hot spots and potential reduction measures.

Each category contains principles, i.e. the desired status to be reached, broken down in criteria and then measurable indicators. As shown in Figure 6[11], the 4C Climate Code is structured, just as the normal 4C Code of Conduct, using a traffic light system.

This traffic light system allows for continuous improvement and shows the progress of a producer organization. Red indicates practices that are not sufficient for verification, yellow indicates practices that are leading towards the desired practices, being the ones indicated in green. For verification under the Climate Code an average state of yellow has to be reached.

II. How it works

Verification under the 4C Climate Code is voluntary and additional to verification under the 4C Code of Conduct, i.e. it does not influence the status of an existing 4C license.

In order to start working on climate change issues, a producer organization first has to identify the need to act, i.e. they have to be aware of climate change impacts on their production. To support them in this task, the Climate Module offers an Introductory Training (see manual for Introductory Training on the mentioned website and also chapter 3 c) III of this guide book) looking into climate change adaptation as well as mitigation.

Once a producer organization decides to become verified under the 4C Climate Code a 2-day participatory analysis (see Manual "Climate Change and Coffee –Training for coffee organizations and extension services" chapter 3 d) and also chapter 3 c) IV of this guide book) is carried out in order to identify which present challenges at the organization are climate related. The outcome of this analysis is a short Action Plan in which the producer organization prioritizes activities to be implemented to address climate change challenges.

The activities stated in this Action Plan are then further enriched according to the Climate Code. This ensures implementation of the Climate Code due to ownership of the producer organization. Within the framework of the Sangana PPP this participatory analysis has been tested with two different coffee cooperatives, Komothai and Baragwi.

11 The Code document is available at www.4c-coffeeassociation.org/en/work-on-climate-change.php

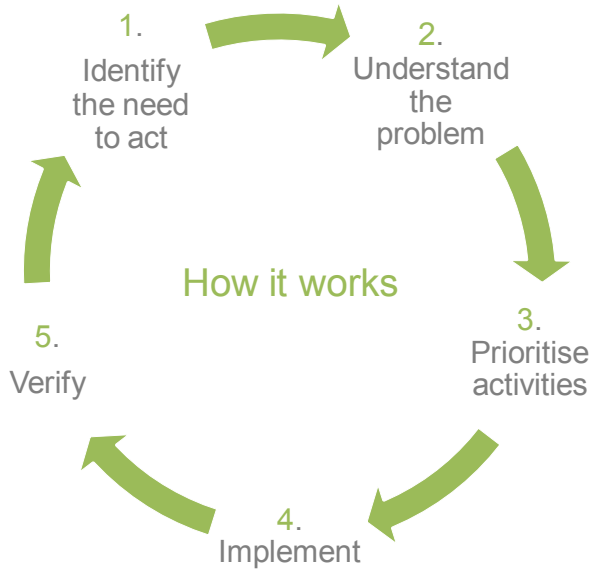


Figure 7: How the 4C Climate Module works

In both cases the Climate Code covered the activities prioritized in the Action Plans. In another project, Adaptation for Smallholders to Climate Change **(AdapCC I www.adapcc.org)** the participatory analysis has also been implemented with a Mexican coffee cooperative and a Kenyan tea cooperative. The results of these participatory analyses also showed a great overlap with the 4C Climate Code.

Climate change is continuous and therefore also the need to analyze climate change impacts and to adapt to changing climatic conditions is a continuous process. Figure 7 shows the necessary steps for implementation of the Climate Module as described above. For the 4C Code of Conduct an audit is due every three years. For the 4C Climate Code the same period for revision is proposed.

III. How it was implemented with the Baragwi Farmers' Cooperative Society Ltd.

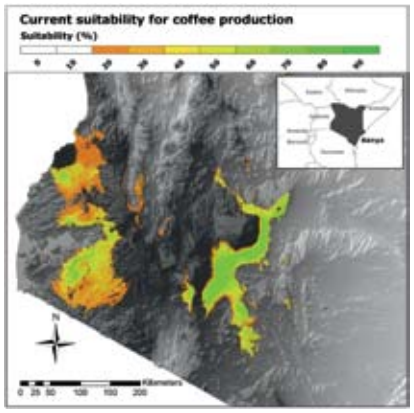
In May 2010 the Sangana PPP started working with the Baragwi Farmers' Cooperative Society Ltd. (BFCS). This change in pilot group from Komothai to BFCS was mainly due to, at the time, insurmountable challenges between Komothai and the project implementer (see Sangana Project News Brief June 2010).[12]

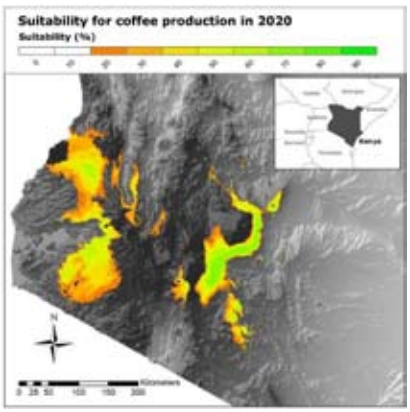
BFCS was founded and registered with the Kenyan Ministry of Cooperative Development in 1953. It counts 16,940 members of which 13,472 are delivering cherry to the coop. Counting 12 wet mills it is located in Kenya's Kirinyaga County. In the coffee harvest 2008/09 BFCS had a total yield of 5,789,403kg cherry leading to a total income of 234,714,110 Kenya Shilling for the coop. In the harvest 2009/2010, when the project started working with BFCS, total yield came to 5,045,077kg cherry resulting in a total income of 293,669,692 Kenya Shilling.

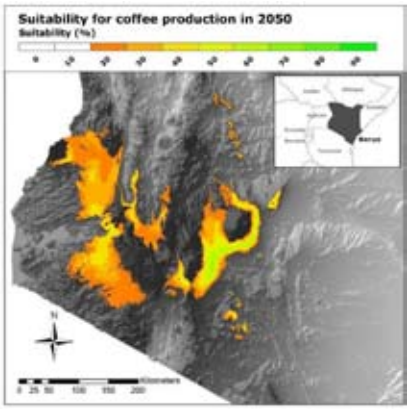
When starting the project with BFCS, the cooperative was already involved in a Smart Source project with the German coffee roaster Tchibo GmbH. Therefore the Sangana PPP could build upon the work done by the Smart Source project in terms of capacity building on good agricultural practices (GAP). Furthermore this lead to gaining a new project partner for the Sangana PPP: Tchibo GmbH.
The project had already, together with CIAT, developed future scenarios calculating the climatic suitability of Kenya's coffee regions for 2020 and 2050 as shown in Figure 8.[13]

12 http://www.4c-coffeeassociation.org/en/work-on-climate-change.php
13 See also Training Manual CC Adaptation chapter 1 at www.4c-coffeeassociation.org/en/work-on-climate-change.php

Figure 8: Future suitability of Kenya's coffee zones







According to these scenarios, by 2050, Kenya will have less seasonality in its climate and maximum mean temperature is predicted to increase to 31.2C° (currently 28.6C°), minimum mean temperature increases to 12C° (currently 9.8C°). An increase in rainfall from currently 1405mm to 1575mm by 2050 is predicted. However, expected distribution of this rainfall is not necessarily favourable for coffee. These changes will lead to a shift of optimal coffee producing zones from currently 1600masl to higher altitudes at 1700masl. As already mentioned general suitability of the coffee regions will decrease. Current suitability for coffee production is 50 to 70%, by 2050 suitability is predicted at 30 to 60%.

Figure 9 gives a good overview on the expected climate trends for Kenya:

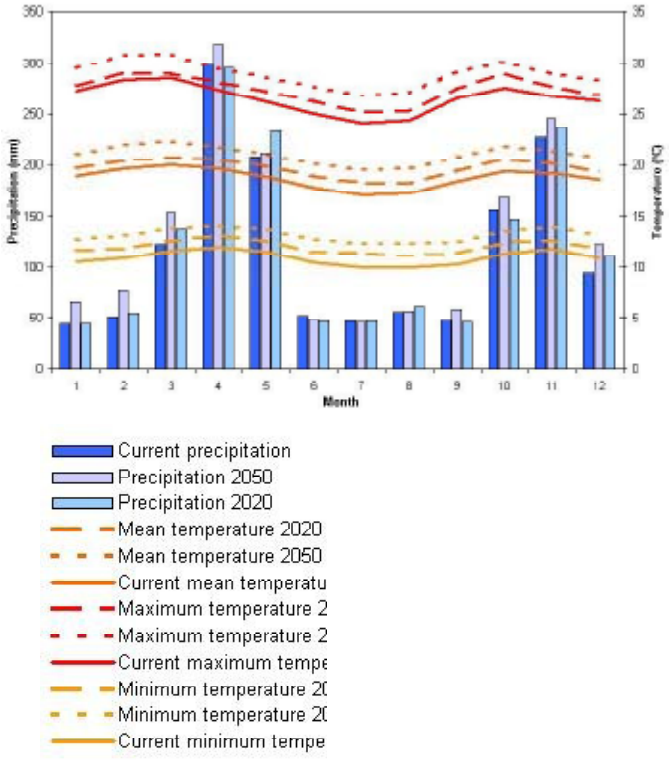
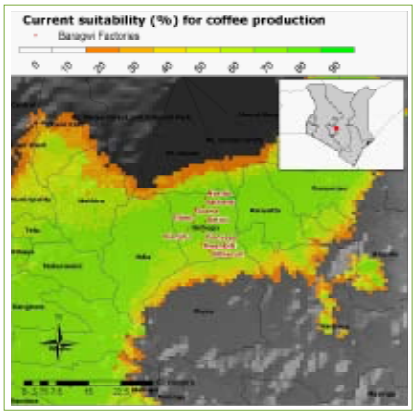
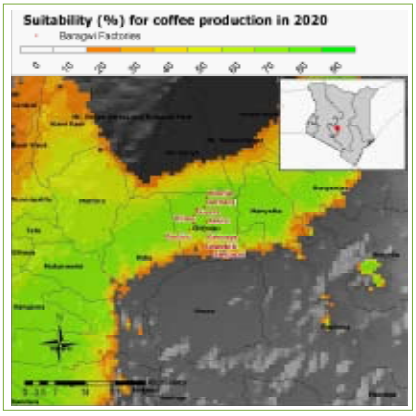


Figure 9: Climate trends for Kenya





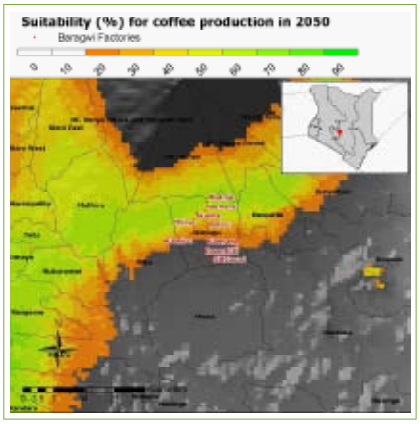


Figure 10: Future suitability of Baragwi region

When starting to work with BFCS these scenarios were downscaled for the cooperative's region indicating the wet mills that are and will be hit hardest by changes in climate. Figure 10 indicates that the wet mills located in the lower altitudes, i.e. Githiururi, Rwambiti, Kianyaga, Kianjiru and Gichugu will face the biggest challenges imposed by climate change:

In order to work with BFCS on the implementation of the 4C Climate Module a sister company of Sangana Commodities Ltd was contracted to work with the producers: Sustainable Management Services Ltd (SMS). SMS Ltd implemented their promoter farmer model to achieve the set project indicators. This training model is a "bottom up strategy" that is based on risk assessment and continuous improvement through the Plan-Do-Check-Act cycle to ensure a high adoption rate.

The promoter farmer model, as described in Figure 11, builds on a set of pre-defined implementation steps:

- Hold sensitization meetings with the farmer groups
- The farmer groups elect the Promoter Farmers (PF): 1 promoter farmer per 50 farmers
- Establish members of the Quality Team & train them
- Appoint an internal auditor & train
- Induce and train PF on the coffee chain, GAP, recording and safety issues
- Define calendar of activities for PF
- Set quality plans for wet mills
- Review quarterly and redefine priority activities
- Hold a special training with computer staff for recording purposes
- Train factory management and staff on issues around the harvest
- Introduce the corresponding coffee certification programs, in this case Rainforest Alliance, 4C Code of Conduct and 4C Climate Code
- Organize exchange visits to other farmer groups
- Organize annual awards for best performers

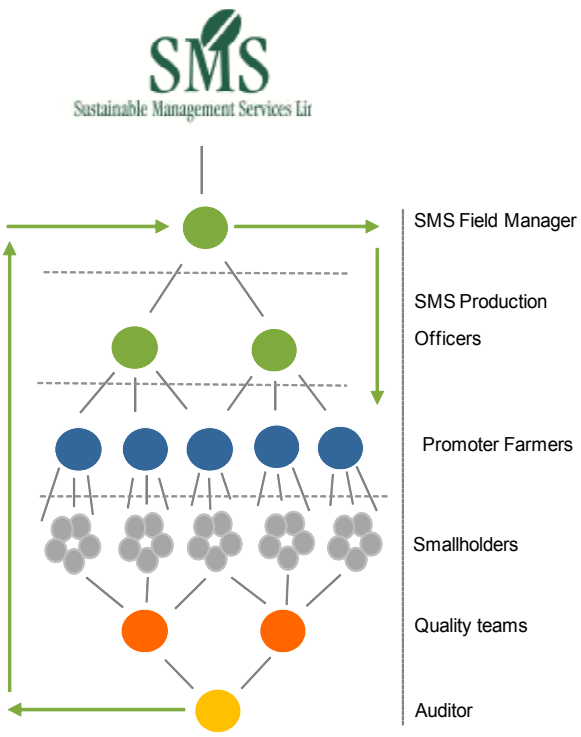


Figure 11: The SMS promoter farmer model

c) Trainings

Grafting - a good climate practice

I. Good Agricultural Practices

In order to support the coffee farmers in the implementation of the Climate Code several training sessions have been developed and carried out with promoter farmers who then passed on their knowledge to the farmers. A first step was the implementation of trainings on Good Agricultural Practices. These trainings were held by SMS Ltd. [14] and were aimed to:

- Increase coffee yields and quality
- Improve soil characteristics including texture, structure, drainage, color and temperature regulation
- Conserve natural ecosystems by conserving soil and water

These trainings followed the coffee calendar of activities making them most relevant to the farmers. Table 4 on the following page gives an overview on the implemented trainings both with KOMOTHAI and with Baragwi promoter farmers.

Apart from trainings on Good Agricultural Practices organizational capacity was strengthened by setting up a Quality Team and a Quality Management System. The Quality Team was involved and trained in planning the promoter farmer program, project implementation, the bottom up approach in decision making, coffee quality management and principles of cooperative management. Trainings to develop internal auditing skills were also conducted.

14 See also A Manual for Field Staff and Promoter Farmers by SMS Ltd

Training on	Aim	People trained	No. of trainings carried out
Soil Management	Know how to ■ do soil sampling ■ interprete soil sample reports ■ make vegetation and boma compost manure ■ use inorganic fertilizers correctly ■ do mulching for soil conservation ■ build terraces ■ use strip grass in bench terraces	KCGCS - 157 promoter farmers BFCS - 240 promoter farmers 23 board members of KCGCS and BFCS	19 zonal trainings
Canopy Management	Know about ■ tree cycle ■ tree handling ■ desuckering	KCGCS - 157 promoter farmers BFCS - 240 promoter farmers	35 zonal trainings 3 field days
Coffee picking	Know about ■ picking intervals ■ picking of overripe and under ripe cherry ■ correct handling and transport of cherry before processing	KCGCS - 157 promoter farmers BFCS - 240 promoter farmers	13 wet mill trainings (KCGCS) 35 zonal trainings
Coffee processing	Know about ■ cherry sorting ■ pulping ■ pre-grading ■ fermentation ■ grading ■ water soaking ■ drying	56 wet mill staff including wet mill managers 385 promoter farmers 23 board members	5 trainings
Integrated Pest Management (IPM)	Know how to ■ use quality compost manure ■ reduce the use of pesticides by increasing tree immunity ■ conserve flora and fauna ■ restore coffee growing ecosystems ■ use personal protective equipment during the application of agro-chemicals ■ do record keeping	KCGCS - 157 promoter farmers BFCS - 228 promoter farmers BFCS - 234 promoter farmers + 240 spray team members	several trainings
Ecosystem conservation	Know about ■ soil and water conservation ■ agro-forestry systems ■ suitable shade trees for coffee ■ waste management ■ planting of shade trees ■ tree nursery management	BFCS - 234 promoter farmers BFCS - 49 wet mill staff + 12 management committee members	12 field days

Table 4: Conducted GAP trainings with promoter farmers

II. Introductory Training

Besides trainings on Good Agricultural Practices which support coffee production in general, trainings specifically for the implementation of the Climate Code were developed. The very first session is an introductory training[15] for management staff of producer organizations and promoter farmers. This training gives an overview on climate change impacts on coffee (see example Figure 12) and offers a first introduction to climate change adaptation and mitigation issues. It is designed for one day and includes group work sessions where the participants can quickly analyze if and which challenges they are facing are climate related.

This introductory session serves as a first sensitization on climate change issues. It is designed for producer organizations to then decide whether or not climate change is a challenge for them and if they want to become verified under the 4C Climate Code.

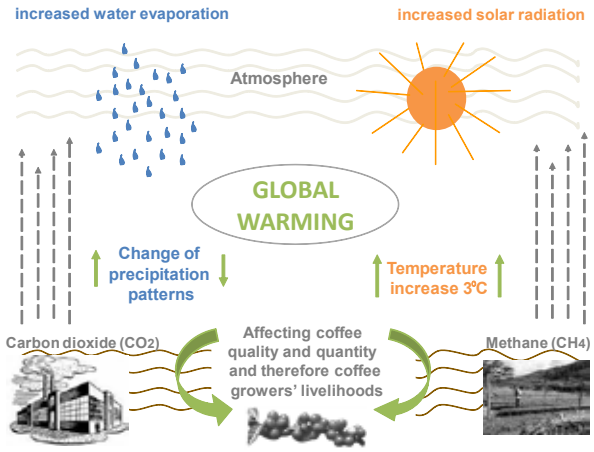


Figure 12: Introduction to Climate Change

III. Participatory Analysis of Climate Risks and Vulnerabilities

After deciding to become verified under the 4C Climate Code, the producer organizations undergo a two-day participatory analysis.[16] On the first day the producers look into the current status of their production. Only towards the end of day 1 the influence of climate and climatic changes is linked to the current production where applicable. On day 2 the participants identify their shared values and analyze which prominent challenges and risks endanger future existence of these values.

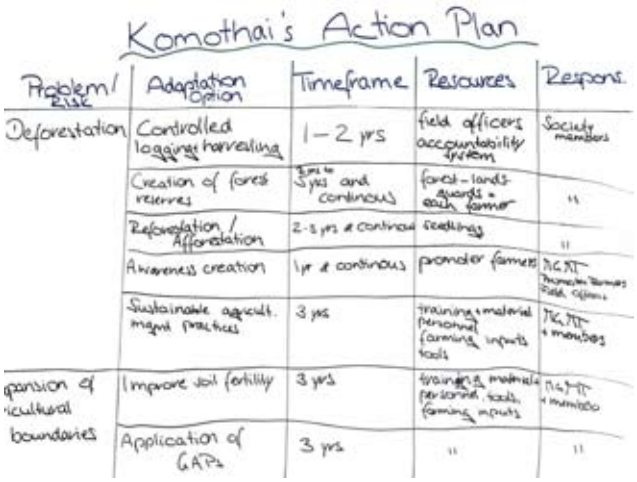
Figure 13: Participatory analysis with KOMOTHAI - the problem tree exercise

The identified challenges and risks are then analyzed and for the ones that are somehow related to climate issues the participants are developing suitable solutions – adaptation options. Between all participants these adaptation options are discussed and the ones considered feasible and effective for addressing the corresponding challenge are fed into an action plan. This action plan builds the base for starting implementation of the 4C Climate Code.

Through this process Baragwi identified deforestation, pests and diseases, poor farming practices and erosion as most pressing climate vulnerabilities and changing weather patterns as their biggest climate risk. KOMOTHAI's analysis showed deforestation, expansion of agricultural boundaries, cultivation in water catchment areas, draining waste water into rivers and loss of soil fertility as prominent climate vulnerabilities and lack of rains / water as well as droughts as pressing climate risks (see example in Figure 14).

The 4C Climate Code, through its principles, criteria and indicators offers guidance on how to tackle these challenges. Therefore the identified aspects by the producer organizations are prioritised to address first and then other aspects of the 4C Climate Code are added accordingly.

15 The manual and the presentations to this training can be downloaded at www.4c-coffeeassociation.org/en/work-on-climate-change.php
16 Manual and results of KOMOTHAI as well as of Baragwi are available at www.4c-coffeeassociation.org/en/work-on-climate-change.php


Komothai's Action Plan

Problem/ Risk	Adaptation Option	Timeframe	Resources	Respons.
Deforestation	Controlled logging/ harvesting	1 – 2 yrs	field officers accountability system	Society members
	Creation of forest reserves	5 yrs and continous	forest – lands awards = each farmer	"
	Reforestation / Afforestation	2-5 yrs & continous	seedlings	"
	Awareness creation	1 yr & continous	promoter farmers	TC, FT,
	Sustainable agricult. mgmt practices	3 yrs	training + material personnel farming inputs tools	TC, FT, + members
pansion of icultural boundaries	Improve soil fertility	3 yrs	training + material personnel, tools, farming inputs	TC, FT, + members
	Application of GAPs	3 yrs	"	"

Figure 14: KOMOTHAI's action plan

IV. On-farm Carbon Monitoring

The Sangana PPP had its focus on climate change adaptation, but due to its link with the World Bank's carbon project also wanted to offer support for the producers in understanding mitigation activities. As the developed SALM methodology did not offer any specific farmer guidance on how and what to monitor, the Sangana PPP developed a training module for on-farm carbon monitoring.

This training session is split into four chapters:

1) Overview on climate change
2) Concepts in monitoring GHG
3) Overview of GHG monitoring
4) Monitoring

In these four chapters the producers learn about the international framework in which global mechanisms, such as carbon trade, are operating, they learn about the carbon pools and sources in their production systems, about project boundaries and leakage. Furthermore the producers learn how to take the necessary samples and collect the necessary data for determining an increase in the carbon stocks and a decrease in the emissions.

Carrying out this training with promoter farmers and management staff from Baragwi showed that the hardest for the producers to follow were the more theoretical parts. Chapter 1 looking into international mechanisms for climate change mitigation presented the biggest challenge. When implementing this training module it is advisable to check all four chapters first and consider them more like a toolbox – this allows for tailoring the training session better to the participants' needs.

d) Verification and Instruments

I. 4C Verification Tools

For any private standard in the agricultural sector it is a normal procedure to carry out an audit to ensure compliance with the demanded principles and criteria. The 4C Code of Conduct demands such an audit every 3 years. This means an accredited certification body is hired to check if the corresponding producer organization fulfils the principles stated in the 4C Code of Conduct. In order to carry out an audit on the compliance with the 4C Climate Code the existing auditing tools and procedures of 4C were adopted.

An already verified 4C Unit can opt to become verified under the 4C Climate Code during their normal 4C audit or at any other time. A new 4C Unit can opt to do the inspection for compliance on the 4C Climate Code together with their first verification to become a 4C Unit or at any later stage. The further development of the 4C Climate Module within the 4C Association after the end of the Sangana PPP may lead to changes in this procedure. For the verification of the Climate Code some climate specific components have been added to the usual instruments or guidance offered from the 4C Association. This includes the 4C Verification Report Template and the 4C Self Assessment. As shown in Figure 16 on the next page a document of the 4C Climate Code is available indicating measurable indicators and explicit guidance on how to verify the different principles and criteria for certification bodies.

The audit of the Baragwi Cooperative Society Ltd (BFCS) under the 4C Climate Code was carried out by AfriCert Ltd. in July 2011. BFCS had already achieved Rainforest Alliance certification and an official benchmark process had been carried out entitling BFCS also to hold the 4C Certificate, i.e. to become an official 4C Unit.

Figure 15: BFCS board members celebrating their 4C Climate Certificate during a certificate award ceremony

Category	Principle	Criteria / Indicator			Comments
		Green	Yellow	Red	
Enabling Environ-ment	Capacity building on climate change adaptation and mitigation is accessible	Action plan to address climate vulnerabilities and risks is being implemented	Action plan to address climate vulnerabilities and risks has been elaborated, implementation has not taken place	Action plan to address climate risks and vulnerabilities has not yet been developed	See manual for participatory workshop on climate risks + vulnerabilities; New
	How to verify	Participatory WS on climate risks + vulnerabilities carried out (participants list) Action Plan developed (Action Plan) Action Plan being implemented (Field)	Participatory WS on climate risks + vulnerabilities carried out (participants list) Action Plan developed (Action Plan)	Participatory WS on climate risks + vulnerabilities not carried out	

Figure 16: The Climate Code indicating how to verify the different criteria according to the traffic light system

II. The Cool Farm Tool

Besides verification of compliance with the 4C Climate Code the Sangana PPP also opted to work together with the Cool Farming Options[17] project by the Sustainable Food Laboratory, Unilever and the University of Aberdeen to be able to monitor the climate impact of the proposed practices in the Code and to define emission hot spots in coffee production. The Cool Farm Tool (CFT)[18] is a greenhouse calculator for quantifying on-farm emissions. A general version, applicable for many different crops, was developed by the Cool Farming Options project and sponsors for developing the tool further tailored to the needs of different crops were included. Out of the Sangana PPP Ecom and GIZ became a sponsor to include coffee or tree crop specific aspects.

The main effort in order to define emission hot spots and to see what impact on emissions and sequestration is caused by the implementation of different agricultural practices is the collection of necessary data.

Within the Sangana PPP Sustainable Management Services Ltd (SMS) was tasked with data collection for the CFT. An initial data collection was done by GIZ in May 2010 for 40 farms. It was decided after this sampling that a sequestration function was necessary in the CFT to allow for proper accounting for the carbon sequestration of above ground biomass in perennial crops. SMS then did a second round of data collection, including numbers, species and diameters of non-coffee trees within the coffee parcels, from 25 additional farms. These 25 farmers were categorized by agroecological zone (Upper, Mid, Low) and by management level (low, medium, high). The management levels correspond with average yields:

Low Management = 0-2.9 kg cherry/bush
Medium Management = 3-4.9 kg cherry/bush
High Management = 5 and above kg cherry/bush

Furthermore another grouping was done according to being a promoter farmer or a farmer. Through the SMS Promoter Farmer Model and the trainings carried out within the project, a promoter farmer adopts proposed practices quicker than a normal farmer.

17 www.sustainablefoodlab.org/projects/climate
18 www.growingforthefuture.com

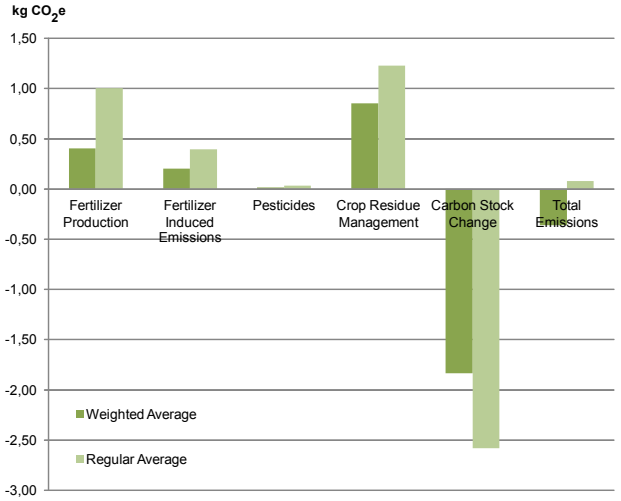


Figure 17: Comparison of emissions by category and total for average and weighted averages of the 25 sampled farms, kg CO_2e/kg coffee cherry

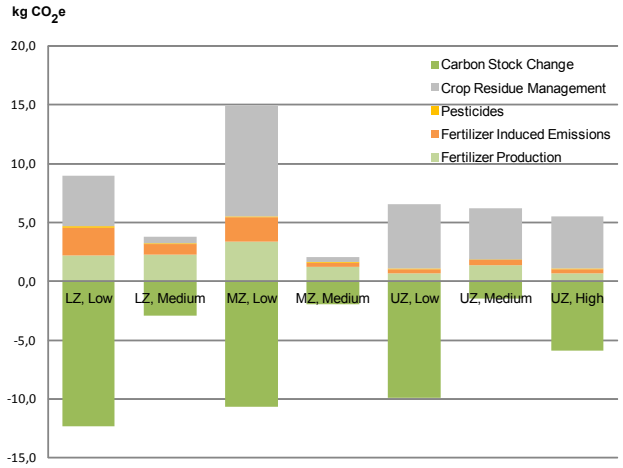


Figure 18: Breakdown of emissions per category by Management Level and Agroecological Zone in kg CO_2e/kg coffee cherry

Figure 19: Weighted average total emissions for promoter farmers vs non-promoter farmers in kg CO_2e per kg coffee cherry

Preliminary results in Figure 17 show that the on-farm net emissions from this sample of farms is an average of 0.08kg CO_2e per kg coffee cherry when calculated on a straight average. The weighted average according to each farm's production volume is -0.3608kg CO_2e/kg cherry. Emissions from fertilizer production and induced emissions from fertilizer use along with crop residue management are the primary sources overall.

Carbon sequestration from above ground biomass and management practices such as incorporation of residues, compost and manure account for the significant carbon stock changes seen in the system, which largely offset the emissions. An important note here is that understanding how the data is collected on numbers and diameters of shade trees, quantity and treatment of crop residues and fertilizers is critical to understanding how representative the results are of the entire system. These numbers are for on-farm emissions and a significant portion of coffee's Product Carbon Footprint comes from the processing stage and waste water treatment. There was not sufficient data from the Kenyan mills to calculate processing emissions.

Figure 18 demonstrates that the farmers within the low management level (i.e. lowest yielding farms) are sequestering the most carbon regardless of which zone they are in. Emissions from crop residues are consistent from all but the farmers in the medium management level, and fertilizer emissions are greatest for the low management level farmers in the low and mid zones. This may be most closely correlated to yield. As coffee farms become more productive, their per kg CO_2e emissions decrease. These results need to be carefully considered with the agronomists at SMS who are directly familiar with the practices of the farmers surveyed to distill and verify the conclusions that can be made from these results.

Figure 19 demonstrates the difference in total emissions between those farmers categorized as 'promoter farmers'. These farmers have received training from SMS on good agricultural practices such as soil management, canopy management, proper harvesting and processing, water use and integrated pest management.

The total (weighted average) net emissions are 50 grams/kg cherry for non-promoter farmers vs. -620g/kg cherry for promoter farmers, a significant difference in these farms ability to sequester carbon and could be closely associated with the management practices being followed. However, promoter farmers are usually more advanced in terms of their production systems than the normal farmers so that they already apply better agricultural practices and then receive extensive training on top. Therefore not the entire difference between the figures for the promoter farmers and the figures for the farmers can be accredited to project activities, but the graph rather gives indications on tendencies.

A promoter farmer at BFCS

The key findings in this assessment are that fertilizer use, crop residue management and carbon stock changes have the most significant impact in terms of mitigation. These practices also relate to the agricultural practices being promoted in the 4C Climate Code and specifically in the SMS Agricultural Training Manual.
In the case of Baragwi, the results of the second round of data collection give good indications which practices to emphasize for further supporting climate change mitigation:

■ Fertilizers and Crop Residues

The efficient use of fertilizer is central to both a productive coffee farm and a coffee farm wanting to contribute to climate change mitigation. Efforts should be made to optimize the use of organic fertilizers and efficient use of synthetic fertilizers to boost yields without unnecessarily boosting GHG emissions. Practices such as composting and/or mulching residues (both from processing and pruning), incorporating compost and manure when available will increase the organic matter of the soil, boost productivity and sequester carbon in the soil. Efforts to adequately aerate composting residues are also critical to minimizing the methane emissions from this process.

■ Above Ground Biomass

The presence of shade trees within the coffee farms is clearly a critical pathway to sequestering carbon. Shade trees vary in their percentage of canopy cover and ability to fix nitrogen, so region-specific recommendations are needed for coffee farmers to learn which trees can offer the co-benefits of fertilization, carbon sequestration and possibly eventual timber revenue with valuable species. Farmers of agroforestry crops like coffee must balance these benefits with the need for increased productivity for livelihood and quality needs.

Piloting the CFT within the Sangana PPP has been extremely productive in identifying how functionality for perennial crops like coffee could be added into the CFT. Early on in the process, the Food Lab convened an adhoc group of experts and stakeholders interested in using the CFT for tropical agroforestry crops like coffee and cocoa. This group included GIZ, CIAT, Rainforest Alliance, CATIE, Efico Trading, and Solidaridad and provided critical insight on robust data and literature. Work to strengthen the CFT for tree crops such as coffee is still ongoing and the Sustainable Food Lab is actively soliciting partners and potential funders to address these issues and continue the next stage of the evolution of the CFT for GHG emissions quantification in tropical crops like coffee, cocoa and tea.

As mentioned before, for the project the biggest challenge on working with the Cool Farm Tool was the data collection itself. This is due to the size of the Baragwi cooperative as well as of the complexity of smallholder production systems. Main issues arose in defining the sample design (What is a representative farm?), the sample size (How many farms to visit to get a representative amount of samples?) and the data collection itself when on the plot with the producer. On the last point challenges for collecting soil samples in terms of costs, adequate equipment available and accordingly trained staff was one issue. Another was how to ask producers and get correct responses (e.g. concept of land-use, plot size and amount of applied fertilizer) and the lack of available data altogether (e.g. crop residues from mulching and pruning, water use, energy use). [19]

19 Based on Henk van Rikxoort, CIAT, 2011; Recommendations for further development of CFT available www.4c-coffeeassociation.org/en/work-on-climate-change.php

Ideally the data collection can be combined with the 4C Climate Module. Within the Climate Code some record keeping on e.g. shade trees is integrated, but collecting the data necessary for the Cool Farm Tool goes beyond farmers' capacities in many cases. Therefore it is advisable to do data collection during the audit.

In this case the auditor is equipped with an additional questionnaire to assemble the necessary data on top of the verification process. Within the Sangana PPP this process has been trialed during a test verification of the Climate Code and auditors from AfriCert in general felt, it was possible. This would also answer the question on sample size as verification for 4C is defining a sample size of half of the square root. However, it very much depends on what the data and the results of the Cool Farm Tool are being used for. It is hardly sufficient for establishing a complete carbon footprint for the cooperative, but it does give good indications on emission hot spots, potential reduction strategies and the climate impact of changes in agricultural practices.

e) Data Bank

As a lack of climate relevant information or a lack of access to climate relevant information is often a problem for producer organizations and also for certification bodies or other actors in the coffee supply chain, the project decided to collect adequate information and make it available.

Therefore scientific texts on the impacts of climate change on coffee, research papers on potential adaptation or mitigation options and case studies have been assembled in the data bank. Furthermore some country specific climate data, as shown in Figure 20, e.g. future scenarios for the suitability of coffee, have been included.

This collection of information is available at the 4C climate change portal:

www.4c-coffeeassociation.org/en/work-on-climate-change.php.

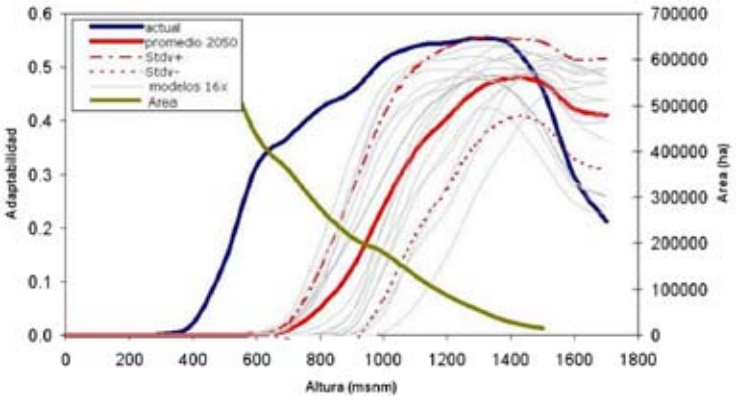


Figure 20: Current and future coffee production suitability by altitude for Nicaragua

3 | Achieved Impact

at Baragwi Farmers' Cooperative Society and beyond

When the project started, the farmers already knew that changes in their local precipitation patterns and in temperature were occurring. The Sangana PPP simply supported the producers in analyzing and structuring their knowledge and gave guidance for finding effective responses via the Climate Code. Due to the sensitization and training carried out with the Baragwi Farmers' Cooperative Society Ltd (BFCS) and the implementation of the 4C Climate Code, farmers have changed some of their practices. Furthermore some changes have happened at BFCS' organizational level. In particular it is worth mentioning the following:

- Farmers are protecting the riparian strip (6 meters from the river line) by allowing natural vegetation, planting Napier grass, sugarcane or any other plant that does not require to be fertilized, sprayed against pest or weeding. These create buffer zones between the farm and the water body.
- Most of the farmers have adopted farming skills that conserve water and soil e.g. bench terracing, strip grassing, mulching, reduced tillage, composting and integrated pest management.
- Farmers have recorded the varieties, number per variety and age of shade tree in their respective farms.
- An indigenous tree nursery has been established to increase the shade tree cover within the region.
- Proper disposal of solid waste e.g. coffee pulp is used for making compost, organic waste separated from inorganic waste and disposed off separately.
- The cooperative has made an inventory of conservation areas which include rivers, fountains, swamps and forest.
- The society has formed and mandated the Quality Management Team that is responsible for addressing extreme weather issues.
- The society has included in their action plan activities relating to address water management e.g. proper disposal of waste water away from any water body or storm water channel, harvesting of rain water, piping water in open furrows, reclamation of water fountains and swamps in the Baragwi region.
- The formation of a spray team that carries out spraying for all members of BFCS and takes care of the proper disposal of the waste.

Through the project BFCS has learned to see their agricultural activities in relation to their micro but also the global climate. Measuring impacts after working with BFCS for such a short time as 1.5 years is asking quite a lot. Nonetheless first perceived impacts were discovered during project evaluation. These impacts include:

- An increase in awareness on climate change and environmental issues.
- Water levels of local river streams are beginning to rise due to improved conservation of riparian land.
- An increase in production (some farmers, especially the promoter farmers managed to double or even triple their yields). In the season 2009/10 BFCS had a total yield of 5 million kg cherry, in the season 2010/11 yields dropped to 2.5 million kg cherry and their estimated yield for the coffee season 2011/12 is 7 million kg cherry.
- Due to increased quality coffee prices paid to farmers have improved from 35 Kenya Shilling in 2009 to 68 Kenya Shilling in 2010 and 116.5 Kenya Shilling per kg cherry in 2011.
- Farmers who had abandoned their coffee farms have started to take it up again.
- The youth is contracted to do the spraying and therefore new jobs are created.
- The youth is gaining interest in farming again.

For project evaluation 20 farmers of BFCS and 20 farmers of the neighboring cooperative, Kabare, have been interviewed. In comparing the results it was seen that BFCS feels better equipped to address climate change challenges, knows where to get support to address climate change challenges and develops own ideas on how to respond to climate change challenges.

Besides impacts at BFCS the project has also caused impacts at the level of the project partners. Sangana Commodities Ltd is thinking about rolling out the approach to other East African countries and maybe even trialing it in the cocoa sector.

The 4C Association has assessed the need for addressing climate change aspects within their standard via a questionnaire whereby 91% of the producers and 80% of the trade and industry respondents expressed their interest in the 4C Climate Module. Tchibo GmbH has decided to further work with BFCS, not only on climate issues but also beyond. As for GIZ there are several ongoing projects where the findings and results of the Sangana PPP are being anchored. One is another strategic alliance on Coffee & Climate: **www.coffeeandclimate.org**

A promoter farmer from BFCS together with his wife

4 | Lessons learnt

throughout the project

Of course there were many lessons learnt throughout project implementation. Stated here are only a couple which are specifically related to the 4C Climate Code and its implementation with coffee producers as well as general lessons learnt when it comes to climate change and smallholder producers.

Looking at the implementation of the 4C Climate Code specifically one observation can be made: When implementing it with a producer organization it is quite easy for the producers to define climatic changes in their region over past years and to define negative impacts on their production and their livelihoods caused by these changes. Crucial is to chose the right terminology and not to look into too much complexity when it comes to global response mechanisms such the carbon markets. Terms such as “adaptation” and “mitigation” or “greenhouse gases” are hard to grasp for producers, especially when starting to work with them on climate change issues. Using simple language such as “responses to climate change” or “less susceptible coffee farms” is advisable. Furthermore it can help to work with a couple of simple illustrations to explain e.g. the climate change phenomenon.

Besides terminology it was certainly a challenge to convert hard data of 16000 farmers into soft data to process it. Even entering – apart from collecting it - all data necessary for the Cool Farm Tool of just 25 farmers was cumbersome and time consuming. The measuring of the diameter at breast height of all shade trees in a given coffee farm presented the biggest challenge in collecting this data.

The Sangana PPP gained a couple of general lessons learnt when working on climate change issues with producer organizations:

- In agriculture adaptation is more important than mitigation.
- Producers have their own coping mechanisms and have to be involved in finding solutions, i.e. adaptation options.
- Adaptation has to be a mix of scientific and participatory approaches.
- Local, regional and national networks are necessary for successful adaptation.
- Funding for adaptation is one of the biggest challenges.
- Adaptation can have mitigation effects.
- Data collection for mitigation is cumbersome and not (always) precise.

Healthy coffee

I wish to thank all parties involved in the Sangana PPP for their inputs and their support. It has been a great project and I hope future projects on climate change issues with coffee smallholders – and potentially beyond the coffee sector – can learn from and build upon the results and lessons learnt generated. In particular I would like to thank:

- The KOMOTHAI Coffee Growers Cooperative Society Ltd. and the Baragwi Farmers' Cooperative Society Ltd. for their great efforts in implementing the 4C Climate Code
- Justin Archer and his team at Sangana Commodities Ltd. for being one of the initiators of the project
- Julius Ng'ang'a and his team at Sustainable Management Services Ltd. for delivering excellent work at producer level and giving valuable feedback for general project implementation
- Cornel Kuhrt from Tchibo GmbH for her passion for sustainability issues in the coffee sector and her great support for the Sangana PPP
- Annette Pensel, Gabriele Schmidt and Van Thanh Cao from the 4C Secretariat for their efforts and inputs
- Carsten Schmitz-Hoffmann and his team of the Program Social and Environmental Standards at GIZ Division 45 for their support
- Nicole Herzog from Mundografia for designing this Guide Book and several other project materials
- The Sustainable Food Lab for the good collaboration on the Cool Farm Tool
- Sophie Grunze, Henk van Rikxoort and Kate Shippam for supporting the Sangana PPP during their internships
- All of the people who enriched the Sangana PPP with their valuable inputs

Coffee cherries in Kerstin's hand

Published by

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH
PO Box 5180
65760 Eschborn, Germany

Sangana Commodities Ltd.
Wilson Business Park
Foxtrot Building
PO Box 18126
00500 Nairobi, Kenya

Author Kerstin Linne GIZ
Co-author Chapter 2c) I. Charles Nzioka, SMS
Chapter 2d) II. Jessica Mullan, Stephanie Daniels, Sustainable Food Lab

Design mundografia.com I Dresden

Photo and graphic credits

all photos taken by Kerstin Linne / GIZ

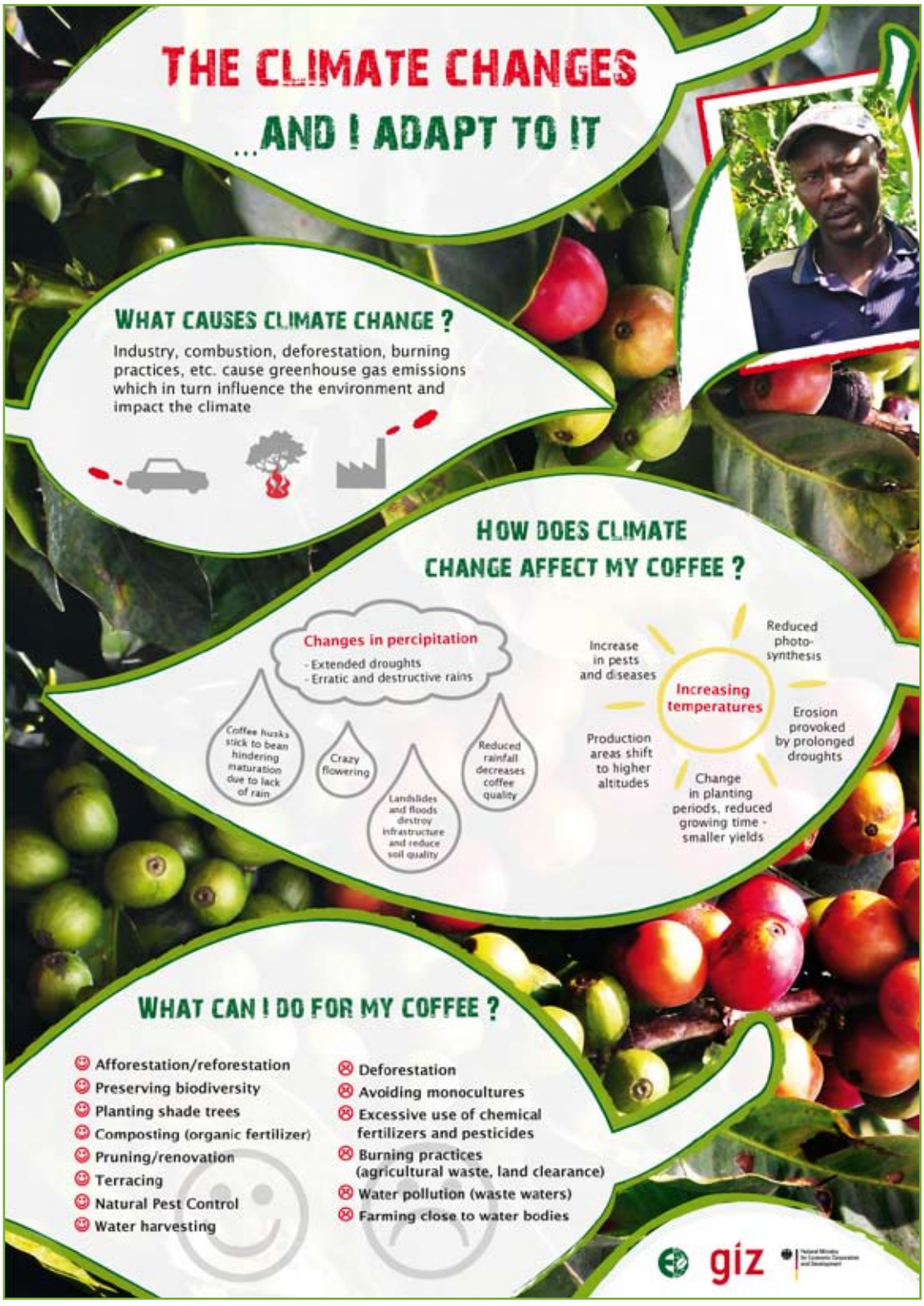
p. 08	Table 1	T. Tennigkeit + J. Wölcke, BioCF, “Coffee Carbon Finance Project”, 2009
p. 10	Table 2	T. Tennigkeit + J. Wölcke, BioCF, “Coffee Carbon Finance Project”, 2009
p. 10	Table 3	BioCarbon Fund, Proposed methodology: Adoption of Sustainable Agricultural Land Management (SALM), 2009
p.18	Table 4	Kerstin Linne, Sangana PPP, 2011

p. 05	Figure 1	Kerstin Linne, Sangana PPP, 2009
p. 11	Figure 2	T. Tennigkeit + J. Wölcke, BioCF, “Coffee Carbon Finance Project”, 2009
p. 11	Figure 3	Unique Forestry Consultants, Carbon Baseline establishment Guidelines for Sustainable Agricultural land-management projects, 2008
p. 12	Figure 4	Unique Forestry Consultants, Carbon Baseline establishment Guidelines for Sustainable Agricultural land-management projects, 2008
p. 13	Figure 5	Kerstin Linne, Sangana PPP, 2009
p. 14	Figure 6	Kerstin Linne, Sangana PPP, 2010
p. 15	Figure 7	Kerstin Linne, Sangana PPP, 2010
p. 15	Figure 8	International Centre for Tropical Agriculture (CIAT), 2010
p. 16	Figure 9	International Centre for Tropical Agriculture (CIAT), 2010
p. 16	Figure 10	International Centre for Tropical Agriculture (CIAT), 2010
p. 17	Figure 11	C. Nzioka, ”Sangana PPP implementation by SMS”, final dissemination workshop Kenya, August 2011
p.19	Figure 12	Adapted from Kathleen Schepp, AdapCC 2008
p.19	Figure 13	Kerstin Linne, Sangana PPP, 2009
p.20	Figure 14	Kerstin Linne, Sangana PPP, 2009
p.20	Figure 15	Kerstin Linne, Sangana PPP, 2011
p.21	Figure 16	Kerstin Linne, Sangana PPP, 2011
p.22	Figure 17	Jessica Mullan, Sustainable Food Lab, 2011
p.22	Figure 18	Jessica Mullan, Sustainable Food Lab, 2011
p.22	Figure 19	Jessica Mullan, Sustainable Food Lab, 2011
p.24	Figure 20	International Centre for Tropical Agriculture (CIAT), 2010

Further information

Kerstin Linne
GIZ, PO Box 5180
65726 Eschborn, Germany

T +49 - 6196 - 79 3004
M +49 - 160 - 90 41 41 69
E kers.linne@gmail.com
I www.4c-coffeeassociation.org/en/work-on-climate-change.php


THE CLIMATE CHANGES
...AND I ADAPT TO IT
WHAT CAUSES CLIMATE CHANGE ?
Industry, combustion, deforestation, burning practices, etc. cause greenhouse gas emissions which in turn influence the environment and impact the climate
HOW DOES CLIMATE CHANGE AFFECT MY COFFEE ?
Changes in percipitation
- Extended droughts
- Erratic and destructive rains
Coffee husks stick to bean hindering maturation due to lack of rain
Crazy flowering
Landslides and floods destroy infrastructure and reduce soil quality
Reduced rainfall decreases coffee quality
Increasing temperatures
Increase in pests and diseases
Reduced photo-synthesis
Erosion provoked by prolonged droughts
Change in planting periods, reduced growing time - smaller yields
Production areas shift to higher altitudes
WHAT CAN I DO FOR MY COFFEE ?
Afforestation/reforestation
Preserving biodiversity
Planting shade trees
Composting (organic fertilizer)
Pruning/renovation
Terracing
Natural Pest Control
Water harvesting
Deforestation
Avoiding monocultures
Excessive use of chemical fertilizers and pesticides
Burning practices (agricultural waste, land clearance)
Water pollution (waste waters)
Farming close to water bodies
giz

The climate changes and I adapt to it !

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Dag-Hammarskjöld-Weg 1–5
65760 Eschborn / Germany
T +49 61 96 79 - 0
F +49 61 96 79 - 11 15
E info@giz.de
I www.giz.de