How can small-scale coffee and tea producers adapt to climate change?

AdapCC Final Report - Results & Lessons Learnt

gtz

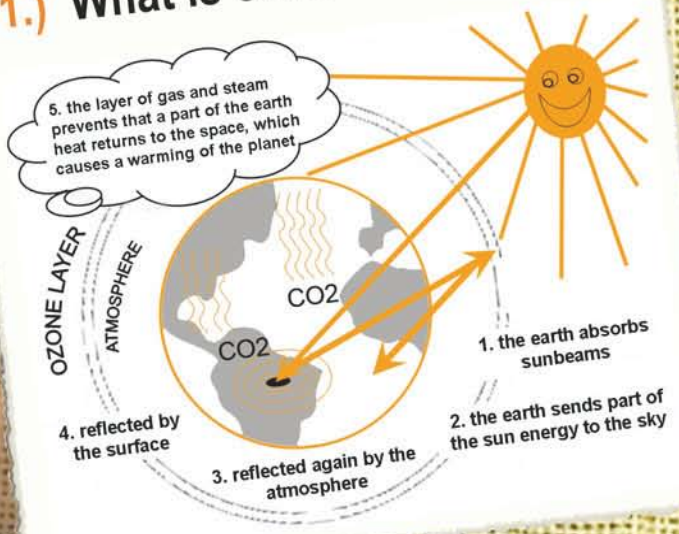
Federal Ministry
for Economic Cooperation
and Development

CAFÉ DIRECT

THE CLIMATE CHANGES

...AND I ADAPT TO IT

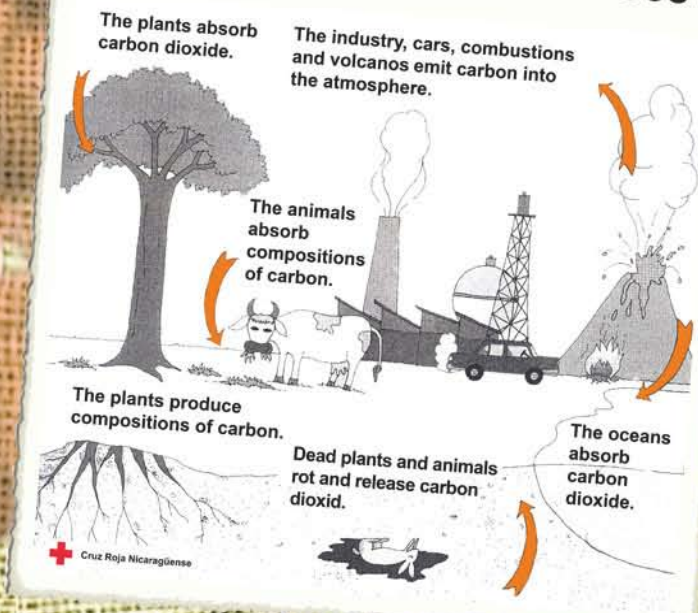
1.) What is climate change?



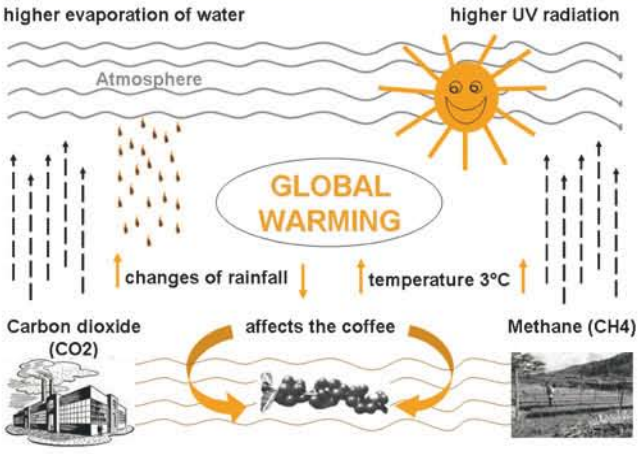
3.) What happens to my land?

+ Increase of hurricanes
+ Extended droughts
+ Increase of evaporation of water
+ Loss of forests
+ Death of livestock
+ Less production of forest crops
+ Reduction of honey production
+ Less availability of water
+ Sea level rises
+ Shortage of agricultural products

2.) What are the main causes?



4.) How is my coffee impacted?



in its quality and quantity as well as the prosperity of the coffee farmers

5.) What can I do?

+ Reforestation/ avoid deforestation
+ Fertilization
+ Pests and diseases controlling
+ Management of irrigation systems
+ Soil management
+ Shadow management

CAFÉDIRECT® gtz CEPICAFE

Contents

„I have lived near Mt Elgon all my life, and I have never known the weather to be so unpredictable. Rains now fall heavily for a short period of time and our dry season has become much longer. So while heavy rains are causing landslides because the ground cannot handle the downpours, key water sources for our community - like streams - are drying up.

This is causing big problems for growers. The coffee plants are badly affected - flowering is stopping. Last year alone we lost about 40% of our coffee production because of climate change. As a result, our people struggle for everything - food is getting more expensive and key food crops, like bananas, are being threatened as well. I have seen some crops completely wiped out. Without work and opportunities young people are being forced to move to cities to try and earn a living."

Willington Wamayeye,
General Manager, Gumutindo Coffee Cooperative, Uganda

(wwamayeye@gumutindocoffee.co.ug)

Before we started the AdapCC pilot initiative in 2007 many coffee and tea farmers in East Africa as well as in Latin America told us, that they were suffering from changing climate conditions. Unpredictable rainfalls, long-lasting drought periods or extreme weather events like hurricanes and heavy rains devastated farmers' plantations, often lying at steep slopes of the hillside, and thus reduced their yields and family income. These issues were the motivation for the British Fairtrade company Cafédirect to contact the German Technical Cooperation (GTZ) and suggest the implementation of a joint pilot project to support small-scale farmers in confronting climate change. As a Fairtrader, the British company is counting on long-lasting relationships with about 40 smallholder producer organisations in Asia, Africa and Latin America, buying their tea, coffee or cocoa and supporting them with financial and technical assistance to sustainably improve their production and living conditions.

The federally owned GTZ as an international cooperation enterprise for sustainable development supports the German Government in achieving its development-policy objectives and operates in 130 countries worldwide.

On behalf of the German Ministry for Economic Cooperation and Development (BMZ) the GTZ is implementing the Public-Private-Partnership (PPP) Programme to jointly carry out projects with private businesses like Cafédirect.
Hence, both partners from public and private sector agreed to start a three years cooperation aiming at the development of exemplary adaptation strategies from smallholder coffee and tea organisations in East Africa and Latin America to strengthen their capacities to cope with climate change.

What does adaptation to climate change mean for small-scale farmers?

Coffee or tea producers living in poor rural areas are highly vulnerable to climate change, but they are not only loosing the quality of their crops or their yields due to climatic impacts. In fact, they are affected by heavy rains, strong winds, increasing temperatures, or less rainfall because their plantations are often in poor conditions. They have neither access to technical or financial supporting mechanisms nor the capacity to strategically confront future challenges. So the first important step on the long way to adapting to future climate conditions is to help them understand the reasons why they are affected and to recognise their own past and present mistakes.

The AdapCC project developed and applied a very participatory analysis toolkit to empower farmers to take action and responsibility for turning their future visions into reality.
The same toolkit integrates technical expertise and scientific predictions to plan a long-term adaptation strategy at the level of producer organisations. It furthermore helps affected farmers to establish learning networks and to get access to essential supporting mechanisms and partnerships. The biggest challenge of coping with climate change is managing uncertainties and this becomes easier doing it in collaboration with other affected people and institutions. The four exemplary adaptation strategies that were developed within AdapCC rely on few, but important principles:

After three years of working with farmers and help them to find ways to confront changing climate and production conditions and manage uncertainties the AdapCC pilot initiative is now able to present its results and lessons learnt, which we would like to make available for you over the next pages of the present report. More detailed information on the project, the case studies of our pilot groups adapting to climate change, investigation and research reports, forecasts of climate impacts on future suitability of current coffee growing areas, training handbooks and other useful materials are also available at the project website www.adapcc.org.

Kathleen Schepp, Eschborn, February 2010

AdapCC principles for adaptation strategies:

+ **Strengthening the resilience of a farmers' plantation** by applying sustainable agriculture practices is the first step to mitigate the risk of being affected.
+ **Diversifying farmers' income and food production** reduces their dependence on monocultures and spreads the risk of yield and income loss.
+ **Diversification with cash crops suitable for future production beyond climate change** turns climate change losers into the winners of climate change.
+ Increasing the **efficient use of natural resources** like forests, biodiversity, water, and soil increases farmers' productivity in the long run and in a sustainable way.
+ Selecting **more resistant crop varieties** could be an option to adapt coffee and tea production.
+ **Adopting the technologies for processing** helps farmers to conserve the quality of the products and earnings.
+ **Building farmers' capacity** through providing access to information and knowledge empowers them to take action and make decisions.
+ **Building partnerships** between different public and private actors helps farmers to benefit from **improved framework conditions** to cope with climate change.
+ Receiving **income from climate friendly certified products or credits for reduced greenhouse gas emissions** could be an option to finance adaptation measures.

1 How we implemented the AdapCC project

When we started the AdapCC project, we first had to determine and systematise how climate is affecting tea and coffee production and how we could use this information to identify adequate adaptation measures and plan adaptation strategies for the producer organisations.

> The main objective of AdapCC:
>
> Producer groups of Cafédirect's supply chain have created examples for how to strengthen their capability to cope with the impacts of climate change and how to improve their access to respective financial and technical support mechanisms.

Thus, the AdapCC pilot project was divided into four project phases:

1) **Investigation** of regional and local climate change impacts on smallholder coffee and tea production, identification of main local and international actors, proposal of possible adaptation measures for coffee and tea sector.
2) **Participatory analysis process** (ROA) leading to site-specific adaptation strategies for 4 pilot producer organisations.
3) **Implementation of identified adaptation measures**
4) Evaluation of results, lessons learnt and **dissemination** of results.

Between April 2007 and February 2010 several important steps had to be taken on the way to develop exemplary replicable adaptation strategies. As mentioned, we started with a comprehensive investigation to find out the degree to which coffee and tea producers were being affected and threatened by climate change. Besides desktop studies and national research in six pilot countries Kenya, Tanzania, Uganda and Mexico, Nicaragua, Peru we started the producers' dialogue to identify farmers' perception of climate change.
Interviews with nearly 400 smallholders and management team members of their organisations were realised between July and September 2007 in the six focus countries. The topics discussed with the producer groups included experienced impacts of climate variability, options to deal with those impacts, traditional measures in dealing with climate change successfully as well as possibilities to access information and technical and financial support.

Nearly all interviewed farmers confirmed to have experienced climatic changes during the last 20 years. Among these changes were, important modifications in rainfall with a tendency to reduced and unforeseeable precipitation, heavy rainfalls causing landslides, increasing temperature and changed wind patterns. Producers had many ideas of how to cope with these risks and adapt to changing climate and worsening environmental conditions.

	April – October 2007	November – December 2007	January – November 2008
Phase	INVESTIGATION		ANALYSIS PROCESS
Activities	Desktop study and interviews in 6 countries	Definition of criteria & selection of pilot groups	Development and application of ROA process
Output	+ Main CC impacts + Producers' perception & adaptive capacity + Data availability + Framework conditions + Traditional coping strategies + Adaptation options + Stakeholder mapping + Financing mechanisms + Methodology to develop adaptation strategy	+ Severity with which producers are affected + Implementation capacity of producer organisation + Representativness for successful examples + Number of producer partners in the area, potential synergies + Framework conditions to receive technical and financial support	+ Design of ROA process + First testing with CEPICAFE in Peru and PRODECOOP in Nicaragua + Adoption of ROA process + Second testing and refining with Más Café in Mexico and Michimikuru in Kenia

Figure 1 - AdapCC activities between April 2007 and November 2008, phase 1 and 2

	November 2008 – February 2010	January – September 2009	September 2009 – February 2010
Phase	IMPLEMENTATION		DISSEMINATION
Activities	Implementation of exemplary adaptation strategies in four pilot groups	Development and realization of capacity building program in LA	Dissemination of results & scaling up
Output	Coffee sector: + CEPICAFE Piura / Peru + PRODECOOP / Nicaragua + Más Café Chiapas / Mexico Tea sector: + Michimikuru Meru / Kenya	+ Design of one week seminar to train the trainers + Cooperation with CATIE and CIAT + Carrying out seminar in March 2009 in Nicaragua, 26 trainers trained + Development of training handbook	+ Expert meeting at GTZ Germany Oct 9th 2009 Regional workshops: + Nov 27th 2009 Kenya + Jan 14th 2010 Peru + Feb 2. – 3. 2010 Mexico + Political sensitization campaign in Central America Jan 2010 + Extending pilot case to Cafédirect producer partners

Figure 2 - AdapCC activities between November 2008 and February 2010, phase 3 and 4

They have developed coping mechanisms in order to live with climatic variations such as; diversification of crops and sources of income, migration, reliance on remittances and social networks for support. The lack of financial and technical support and the missing awareness among politicians were the main barriers for adaptation. Any support to implement the adaptation to climatic change impacts was welcome, especially in the context of farmers' ideas.

The complete synthesis report is available at the project's website http://www.adapcc.org/download/Synthesis_Report_AdapCC_200804.pdf.

Based on these findings we selected 4 pilot producer groups in Mexico, Nicaragua, Peru and Kenya and developed a Risk and Opportunity Analysis (ROA) to participatively design exemplary adaptation strategies for each of the pilot groups.The following phase of implementation included the development of a capacity building programme for smallholder coffee farmers and their organisations in Latin America. The training handbook including all didactic materials and exercises to be applied with coffee farmers is available at the link http://www.adapcc.org/en/results.htm.

After implementing examples of adaptation measures with pilot groups regional workshops in Kenya, Peru and Mexico were carried out to present farmers' and farmers' organisations results and to identify options and multiplying institutions to scale up the pilot approach so that a wider number of farmers will be able to benefit in the future.

Achieved results:

+ **Database** concerning impacts and future risks for the production of tea and coffee as well as the carbon sequestration potential
+ **ROA process** as the participatory basic tool to identify adaptation measures
+ **Exemplary adaptation strategies** implemented in four focal regions
+ **Capacity building program and handbook** to train technical mobilisers of Latin American coffee organizations
+ **Access to financial mechanisms** at national and international level
+ **Network of public and private institutions** on a regional and international level
+ **Integration of results in Central American regional policies** - political sensitization and capacity building campaign

2 How we developed adaptation strategies to climate change

The first barrier to overcome when designing an adaptation strategy is the lack of analysis toolkits to identify adequate adaptation strategies. At the international level some impact assessment tools are already in use to measure the past, current and even future impacts of climate change, but none of them were able to break down the impacts at the small-scale producer level, keeping in mind traditional knowledge and at the same time strategies to manage future uncertainties.
Consequently, the AdapCC pilot initiative provided the basis to adopt and further enhance existing analysis toolkits to identify adaptation measures at the farmer's level. Based on the Risk Analysis for Disaster Risk Management, developed by GTZ and a participatory Climate Witness Toolkit, developed and applied by WWF South-Pacific at the Fiji Islands, AdapCC developed and tested the process of the Risk and Opportunity Analysis (ROA) together with four pilot producer organisations.

The main objective of the ROA process is the **participatory identification of adaptation measures and strategies at the small-scale farmer level to cope with climate change**. The analysis serves to answer key question.

The ROA process is an analysis, carried out in 7 steps, which allows us to identify climate risks for small-scale production systems in a specific region and to understand the root causes of being affected by climate variability or extreme weather events.

The **final product of the analysis is supposed to be a site-specific strategy to adapt to climate change,** which could be implemented by the affected producers themselves. This adaptation strategy contains concrete measures to reduce the climate risks and the vulnerabilities on the producers' farm.

Key questions to be answered:

+ What are the scientific predictions of climat change for the pilot region?
+ What are the forecasted impacts of climate change on the small-scale agriculture production systems in the region?
+ How will the suitability of the current production areas change in the future?
+ Who are the main actors working in the pilot region with the ambition of confronting climate change and with the capacity to implement an adaptation strategy?
+ What are the climate risks, possible damages, vulnerabilities and root causes for the small-scale farmers?
+ What are adequate measures to confront climate change in agricultural production?
+ How can we develop an adaptation strategy in the short, medium and long term?
+ How can we implement an adaptation strategy with producer families?

Expected output of the ROA process:

+ Detailed information about the impacts of climate change on small-scale coffee and tea production in the focus regions (risks, damages, vulnerabilities of smallholders)
+ Identified countermeasures to reduce the climate risks for the producers (adaptation measures)
+ Adaptation strategies for the pilot groups including technical project designs and operational plans to implement concrete measures
+ Options to generate additional financing or funding for implementing the adaptation strategies
+ Regional network of institutions and farmers to exchange and transmit the experiences and the results of the projects

To carry out the ROA process it is necessary to facilitate participatory instruments, motivating the affected population to make decisions in the consolidation of the processes. On the one hand the process is an analysis and on the other hand it contains sessions of capacity building for all involved actors as well as sensitization lessons. Hence, the members of the small-scale producer organization are contributing to the analysis, making decisions and becoming sensitized for the climate risks and the need to adapt.

Especially the technical promoters of the organization learn to apply the analysis and to carry out the 7 steps. Accordingly, the ROA process is a process of various analyses as much as a process to develop capacities among small-scale farmers and their institutions to cope with climate change.

A manual to apply the ROA process is available at www.adapcc.org/en/results.htm.

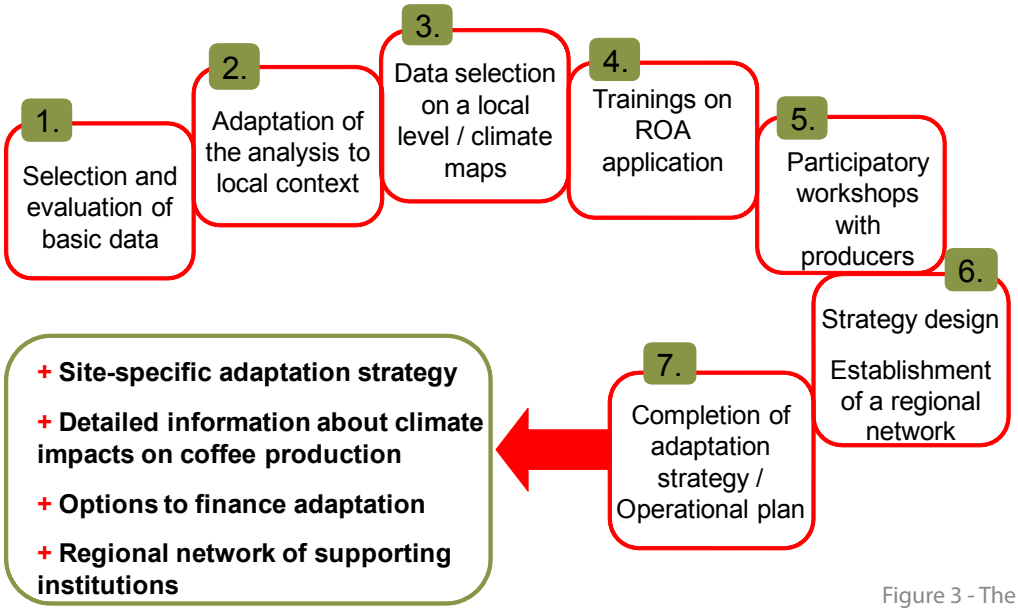


Figure 3 - The 7 steps of the ROA process

Examples for farmers' future visions with and without adaptation in Nicaragua

3 How Kenyan tea producers adapt to climate change - the Michimikuru case study

Climate change is affecting Kenyan agriculture

Climate change is affecting the weather patterns in many East African countries. In Kenya, proven climate changes are already existing, such as delayed; reduced and destructive rainfall as well as increasing temperatures that are affecting heavily the tea production. As the local population is highly dependent on tea production the main source of income for many families is in danger.

The pilot group Michimikuru Tea Factory LTD

Michimikuru was established in the early 1960's by Eastern Produce (Kenya) to produce Black CTC tea. It is located approximately 300 km North East of the capital city of Nairobi at 0.3 degrees North of the Equator and at a Longitude of 38 degrees East. It lies on a beautiful hill, 1950m above sea level on the panoramic Nyambene Hills within Tigania East administration District in Kenya's Eastern Province.

Michimikuru has a tea processing factory with a capacity to crush 15 million kilograms of green leaf per annum and approximately 4 million kilograms of black CTC tea.The company is wholly owned by 9000 registered small scale tea farmers through shareholding. It has 201 ha nucleus estate owned by the farmers. The total area under tea by the farmers is approximately 1790 ha. Tea farming accounts for about 80% of household activities and brings in about 90% of family income. The average tea farm per household is less than 0.5 acres. Michimikuru has been Fairtrade certified since the year 2007. The company is also ISO 9001:2000 certified and is currently working towards certification in ISO 22000.

Climate Change and environmental degradation affecting tea production in Michimikuru

Between November 2008 and February 2009 AdapCC realised the process of Risk and Opportunity Analysis (ROA) with the pilot group Michimikuru. The participatory workshops found out that tea farmers are suffering from the following risks threatening their yields and livelihood:

	Problem / Risk	Root Causes	Proposed Solutions
1	Increasing pests and diseases for plants and people	+ Changing climate conditions + Unsustainable agricultural practices	+ Sustainable agricultural practices
2	Food shortages and malnutrition	+ Tea monoculture + Decreasing income from tea due to climate impacts and decreasing productivity	+ Nutritional diversification and staple food production + Income diversification through alternative crops
3	Degraded soils and landslides	+ Deforestation + Lack of alternative energies + Unsustainable soil management practices + Prolonged drought periods + Lack of environmental education	+ Energy efficiency at factory and households to reduce deforestation + Reforestation with indigenous trees + Improved soil management + Environmental education
4	Less water availability	+ Deforestation and land use changes at river banks, eucalyptus trees + Prolonged drought periods	+ River bank protection + Improved soil management

The identified problems were directly caused by unsustainable land use practices, inefficient use of natural resources and the high dependence of Michimikuru farmers on monoculture tea. People are furthermore vulnerable to environmental and economic risks due to the lack of money and capacities. Changing climate conditions like increased temperatures, prolonged drought periods and changing unforeseeable precipitation patterns along with the above mentioned vulnerabilities hit farmers hard, leading to crops not giving the expected output, reducing productivity and thus family income.

Adaptation strategy to climate change

As result of the analysis process the following working areas for exemplary adaptation to climate change in the tea sector for Michimikuru were defined and implemented during 2009:

1) Food and Income Diversification
2) Water and Soil Management
3) Good agriculture Tea Practices
4) Energy use Efficiency

1) Food and income diversification

To reduce the high dependence on tea monoculture in cooperation with the Kenyan Ministry of Agriculture, alternative crops have been identified to enhance nutrition and the availability of staple foods, but also to produce passion fruit as alternative trading option. Nutritious vegetable crops like spinach, onions and carrots were introduced in 15 demo plots evenly distributed within the tea catchment. Sensitization workshops have been organized to encourage the adoption of these supplementary crops. Since most of the land is committed to tea, the productivity of the remaining little land must be increased through modern farming methods. Double digging plots break the hard pan thereby enhancing water and nutrient availability. The method allows an optimal increase of the plant population. 2290 farmers in the catchment have adopted these farming methodologies with 47,982 vegetable seedlings from the tea factory's nurseries and the rest from own nurseries.

Double digging plot

Ideal for tenants and residential factory workers and even farmers who may have utilized their entire land and where land for kitchen gardening is not available are the multi-storey gardens, bags that serve as kitchen garden. Four multi-storey gardens have been adopted at factory level and two at the household level and some more will be set up during the rainy season.

Multi-storey garden

For the daily ration to be adequate, starch should form the bulk of the ration. On this realization we sat with the farmers to select the best crops. It was unanimously agreed that the almost forgotten traditional crops like sweet potatoes or cassava were both nutritional and more adaptable to the environment. With support of KARI, bulking sites were established in the factory compound with the aim of distributing the planting materials to the farmers at an affordable price.

Cassava

Sweet potatoes

Passion fruit is a lucrative business and the ministry of agriculture was very supportive in terms of technical advice, sourcing of clean planting seedlings as well as looking for marketing options. 30 contact farmers were trained and modalities of linking them with sources of clean seedlings are being worked out. The passion fruit belongs to the winners of climate change in the Meru region, because its production will become more suitable under predicted changing climate conditions.

Passion fruit

Along with the above described components, soil fertility management is critical and need to be addressed. Farmers have been shown how to improve soil fertility using cheap and locally available materials and good agricultural practices like mulching and the use of compost. 2891 growers were trained during grower field days on the compost manure technology and about 40 growers have adopted though this was greatly affected by the drought due to lack of water and therefore materials. Farmers have been taught how they can make use of rejected green leaf in composting and manure for kitchen gardens.

Tea leave composting

Compost manure

2) Water and soil management

Better soil conservation techniques have been implemented in the pilot region. These range from the construction of terraces and embankments to the reforestation of river banks. These measures are helping to reduce the risk of landslides and improve the availability of water. It is evident that people have encroached on water springs hence leading to their drying up.

Tree nursery - river bank protection

The wet lands have been equally exposed. People have cultivated on the riparian areas, thus polluting the rivers and increasing soil erosion. Tree cover has been reduced considerably to allow for human habitation and farming, thus exposing the soil which has led to soil erosion. Five rivers were selected to serve as demo sites. The farmers, whose farms border the rivers, were sensitized on the importance of river bank protection. Trees that are considered to be not eco-friendly on such sites, e.g. eucalyptus, were cut down and indigenous trees which are known to enhance water conservation were planted. So far 63 km of riparian strips have been successfully protected. Farmers formed conservation associations to protect the mapped out riparian areas.

They further elected river bank scouts for each river who were then trained on aspects of soil and water management by the Ministry of Agriculture and issued with certificates. The ministry also donated literature on wetlands protection and supplied equipment like spirit level to assist in construction of soil and water conservation structures.

Demo unit - river bank protection

The children, who own the future, should be in the front line when it comes to winning the battle against deforestation. In this regard it was decided that all schools should be incorporated into the forest corner program. School heads and their chairpersons were called to a workshop and they came up with their own strategy, which include among others, the establishment of forest corners in their school compounds. The types of tree species to increase forest coverage and to serve as a gene bank for endangered species were also identified. Three hundred trees composed of five different species are being supplied to ten schools for a start.

Gene bank

Forest corners at schools

Michimikuru Company has partnered with Kenya Forest Department to make sure no further encroachment and destruction of public forests takes place. In this regard, three Kenya forest guards with company houses have been assisted in order for them to be within reach.

3) Good agriculture tea practices

To increase productivity of tea plants some good agricultural tea practices have been identified and implemented with support of TRFK.

Pennisetum clandestinum, popularly known as kikuyu grass is a good soil stabilizer in tea zones.

Kikuyu grass

Farmers have been taught to leave tea prunings in situ to enhance soil fertility, water retention and check run off. This is so, despite the acute shortage of firewood in the tea catchment area.

Tea prunings

Various aspects of GAP in tea farming have been disseminated through demos, barazas, field days and farm visits and among them is the infilling of all the empty spaces in the tea farms. In this regard, farmers were encouraged to start their own tea nurseries using the TRFK recommended clones with high soil nutrient utilization efficiency. The T.E.A.s assist the farmers to identify these clones in their farms.

Tea nursery

4) Energy use efficiency

This component was approached in two dimensions, energy saving at factory level and energy saving at farmer household level. The factory has replaced ordinary bulbs with energy saving ones including at the workers living quarters. Furthermore, the factory has adapted the use of energy saving motors in the recent expansion of the withering area where motors have been installed. These actions have resulted to a 30% saving on electricity consumption.

Proper maintenance, including avoidance of leaks and the use of cured wood has led to savings which have improved returns to the farmers. Previously the factory used to live from hand to mouth, i.e. using wet firewood directly from harvest fields. This used to consume a lot of energy to get rid of the moisture. It was felt that the wood should be cured first before using it in the boiler. Firewood sheds to allow for such curing were constructed and now efficiency has been enhanced and savings have been realized.

Firewood sheds

30 households were selected in the initial stages to serve as demonstration sites where 15 jiko kisasa (energy saving stoves for households) and 15 rocket stoves were installed. At planning level it was realized that more than 98% of the farmers use firewood. They were using the traditional three stones, a method that consumes a lot of firewood. It was therefore decided that the farmers should be introduced to the tested modern energy saving stoves. Since the factory did not have this capacity, the Private Sector Development in Agriculture (PSDA) programme of the German Technical Cooperation (GTZ) was invited to collaborate and since then great achievements have been made on this. Results from the demos that were installed in households so far indicate that there can be savings of between 30 and 70% on fuel wood depending on the type of stove.

These results have created a lot of interest and so far about 2000 farmers have adapted the stoves within a span of four months. The GTZ/PSDA trained installers on the job. The idea was to train as many installers as possible but upon assessment and evaluation only thirty graduated and received certificates. These are expected to carry the programme further on commercial basis although with the understanding that the materials which they use will be from accredited PSDA suppliers and as per the PSDA/GTZ recommended design.

Jiko Kissasa

Rocket stove

Certified stove constructors

Michimikurus' adaptation strategy to climate change:

	Components	Facts & Figures	Benefits
1	Food and Income Diversification	Staple and traditional food production: + 15 demo plots every distributed within tea catchment area with staple food (spinach, carrots) + Promotion of double digging plots + 2.290 farmers trained + 48.000 seedlings distributed + Promotion of multi-storey gardens + Installation of bulking sites for traditional food like sweet potatoes and cassava Alternative crop production: + Production of passion fruit + 30 contact farmers trained Mulching and composting: + 2891 farmers trained during growers field days + 40 farmers adopted compost manure + Green leaf composting	By producing staple food farmers are able to enhance their nutrition. On the long run this might reduce malnutrition and the resulting diseases. Farmers have now access to knowledge and experiences to produce food for their own needs. Planting materials are available as well. The cultivation of the suitable and marektable passion fruit enables farmers to benefit from climate change and reduce their dependence on the tea monoculture. The production of organic compost can improve the fertility of the soils.
2	Water and Soil Management	+ 5 rivers selected to serve as demo sites + Sensitization for farmers living along the rivers + Replanting of indigenous trees conserving water along 63 km riparian stripes + River conservation associations formed + 5 river bank scouts certified and trained on water and soil conservation + Establishment of forest corners at schools, 300 trees of 5 different species distributed to 10 schools + Construction of native tree gene bank + 3 Kenya forest guards trained	River bank protection measures will enhance the water storage capacity of the soils. On the long run the availability of water in the river streams will increase. Environmental education is integrated in school lessons and will raise the awarness among people to conserve nature and biodiversity.
3	Good agricultural Tea Practices	+ Planting of kikuyu grass as soil stabilizer in tea zones + Leaving tea pruning in situ practice applied + Infilling of gaps in tea plantation + Installation of farmers' tea nurseries + Installation of demo units, realisation of field days and farm visits	The application of sustainable tea practices will help to increase the resilience of tea plantations and enhance the productivity.
4	Energy Use Efficiency	At factory level: + Replacing ordinary bulbs with energy saving ones at factory and workers' houses + Use of energy saving motors + Avoidance of leaks and use of cured firewood + Construction of firewood sheds At household level: + 30 households as demo units with 15 jiko kissasa and 15 rocket stoves + 2000 farmers adopted stoves + 30 constructors trained and certified	30% energy savings can be achieved at factory level and between 30% and 70% at household level. This will also contribute to the reduction of the tremendously high deforestation rate at Michimikuru.

4 How Peruvian coffee producers adapt to climate change - the CEPICAFE case study

Climate change is affecting Peruvian agriculture

According to the Tyndall Centre[1] Peru is the third country most hit by climate change. Almost the entire agricultural sector is suffering from increasing water stress due to melting glaciers and changing precipitation patterns. The productivity, especially of small-scale agriculture production systems is threatened, and thus the income of smallholder families is at risk.

The pilot group CEPICAFE

The small-scale producer organization was founded in 1995 as a second level non-profit organization, which represents 90 cooperatives with 6,600 farmer members, producing mainly coffee, sugarcane, fruits and cocoa. The associated farmers participate democratically in all decision-making processes. Coffee represents 60 to 70% of a family's income.

[1] Tyndall Centre for Climate Change Research, www.tyndall.ac.uk

CEPICAFE farmers

CEPICAFE's mission is to support farmers to improve the quality of their products, develop sustainably and hence reduce poverty.
In the department of Piura in the very North of Peru coffee is produced in 3 provinces: Ayabaca, Morropón and Huancabamba. The area is located South of the equator and East of the occidental cordillera of the Andes. Approximately 3,000 smallholder families between an altitude of 800 and 1,800 m.s.l. cultivate the main portion of the coffee. Coffee is grown on 8,540 ha in small-scale agro-forestry systems under the shadow of fruit and other trees. Farmers' plantations are between 0.5 and 5 ha. Some of the farmer families are the legal landowners, others are precarious owners and some are cultivating on community land. Although Piura is not a typical coffee growing region, CEPICAFE members count on some useful experiences to produce coffee under suboptimal conditions. This knowledge could be helpful to adapt to changing rainfall and climate patterns.

Climate Change and environmental degradation affecting coffee production in Piura

Between February and April 2008 AdapCC realised the process of Risk and Opportunity Analysis (ROA) together with the pilot group CEPICAFE. The participatory workshops discovered that coffee farmers are suffering from the following risks which threaten their yields and livelihood:

	Problem / Risk	Root Causes	Proposed Solutions
1	Drought	+ Less rainfall during flowering and maturation season + Increasing temperature + Poor irrigation management and poor water distribution + Lack of technical irrigation systems and water storage tanks + Deforested areas and forest burning practices	+ More efficient water management (trainings on efficient water use, improvement of water distribution at communities, installation of technical irrigation systems)
2	Frostiness and fogs	+ Change of temperature + Prolonged rainfall periods + Extension of shadow at coffee plantations / poor management practices + Old plantations and coffee trees	+ Installation of coffee nurseries at farm level and renovation of coffee plantations + Improved shadow management + Improved water management at plantation, especially from August to September + Adoption of seasonal plantation management

3	Pests and diseases	+ Increase of temperature + Climate variability + Increased humidity + Shadow extension at plantations + Lack of organic manure + Poor plantation management + Poor organisation of farmers	+ Improved pest management + Shadow management + Manure management + Installation of demo plots + Training for farmers
4	Erosion and landslides	+ Heavy rainfalls + Drought periods + High deforestation + Plantations lying on steep slopes of the hillsides + Lack of measures to prevent landslides and erosion	+ Reforestation + Forest protection + Soil management to prevent erosion and landslides + Technical irrigation systems + Trainings and capacity building, demo plots
5	Strong winds	+ Extreme weather events / El Nino + Plantations lying on steep slopes of the hillsides	+ Reforestation and avoided deforestation + Construction of more stable housing

The identified problems and risks were linked to changing climate conditions like increasing temperature, unpredictable rainfall patterns and more extreme events like storms and drought periods or unknown phenomena like cold spells and frostiness. Coffee farmers along Andean hillsides are vulnerable to climate variability due to their often unsustainable land use practices, the inefficient use of natural resources, especially water, soil and forest and the lack of knowledge and capacities.

CEPICAFE's adaptation strategy to climate change

As a result of the analysis process the following working areas for exemplary adaptation to climate change in the coffee sector for CEPICAFE were defined and implemented between September 2008 and December 2009:

1) Reforestation and Carbon Sequestration
2) Capacity Building and Implementation of Integrated Coffee Management Practices

Unsustainable land use practices and intensive agriculture in Piura

The main objectives of the adaptation strategy were to raise awareness, enhance the environmental responsibility among farmers and communities, and to strengthen their resilience to climate and environmental risks. By conserving nature people should benefit sustainably from existing resources in the long run. Local public institutions and actors were involved in the implementation of adaptation measures to feed back results to local political and development strategies. Concrete measures to confront changing climate conditions should be planned and implemented exemplarily, so more farmers would be able to learn from the results.

1) Reforestation and Carbon Sequestration

Avoiding deforestation and reforesting degraded lands is one of the key activities to enhance the resilience of the agro-ecosystems were coffee is produced. Sustainable forest management improves soil conditions, conserves biodiversity and increases the availability of water for households and irrigation. Forest can reduce the effects of cold spells and drought periods. CEPICAFE not only planned a reforestation project in higher areas and around coffee plantations in the Choco region, district of Yamango, but also designed a carbon project to generate carbon credits for the voluntary carbon market.

In the Choco region 285 ha will be reforested. As a first step, native tree nurseries were installed to produce approximately 50,000 tree seedlings. With the support of PIDECAFE and VSF CICDA the Project Idea Note (PIN) and the Project Design

Document (PDD) to register in the voluntary carbon market were elaborated. The PDD can be downloaded at http://www.sendspace.com/file/krn88s. The CO2 credits shall be generated under the Carbon Fix Standard, where the project is already registered (http://www.carbonfix.info/Project.html?PHPSESSID=qffpii8m8dbmv4u0f5e0p70s44).

Degraded areas in the Choco region, district of Yamango

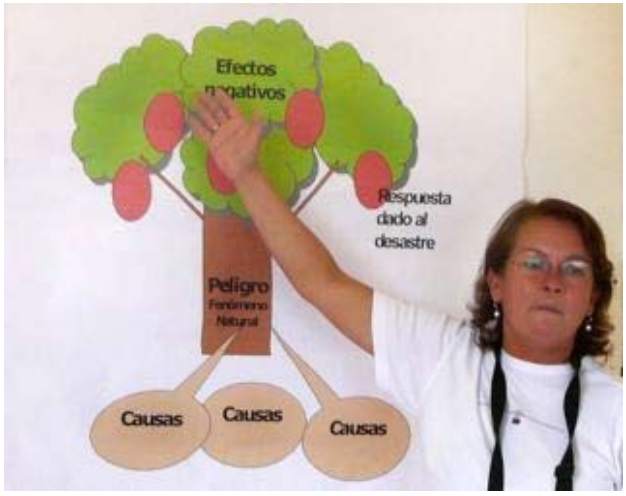
After 25 years it is expected to capture 560.5 tCO2/ha on 285 ha, corresponding to 159,742.5 tCO2 captured in reforested areas. Given the price of €7,50 per carbon credit, you could earn approximately 275,000 € in 25 years. The project is expected to extend later on.

Area to reforest under CO2 project in the Choco region, district of Yamango

To be able to pre-finance the reforestation and carbon project CEPICAFE and Cafédirect signed a Memorandum of Understanding to pre-sell 5,092 carbon credits at the price of approximately €60,000 over the next 5 years to Cafédirect, which enables the company to offset their own emissions at their offices. Both parties also agreed to re-invest 10% of the income from carbon credit sold to apply and test an additional climate module of the 4C coffee standard. The climate module integrates climate adaptation and mitigation aspects to be implemented at small-scale coffee farms. It is developed within the framework of a public-private partnership project between a global coffee trader, the 4C association and the GTZ.

2) Capacity Building and Implementation of Integrated Coffee Management Practices

The development of an organizational strategy to adapt to climate change was a very participatory process; around 872 coffee producers from 4 districts (Canchaque, Montero, San Miguel del Faique, Yamango) were involved in the development of it. Those farmers not only contributed through their local and traditional knowledge to design the adaptation strategy, but were also sensitized to the needs and solutions to confront climate risks.



Application of ROA process to design adaptation strategy

Trainings

Based on the participatory instruments of the ROA process and the AdapCC Capacity Building Programme to adapt small-scale coffee production to climate change CEPICAFE supported 36 member cooperatives to design their own action plans to confront climate change.

At the CEPICAFE level, 10 technical advisors were trained to train 50 environmental promoters and 200 promoter farmers in climate change adaptation on coffee plantations at community level.

Training workshop for promotor farmers

Reforesting community land

To reduce the risk of landslides and prevent erosion on community land, the four districts; Canchaque, Montero, San Miguel del Faique and Yamango were reforested. Hence, 4 communal nurseries with around 45,000 seedlings were installed in the four districts.

Installation of tree nurseries

Solar driers

Following the good practices in Nicaragua and Chiapas, CEPICAFE started the installation of 10 solar driers in Montero to assure the coffee drying process under changing precipitation patterns. Like in Chiapas, more often unforeseeable rainfalls interrupt the sun drying process during harvest season, thus negatively affecting the quality of the green coffee beans.

Solar drier

Adaptation measures within coffee plantations

To reduce their vulnerability to climate change and improve the productivity of the coffee plantations CEPICAFE supported its members in implementing sustainable coffee practices, like soil conservation, irrigation, fertilization, pest control or shadow management.

Technical irrigation system

Water Management

Prolonged drought periods and water scarcity for communities and agriculture were identified as climate related risk threatening the coffee farmers. During the ROA process a comprehensive study on water management and measures to implement in order to improve water use and efficiency has been elaborated. As the identified measures require huge investments at the regional and public level, those measures could not be implemented during the AdapCC lifetime. CEPICAFE focussed on trainings and advisory services for farmers to improve irrigation systems and water management at the community and farm level. It is recommended to further support improved water management techniques and involve the local and regional political institutions to access additional financing.

Water storage

CEPICAFE's adaptation strategy to climate change:

	Component	Facts and Figures	Benefits
1	Reforestation and Carbon Sequestration	+ Reforestation project on 285 ha community land in Choco region, district of Yamango planned + Nursery with 50.000 seedlings of native trees and pines installed + Carbon project planned: PIN and PDD available at http://www.sendspace.com/file/krn88s + Carbon project registered under Carbon Fix Standard http://www.carbonfix.info/Project.html?PHPSESSID=qffpii8m8dbmv4u0f5e0p70s44 + After 25 years carbon sequestration of 560.5 tCO2/ha on 285 ha, corresponding to 159,742.5 t CO2 in reforested areas expected + MoU between CEPICAFE and Cafédirect to pre-sell 5,092 carbon credits for approximately €60,000 by 2015 + 10% of earnings from Cafédirect carbon credits will be re-invested in application of 4C climate module with CEPICAFE farmers to adapt to climate change	Degraded lands will be reforested, which will lead to an enhanced resilience of the agro-ecosystem, providing improved water storage capacities and soil fertility. Forest can reduce the effects of droughts and cold spells. An additional income from carbon credits for communities is expected over the next 25 years. Carbon will be stored in the re-planted trees. The carbon project under the Carbon Fix Standard will promote sustainable forest management practices. Among the communities environmental awareness may have been raised. In the long run the implemented activities will help to enhance the resilience of the coffee eco-systems. Cafédirect will be able to offset the GHG emissions at their offices.
2	Capacity Building and Implementation of Integrated Coffee Management Practices	+ 872 producers in 4 districts (Canchaque, Montero, San Miguel del Faique, Yamango) sensitized for climate change adaptation needs + 36 member cooperatives designed their climate change action plans + at CEPICAFE level 10 technical advisors trained + 50 environmental promoters trained + 200 promoter farmers for adaptation measures on coffee farms trained + 4 communal native tree nurseries with 45,000 tree seedlings installed in Canchaque, Montero, San Miguel del Faique, Yamango to re-forest community land + 10 solar driers installed in Montero to secure coffee drying process + 860 farmers produce organic manure and installed living and dead barriers to prevent soil erosion and landslides + 200 farmers improved fertilization practices + 729 farmers applied integrated pest management measures on their farms + Shadow management has been improved on 1,800 ha + Some farmers received technical advice and access to financing to improve their technical irrigation systems	The capacities of the member cooperatives and at CEPICAFE to cope with climate change and to strategically make adaptation decisions have been built. Promoter farmers are enabled to multiply the adaptation and environmental conservation knowledge. First steps to technically adopt the coffee drying process have been taken. In the long run this will secure the quality of the green coffee for exports. Applying sustainable practices and the renovation of the coffee plantations enhances their resilience and helps to improve their productivity of the farms. (The water management practices need to be further improved.)

5 How Mexican coffee producers adapt to climate change - the Más Café case study

Climate change is affecting Mexican agriculture

Within Latin America Mexico is one of the most vulnerable countries to climate change. The climate study on the region of Chiapas shows a slightly decreasing tendency in registered levels of rainfall and a clear increasing tendency of temperature during the last three decades. Similar predictions are also underlined by the applied climate change scenarios for the next decades of the present century. The situation is especially alarming as the actual temperature and rainfall levels of the region are out of the as optimal considered conditions for coffee production. These changes affect the yields, increase production costs and reduce quality, which minimizes drastically the producers' income – especially alarming taking into account that coffee represents 70% of the families' income in the region.

The pilot group Comercializadora Más Café SA de CV

The trader Más Café counts around 2 250 producer members of eight coffee cooperatives. These eight cooperatives are located in 153 communities in the state of Chiapas. The mission of Más Café is to generate benefits and create opportunities for development for their members.

The offices of Más Café are situated in Comitán, Chiapas. The two cooperatives the AdapCC project worked with are Juan Sabines Gutiérrez in the municipality La Independencia as representatives of the lower region (600-900masl) and Kulaktik in the municipality of Tenejapa as representatives of higher altitudes (900-1200 masl).

Juan Sabines Gutiérrez (JSG) in the Lacandonian rainforest was founded in 1982 as part of a bigger cooperative. In the late 90s JSG became an independent cooperative and joint the Comercializadora Más Café. It counts 670 members in 25 communities and is certified by Certimex, IMO Control and Naturland. JSG produces 10.080 quintals of green coffee on 872 hectares.

Kulaktik S. de S.S. was founded in 1992 and counts 167 members in 22 communities. Since 1998 the cooperative exports their coffee directly to the USA. It counts with fair trade and organic certifications by Naturland, Certimex, IMO Control and NOP USDA and produces 2.977 quintals of green coffee on 275 hectares.

Climate Change and environmental degradation affecting coffee production in Chiapas

Between July and December 2008 AdapCC realised the process of Risk and Opportunity Analysis (ROA) together with the pilot group Más Café. The participatory workshops found out that coffee farmers in Chiapas are suffering from the following risks threatening their yields and livelihoods:

	Problem / Risk	Root Causes	Proposed Solutions
1	Deforestation	+ Use of wood for fire and construction + Increasing temperatures lead to drying up of surrounding areas and causing bush fires + Burning practices + Increasing pressure on natural resources + Lack of environmental conservation culture	+ Adoption of energy saving or gas stoves + Ban burning practices + Adoption of alternative material for construction + Reforestation + Environmental education in communities
2	Less water availability	+ Lack of rainfalls + Lack of water catchment installations + Deforestation	+ Water catchment facilities + Reforestation + Enhanced soil coverage + Irrigation
3	Increasing pests	+ Rise in temperature (CBD) + Strong rains (worms) + Loss of native vegetation + Loss of shade trees + Excessive application of pesticides	+ Reforestation with native species + Renovation of coffee plots + Diversification of production systems + Ban chemical pesticides + Natural pest control + Capacity building among communal extension service

4	Poor soil fertility	+ Accelerated soil erosion due to climatic changes and natural extreme events + Human settlements + Prolonged droughts + Inorganic waste + Excessive use of agrochemicals	+ Application of organic fertilizer & vermi-compost + Increasing soil cover + Planting trees + (linorganic) waste treatment + Terracing & hedges
5	Erratic rains and strong winds	+ Increased extreme weather events like hurricanes	+ Shade trees + Woodlots & hedges + Use of more resistant material for construction + Early warning systems
6	Difficulties in drying coffee beans under sun	+ Changing precipitation patterns + Rains during the Mexican harvest season when coffee beans are dried	+ Adoption of coffee drying technologies

These "problems" could be linked to climate change directly or indirectly and clear vulnerabilities of the production systems were identified. Apart from the discussed and analyzed "problems" the producers stressed difficulties in drying their coffee beans after harvesting. In the past 15 years precipitation patterns have changed so that January and February, a critical period during the Mexican harvest season, are no longer dry months. Producers cannot dry their coffee in the sun as they used to due to rain showers in this season. However, as many producers are forced to sun-dry their coffee resulting from a lack of alternatives they lose quality and quantity translating into less income.

Más Café's adaptation strategy to climate change:
As result of the analysis process the following working areas for adaptation to climate change in the Mexican coffee sector were defined and implemented between January and December 2009:

1) Maintain and increase Forest Cover
2) Pest Management
3) Carbon Sequestration
4) Energy Efficiency/ renewable Energies
5) Secure Coffee Drying Process

When developing the adaptation strategy Más Café right from the start had a very broad approach reaching beyond project lifetime and financial resources available. That is why it was agreed to actively look for further funding to implement the agreed activities. Más Café also chose to integrate the climate change topic and their adaptation strategy in their strategic planning until 2020.

This allowed for using project duration to foster strategic partnerships on local, regional and national level. Many of the below mentioned implemented activities have therefore been funded not only by project budget, but by many different sources including AdapCC funds, Más Café's own funds, funds of the cooperatives and funds from Mexican institutions such as ECOSUR (Colegio de la Frontera Sur), SEDESOL (Secretaría de Desarrollo Social Federal), Banchiapas (Bank of Chiapas), PRODESIS (Proyecto Desarrollo Social Integrado Y Sostenible) and many more.

1) Maintain and increase forest cover

In order to re-establish forest cover in the focal zones to protect against pests and erratic rains and to conserve humidity in the coffee ecosystems the following activities were implemented:

Two agreements in the cooperatives were signed to ban burning practices.

The nursery of Más Café was further equipped and extended, now producing 450000 plants per cycle and 24 communal extension services in 6 cooperatives were trained to collect native forest seedlings. This will support the creation of further nurseries at producer level and enable reforestation activities in the long-run.

12 sensitization workshops in each of the 2 cooperatives and 1 workshop on bush fires and fire prevention were carried out for creating environmental awareness. To further expand activities 1 project proposal to implement adaptation measures in another 20 communities was elaborated.

Two exchange visits at national level in order to find alternative construction material to wood were realized to Puebla and the State of Mexico. By minimizing wood use and showing other available material less deforestation will take place. This goes hand in hand with sensitizing women in the use of energy saving stoves. So far 40 women have been trained and 300 energy saving stoves have been adopted by families.

improved kitchen - energy saving stove

greenhouse at farmer level

coffee tree nursery

2) Pest management

For enabling producers to apply good agricultural practices in order to minimize pest incidents the following measures were carried out:

Two internal agreements in the 2 cooperatives not to apply chemical pesticides were signed and 2 capacity building workshops with ECOSUR on Integrated Pest Management (IPM) were carried out. The cooperative Kulaktik implemented 8 workshops for sensitizing their members not to apply chemical pesticides. Furthermore 132 small greenhouses on family level are now functioning to produce vegetables. In order to restore soil fertility 80% of the producers of the 2 cooperatives adopted the introduction of hedges in their coffee plots and 90% of the producers of the 2 cooperatives are working on their individual composting sites. This will be further supported by ongoing vermin-composting activities at cooperative level. 6 tanks for producing vermin-compost have been built and a student of the Tecnológico de Comitán supports with technical assistance on how to make vermin-compost throughout his social service. Through ECOSUR an investigation project on soil fertility will be carried out with Más Café by the University of Finland.

For renovating coffee plots 150000 coffee plants per cycle are produced in Más Café's nursery and special bags are given to producers with own nurseries in order to be able to grow their seedlings. Throughout 2009 20% of the planned renovation could be achieved.

compost unit at farmer level

(vermi-) compost unit at organizational level

pest infected coffee tree

3) Carbon sequestration

With the objective to measure the potential of sequestering greenhouse gas emissions in the coffee regions and to finance adaptation options via mitigation means, the following activities have been implemented:

Mexico is hosting the 16th Conference of the Parties (COP) in 2010. As Chiapas is a biodiversity hot spot, Mexico is aiming to develop a strategy for carbon projects on Reduced Emissions from Deforestation and Degradation (REDD) and to present it at the COP 16. Therefore Más Café via ECOSUR has partnered up with the group working on a pilot REDD project in Chiapas called "Una REDD para Chiapas" and has collected baseline data (numbers, size and types of trees). 12 promoter farmers have been trained to collect this data. Más Café is involved in designing this pilot REDD project which has a bottom up approach and is feeding necessary data and comments into the process.

Furthermore didactic material has been collected and disseminated to Más Café's extension services in order to learn about the Voluntary Carbon Markets as well as possibilities and limits to enter these as coffee producers.

coffee as part of the biodiversity in Chiapas

4) Energy efficiency / renewable energy

For elaborating a study on using renewable energy at the dry mill and warehouse of Más Café the following activities have been carried out (when the adaptation strategy was elaborated, Más Café was constructing a new warehouse and dry mill):

The current energy consumption of the dry mill and warehouse was analyzed showing that 30% of the total consumption are used for illumination. Furthermore possibilities to use renewable energy in the new warehouse and dry mill were assessed and proposals to integrate renewable energy sources as well as energy efficient models were elaborated. It is estimated that 30% of the costs for energy can be saved by updating processing machinery and introducing renewable energy sources.

5) Secure coffee drying process

The risk of losing coffee quality during the drying process has been reduced by implementing the following measures:

One exchange visit Nicaragua and 1 to Huatusco in the Mexican state of Veracruz have been organized to learn about different drying techniques. Based on the results 30 solar driers as demonstration units have been set up and communal workshops have been implemented to enhance the wet milling at farmer level.

solar drier

coffee dried in a solar drier

Más Café's adaptation strategy to climate change:

	Components	Facts and Figures	Benefits
1	Maintain and increase Forest Cover	+ 2 agreements signed in JSG and Kulaktik to ban burning practices + Extension of Más Café's tree nursery now producing 450.000 plants per cycle + 24 communal extension services in 6 cooperatives trained to collect native tree seedlings + 12 sensitization workshops per cooperative JSG and Kulaktik + 1 workshop on bush fires and fire prevention + Project proposal developed to extend activities to another 20 communities + Exchange visits to Puebla and State of Mexico to identify alternative construction materials + Sensitization for women to use energy saving stoves for cooking, 300 stoves adopted	The forest and biodiversity will be conserved. Seedlings for further reforestation activities are available. Among the communities environmental awareness could have been raised. On the long run the implemented activities will help to enhance the resilience of the coffee eco-systems. The efficiency of use of wood for households and construction has been improved.
2	Pest Management	+ 2 agreements signed in JSG and Kulaktik not to apply chemical pesticides + 2 capacity building workshops with ECOSUR on integrated pest management + 8 sensitization workshops in Kulaktik + 132 greenhouses on family level to produce vegetables + 80% of the producers of JSG and Kulaktik installed hedges to improve soil fertility + 90% of the producers of JSG and Kulaktik are producing compost + 6 tanks for vermi-composting installed at cooperative level + Investigation project on soil fertility will be carried out with ECOSUR and University of Finland + 150.000 coffee plants produced in Más Café's nursery for renovating coffee plots + 20% of planned coffee plot renovation already achieved	The use of chemical pesticides has been reduced and improved natural pest management practices are now applied. This leads to reduced pest attacks and less soil degradation. Applying sustainable practices and the renovation of the coffee plantations enhances their resilience and helps to improve their productivity.
3	Carbon Sequestration	+ Partnership with ECOSUR and group of experts working on a pilot REDD project in Chiapas "Una REDD para Chiapas" + Collection of baseline data (numbers, size and types of trees) with 12 trained promoter farmers	Más Café is enabled to participate in a planned public REDD project and could benefit on the long run from carbon credits.
4	Energy Efficiency / renewable Energy	+ Study on use of renewable energy sources for dry mill and warehouse of Más Café	A proposal to use renewable energy and thus, save 30% of the energy costs is available.
5	Secure Coffee Drying Process	+ Exchange visit to Nicaragua and to Huatusco / Veracruz to learn about alternative drying techniques + 30 solar driers as demo units installed + Communal workshops to enhance farmers' wet milling practices	The risk of losing quality of coffee beans through sun drying has been reduced.

6 How Nicaraguan coffee producers adapt to climate change - the PRODECOOP case study

Climate change is affecting Nicaraguan agriculture

In Nicaragua the yearly and monthly rainfall will progressively decrease and the yearly and monthly minimum and maximum temperatures will progressively increase by 2020 and by 2050. The overall climate will become more seasonal in terms of variation throughout the year in temperature with temperatures in specific municipalities increasing by about 1.0°C by 2020 and by about 2.3°C by 2050. In contrast, seasonality of the climate will not change in precipitation with the maximum number of cumulative dry month staying constant at 6 months. Precipitation for specific municipalities will decrease 70 to 100 mm by 2020, and 100 to 130 mm by 2050 (Fig. 4).

The pilot group PRODECOOP

PRODECOOP, R.L. is a second level organisation with 2,300 member farmers organized in 39 member cooperatives. The coffee production area of the farmers is located in several communities of the departments Estelí, Madriz and Nueva Segovia in the North of Nicaragua. PRODECOOP offers various services like commercialization, technical assistance and capacity building for member cooperatives, access to financing and credits, coffee quality management and social projects. 100% of the member farmers are fair-trade certified. Since 1992 PRODECOOP exports directly to international markets, especially in Europe, USA and Japan. The average annual export is about 30,000 quintales of coffee, with 50% organic certified coffee.

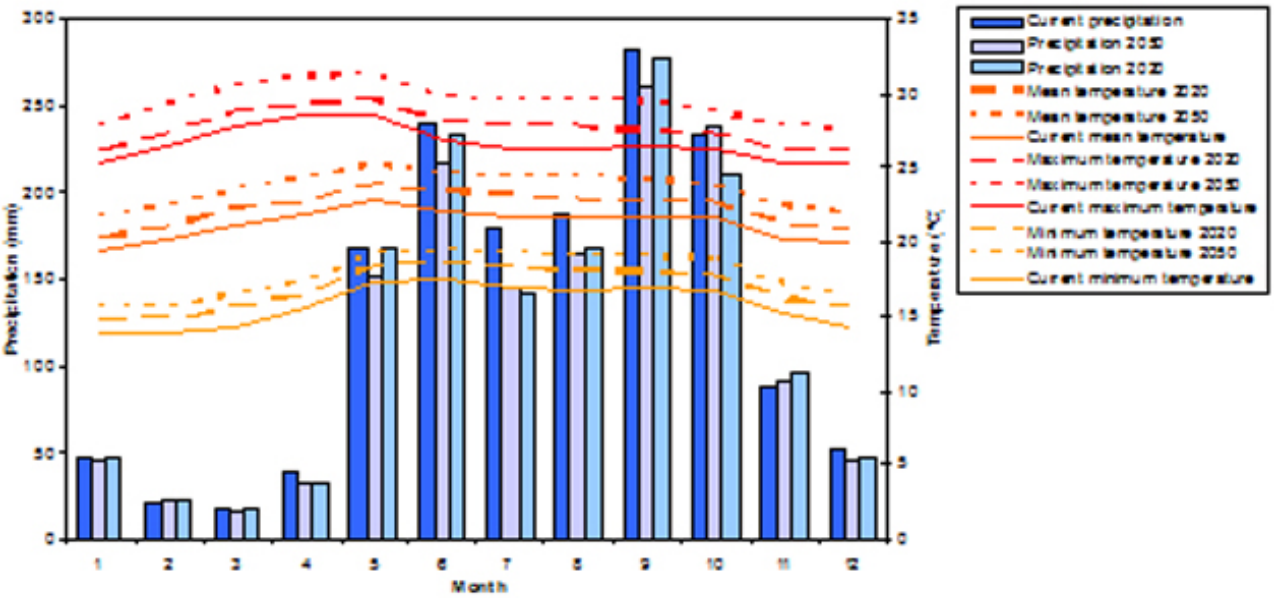


Figure 4 - Climate trend summary for sample sites 2020 and 2050 for 10 coffee-growing municipalities of Nicaragua

Within the AdapCC project the scientific institute CIAT (International Centre for Tropical Agriculture) were contracted to forecast the future suitability of current coffee growing areas in Nicaragua and other pilot regions in Mexico and Peru. For all regions a move of areas suitable for coffee production to higher altitudes and an overall loss of the current areas as well as a loss of quality is predicted. Nicaraguan coffee production is predicted to be among the most hit. The single reports can be downloaded at www.adapcc.org/en/results.htm.

Climate Change and environmental degradation affecting coffee production in Nicaragua

Between March and May 2008 AdapCC realised the process of Risk and Opportunity Analysis (ROA) together with the pilot group PRODECOOP. Representatives from Cafédirect's second Nicaraguan coffee partner organisation CECOCAFEN were also involved. The participatory workshops in Palacaguina found out that coffee farmers are suffering from the following risks threatening their yields and livelihood:

	Problem / Risk	Root Causes	Proposed Solutions
1	Drought	+ Deforestation + Move of production area to higher altitudes + Burning practices + Lack of water storage capacities	+ Enforcement of existing laws that ban deforestation and burning practices and conserve protected areas + Reforestation with native tree species + Environmental education + Install fire brigades + Install irrigation ditches
2	Landslides and erosion	+ Unstable plantations lying at steep slopes + Lack of soil and erosion control measures + Increasing extreme weather events like hurricane Mitch	+ Terracing and construction of living and dead barriers
3	Pests and diseases	+ Use of chemical pesticides and poor management practices + Increasing and decreasing temperatures + Prolonged rainfall periods	+ Analysing pest and diseases and identifying adequate management practices, natural pest control

In Nicaragua all kinds of planning is directed towards droughts with less rainfall, less clouds and a higher temperature that provokes evaporation. This will lead to even drier years than the Nicaraguan agriculture sector has already suffered over the past decades - a reason that needs preventive preparation. Eroded soils, landslides and increasing pest attacks are not only the consequences of changing climate conditions. Prolonged drought, changing seasonality and devastating extreme events due to the high deforestation rate as well as unsustainable agricultural practices are the root causes for coffee farmers being affected.

PRODECOOP's adaptation strategy to climate change

Based on the identified risks that endanger the coffee production and the there out resulting demands PROODECOOP developed an action plan to implement concrete measures that reduce the risks and adapt to the production system. The concrete working axes were the following:

1) Realize a **training process for 24 trainees of CAFENICA[2] members** about climate change and about adaptation measures
2) Establish a small **meteorological station** and monitor rainfall and temperature
3) Validate techniques and methodology of collective work for the **fabrication of agricultural organic input**
4) Validate the technical implementation that allow a **more efficient management and use of water** (drainage, storage and micro irrigation in coffee plantations)
5) Formulate a negotiation proposal for all the members of CAFENICA about the **capture of carbon** and the ambient services that the cooperatives do
6) Develop a **systematisation process** of the experiences which is transferable to a bigger number of coffee producers

Some of the defined adaptation measures were partially implemented between March 2009 and February 2010.

1) Capacity Building for 24 trainees of CAFENICA members

Following the need for trainings on climate adaptation and the idea to develop a more holistic capacity building approach AdapCC contracted the scientific research and education institute CATIE (Centre for Investigation and Training on Tropical Agriculture) to design and implement a capacity building programme to adapt Latin American small-scale coffee production to climate change. CATIE and GTZ in cooperation with CIAT developed a one-week training seminar, which was realised in March 2009 in Matagalpa. 21 trainers were trained on the impacts of climate change on coffee production, the implementation of concrete adaptation measures at the farm level, the application of the ROA process, the carbon reduction potential of coffee farms and processing and the strategic planning of adaptation strategies.

[2] CAFENICA is an umbrella organization grouping 12 coffee organizations like PRODECOOP, which represent more than 6.500 small-scale coffee growers

Among the participants were representatives from all three AdapCC pilot regions in Peru, México and Nicaragua as well as members of CAFENICA. All training materials are available as a complete training manual under www.adapcc.org/en/results.htm.

AdapCC seminar field visit, March 2009 in Matagalpa, Nicaragua

2) Meteorological station

At Miguel Angel Ortéz a pluviometer, a thermometer to measure minimum and maximum temperatures, as well as a meter to measure ph-value were installed. The ph-value meter is measuring the acidity of the organic manure and the soils. A coffee farmer family were trained to monitor the meteorological instruments and the data from 2009 were collected.

3) Fabrication of agriculture organic input

At Miguel Angel Ortéz 2 trainings for farmers to produce organic manure from Bocashi[3] were realised and so far 100 quintales organic manure produced.

Neighbouring communities received trainings on the production of different organic fertilizers that not only improve soil fertility, but also help to reduce pest attacks. Working groups were formed to produce organic manure and to implement the fertilization plan for coffee plantations.

4) More efficient management and use of water

The technical improvement of an artisan fountain and the installation of a pump make available water for the communal wet mill, the communal nurseries and for household use in the whole community of the Miguel Angel Ortéz cooperative. Furthermore, rainwater reservoirs were installed and 4,800 m irrigation ditches were constructed. Farmers were trained to construct the irrigation ditches.

5) Capture of carbon

no activities were implemented - still undone.

6) Systematisation process

some experiences regarding organic manure production, soil conservation techniques and water management were documented and are now available for other coffee farmers and their organisations.

Due to lacking organizational and communicational issues the implementation of a more holistic adaptation strategy is still outstanding.
To enhance the implementation of concrete adaptation measures PRODECOOP intends to improve external and internal communication and to extend the activities to a wider number of farmers and cooperatives. Future challenges will be the application of participatory ROA tools to design action plans at cooperative level, the acquisition of additional financing and funding as well as the integration of all PRODECOOP member farmers.

[3] Bocashi is fermented organic material that has been used traditionally in Japan (where it's spelled 'bokashi') as fertilizer. Making bokashi is an ancient art in Japan, with many recipes, often handed down (sometimes along with bokashi starter) through families. http://www.mofga.org/Publications/MaineOrganicFarmerGardener/Winter20052006/Bocashi/tabid/1133/Default.aspx

PRODECOOP's adaptation strategy to climate change:

	Component	Facts and Figures	Benefits
1	Capacity Building at CAFENICA level	+ AdapCC one-week training seminar held at Matagalpa in March 2009 + 21 trainers trained from pilot regions in Peru, Mexico, Nicaragua and at CAFENICA level + Training manual for adaptation to climate change in Latin American small-scale coffee sector elaborated	The 21 trained technical staff members of the coffee organisations are now able to develop trainings at their organisations' level. At CEPICAFE and Más Café level further local trainings were designed and implemented. Further multiplying coffee organisation will be able to train more trainers.
2	Meteorological Station	+ 1 meteorological station (pluviometer, thermometer and ph-value meter) installed at Miguel Angel Ortéz + Coffee farmer family trained in monitoring the data + Data from 2009 collected	The data need to be analysed and use as basis for strategic planning.
3	Fabrication of agriculture organic Input	+ 2 trainings at Miguel Àngel Ortéz cooperative level to produce Bocashi + 100 sacks of Bocashi produced + Training on different organic fertilizer production held + Working groups formed to produce organic fertilizer and implement fertilization plan	By applying organic fertilizer instead of chemical ones the soil conditions can be improved and pest attacks can be naturally controlled.
4	Efficient Management and Use of Water	+ Technical improvement and installation of pump for community fountain + Installation of rainwater reservoirs + Construction of 4,800 m irrigation ditches	The Miguel Angel Ortéz community now has water for the communal wet mill available, the nursery and for household use of all member families. Irrigation ditches can prevent landslides.
5	Carbon Capturing	+ Still undone	Still undone
6	Systematisation Process	+ Some experiences regarding production of organic fertilizer, soil and water management documented	Good practices are available for further multiplication.

7 How to scale up the AdapCC pilot approach

AdapCC has been implemented as a pilot initiative to create examples of how to cope with climate change in small-scale agriculture production. For the first time since the beginning of the international discussion and research on climate change, a private company and a development cooperation agency have set-up a partnership to work jointly with small farmers to put climate change adaptation into practice at the local level.
The project not only developed examples of adaptation strategies by Latin American coffee organisations and a Kenyan tea farmers association, but also created useful instruments and tools, such as a capacity building programme, training materials, and the participatory analysis process ROA, among others.

As a pilot initiative, AdapCC has made clear the potential to scale up the approach not only within the small-scale coffee and tea sector, but also within the wider Latin American and East African agriculture sector. Multiplying institutions at local and regional, as well as at private and public, levels have already been identified. The approach is already expanding within the network of Cafédirect producer partner organisations and has been picked up by different actors of the coffee and tea value chains. The AdapCC results have even been integrated into governmental programmes in Africa and Latin America.
Upscaling the AdapCC approach not only means extending and disseminating the results and lessons learnt from the pilot project, but also determining which future opportunities to take on and which hurdles to overcome. AdapCC not only resulted in transferable results, but also raised questions that still need to be answered if you wish to cope with climate change. Besides disseminating the existing results, the lessons learnt shall be used to further technically develop long-term adaptation strategies.

a) Disseminating the AdapCC results and lessons learnt at different levels

The extension of the pilot case AdapCC is recommended at the following different levels and will be continued by existing partners and multiplying institutions:

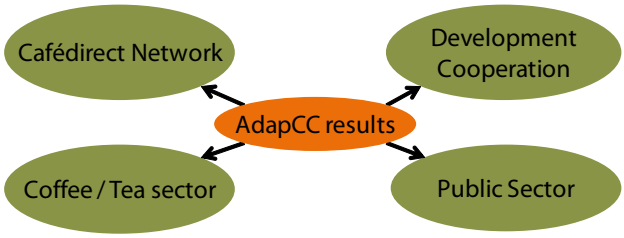


Figure 5 - Upscaling AdapCC at different levels

+ within the **Cafédirect producer partner network**, so a wider number of producer partners from the tea, cocoa and coffee sector will benefit
+ within the **coffee and tea sector** to scale up exemplary adaptation strategies to the mainstream coffee and tea trade
+ within the **public sector** to integrate results and into policy strategies and programmes
+ to the **sector of international development cooperation**, so a wider number of farmers and rural communities, as well as the agricultural sector as a whole, will be able to benefit

The **Cafédirect network** consists of 40 small-scale coffee, cocoa and tea producer organisation in Latin America, Africa and Asia, representing more than 280.000 small-scale farmers. Starting in April 2010 with the Kiegoi Tea Factory, a neighbouring tea organisation to the Michimikuru pilot group in Kenya, Cafédirect will support other East African tea organisations in Kenya, Rwanda, Tanzania and Uganda to undertake the ROA process to design their own adaptation strategies to climate change.

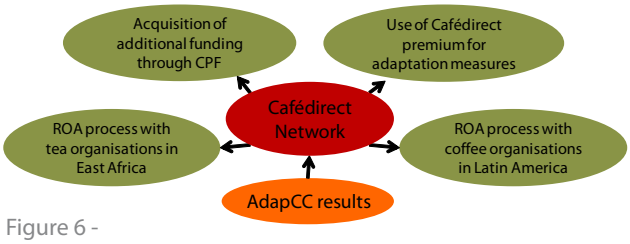


Figure 6 -
Upscaling AdapCC within the Cafédirect producer network

Furthermore, coffee producer partner organisations in Mexico, Central America and Peru, will be able to implement the ROA process to design their own adaptation strategies and to benefit from existing data on the future suitability of the current coffee growing areas (see CIAT climate maps). The partner organisations will be supported technically and financially by the Cafédirect Producer Foundation (CPF), who has been managing the Cafédirect Producer Partnership Programme since 2009.

CPF will also acquire additional funding and financing for the implementation of further adaptation measures. It is recommend keeping in mind the German PPP Africa Facility and Programme for co-financing the implementation of concrete adaptation projects with African tea, cocoa and coffee organisations.

As producers are shareholders of Cafédirect, as well as having representation on the Board of Cafédirect Producers Ltd (CPL) and the CPF, they are now able to influence decisions on how to invest the Cafédirect premium for climate adaptation and mitigation projects. Some Latin American coffee organisations have also suggested spending their FLO premium on strategic climate adaptation. Cafédirect, as the leading company supporting small-scale farmers to adapt to climate change, should open the dialogue with FLO on these issues.
The considerable potential to extend the AdapCC results within the Cafédirect producer network will enable a wider number of small-scale farmers to access climate change information and adaptation techniques as well as technical and financial support mechanisms. Hence, the sustainability of the pilot project is very well ensured. Due to the fact that Cafedirect was the first mover in this sector to address climate change issues with small farmers, the company now takes on the responsibility of building long-term partnerships and cooperating with other actors along the value chain, as well as with public and political institutions, to progress the efforts around adaptation to climate change in agriculture.

Since climate change is increasingly threatening the **worldwide coffee and tea production** and farmers as well as international traders have to cope with the loss of quality and quantity, there can be observed a rising interest in extending the results of the AdapCC pilot initiative to other coffee and tea regions and even to the mainstream sector. In October 2009, the GTZ PPP and Agriculture departments held an Expert Meeting at GTZ headquarter in Germany to use the lessons learnt from the AdapCC as well as another PPP project in the climate and coffee sector to develop further strategic partnerships to address climate change issues. Some international tea and coffee trading companies decided to follow those good practices and are now designing development projects to support coffee and tea mainstream production to adapt to climate change and to manage future uncertainties.

Furthermore, some first ideas to develop micro-insurance products for small-scale farmers to mitigate climate risks were exchanged. International insurance companies and political institutions demonstrated their willingness to cooperate to bring forward the climate insurance issues.

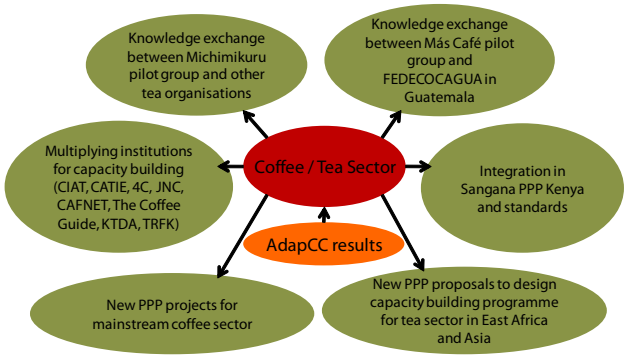


Figure 7 - Upscaling AdapCC within the coffee and tea sector

The existing examples of how to design an adaptation strategy to climate change in Peru, Nicaragua, Mexico and Kenya serve as knowledge source for other small-scale producer organisations that wish to learn from the pilot cases and design their own strategies and action plans.

Tea and coffee organisations at the final AdapCC workshops in the pilot regions in East Africa and Central and South America agreed about a future exchange of knowledge between the pilot groups. The Kenyan Michimikuru Tea Factory will provide their knowledge for other tea organisations. The Mexican Más Café will serve as knowledge source for the Guatemalan umbrella organisation FEDECOCAGUA. Further national and international coffee and tea organisations could provide adaptation knowledge, train the trainers to spread the knowledge and serve as multiplying institutions. The AdapCC partner organisations CIAT and CATIE will extend the development of climate impact forecasts on coffee production and trainings with farmers on how the adapt coffee plantations. Furthermore, they will integrate the generated knowledge in other research and capacity building programmes, e.g. CAFNET[4] .

[4] CAFNET – Connecting, enhancing and sustaining environmental services and market values of coffee agro-forestry in Central America, East Africa and India. It is a participatory rural research and development project that brings together pilot projects, in collaboration with coffee producers and stakeholders in the sector, including NGOs (Rainforest Alliance etc.) and the big buyers (Starbucks, 4C etc.). The four-year project started in 2007, coordinated by CIRAD with regional partners CATIE in Central America, ICRAF in East Africa and Bangalore University/ Coffee Board in India. The EU will provide €2.5 million of financing.

The Peruvian umbrella organisation Junta Nacional de Café (JNC) could serve as multiplier, especially in Peru. The Coffee Guide (www.thecoffeeguide.org) recently updated their database for climate change impacts, forecasts and adaptation and mitigation measures and integrated the AdapCC knowledge and results. The 4C Association (Common Code for the Coffee Community) could also serve as a multiplying institution, especially for the training materials and the climate impact and adaptation database. 4C is partner in another PPP project between GTZ and the Sangana Commodities Ltd in Kenya. Together the partners design and implement an additional climate module for the 4C standard, integrating the climate adaptation and mitigation aspects into the coffee production.

The Kenya Tea Development Agency (KTDA) and the Tea Research Foundation of Kenya (TRFK) supported the implementation of the adaptation strategy at Michimikuru and are now able to spread the knowledge to other tea organisations in Kenya.

AdapCC also attracted the interest of some political institutions and the public sector. In Chiapas the public sector is planning a project to bring forward GHG emission savings and to design a national REDD (Reduced Emissions from avoided Deforestation and Degradation) project. At the end of 2010 the next COP of the UNFCCC will take place in Mexico, where the REDD project shall be presented. At Más Café the REDD potential for coffee grown under shadow will be calculated, so the organisation will be able to benefit from the planned REDD project.

Más Café also intends to extend the AdapCC pilot case activities in the wider context of a soil management project to confront the increasing risks of pest and diseases as well as to avoid erosion and enhance soil fertility. This project will be implemented in cooperation with the Mexican research institute ECOSUR and a Finish University.

In Kenya the Ministry of Agriculture, that also supported the implementation of pilot activities at Michimikuru, intends to scale up the results to other agriculture sectors and to integrate the generated knowledge into their political programmes and climate change adaptation strategies.

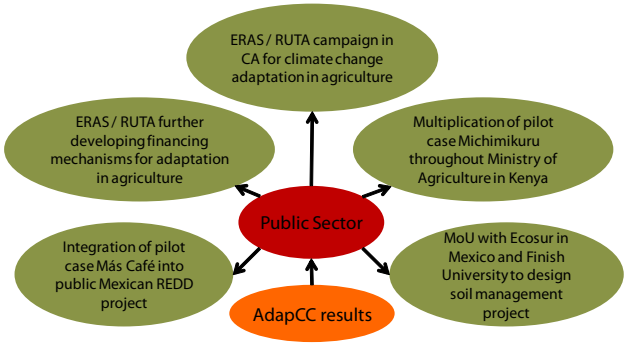


Figure 8 - Upscaling AdapCC within the public sector

The most important up scaling of the AdapCC initiative and at the same time integration into political programmes could be achieved in cooperation with the Central American Regional Unit for Technical Assistance (RUTA), an agency for technical assistance aiming at rural and environmental development. RUTA was established in 1985 on agreement of the ministers of agriculture of the seven member states of SICA (Sistema de Integración de Centroamérica) and seven international donor organisations and acts on behalf of national and regional institutions in Central America. The technical assistance unit is amongst others responsible for bringing forward the integration and realisation of the Regional Strategy of Agro-Environment and Health (Estrategia Regional Agroambiental y de Salud – ERAS), which also includes activities to confront climate change in agriculture as well as the Central American Strategy on Rural Territorial Development (Estrategia Centroamericana de Desarrollo Rural Territorial – ECADERT). Under the rooftop of this regional political strategy RUTA is designing and leading a Central America wide sensitization and capacity building campaign for adaptation to climate change in agriculture. The campaign will be based on the results and knowledge generated within the AdapCC pilot project and will use some of the developed participatory instruments to sensitize affected people and analyse climate impacts.

In this context a regional Forum on Climate Change to exchange scientific and technical knowledge and to feed it back into political planning processes will be carried out in the first half of 2010 in Panama. RUTA is furthermore developing an innovative package of financing instruments to support the implementation of adaptation measures, among them public and private funds and climate micro-

finance and weather insurance products. The extension of adaptation issues in Central America will be carried out in close cooperation between the public and the private sector.

The interest of GTZ to participate as public partner in the AdapCC pilot initiative was to learn from examples of how to cope with climate change and feed the results back into larger development cooperation projects. As mentioned before GTZ is already in discussion with international coffee and tea trading companies to design more complex strategic alliances and new PPP projects to address climate change in the mainstream coffee and tea sectors.
The Programme for Social and Ecological Standards has opened the dialogue with the ISEAL Alliance[5] to integrate climate mitigation and adaptation aspects into social and environmental standards. A first pilot PPP project to develop an additional climate module for the 4C standard has already started between GTZ and Sangana Commodities Ltd in Kenya. The project is furthermore cooperating with the Rainforest Alliance, who is developing a carbon-measuring tool for GHG reductions in coffee plantations.
The GTZ Department for Agriculture, Fishery and Food Security saves the knowledge generated within AdapCC and provides it for future planning of regional and national development cooperation projects on climate change in agriculture. One of the first regional programmes to integrate parts of the ROA process could be the Regional Programme on Climate Change in Andean Countries that will start in the second half of 2010.

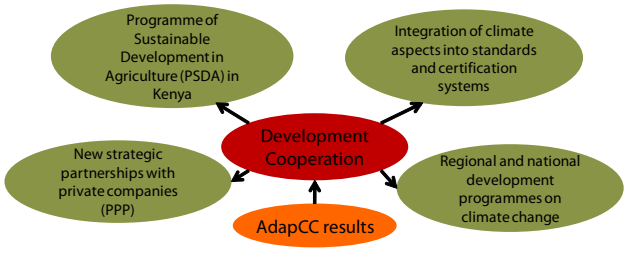


Figure 9 - Upscaling AdapCC within the context of Development Cooperation

At regional level the Programme for Sustainable Development in Agriculture (PSDA) in Kenya, which also supported the implementation of the energy component of the Michimikuru adaptation strategy will extend the pilot case knowledge and further use developed instruments to support climate adaptation and mitigation in other Kenyan agricultural value chains.

b) Using the AdapCC knowledge and lessons learnt to technically improve climate change adaptation

Upscaling the AdapCC approach not only means extending and disseminating the results and lessons learnt from the pilot project in cooperation with multiplying institutions. Upscaling the pilot project also implies technical enhancement of existing adaptation strategies as well as determining which future opportunities to take on and which hurdles to overcome. AdapCC not only resulted in many transferable results, but also raised questions that still need to be answered if you wish to cope with climate change.

Open questions to designing adaptation strategies to climate change:

+ How can you assure the integration of adaptation aspects into long-term strategic planning processes of producer organisations?
+ How can you design long-term adaptation strategies that integrate all actors of agriculture value chains?
+ How can more in-depth scientific studies on future suitability of different crops and adequate long-term adaptation be supported and financed?
+ How can the existing genetic diversity be used to adapt to changing climate conditions? Which more resistant crops need to be cultivated and how can small-scale farmers benefit?
+ How can farmers use the potential of agriculture production systems to access carbon markets and other opportunities of payments for environmental services? Which other environmental services can generate additional payments / income for farmers to serve as financing instrument for climate adaptation?
+ How should political strategies be designed to improve the framework conditions for adaptation to climate change in agriculture sector?
+ How can the impacts of climate adaptation be measured and costs and benefits be analysed?
+ How can financing options to support the implementation of adaptation strategies be generated? Who should finance adaptation?
+ How to develop micro-finance and micro-insurances products to reduce the risk of climate related yield and quality losses?

[5] ISEAL Alliance – global association for social and environmental standards, www.isealalliance.org.

Managing uncertainties is and will remain the main challenge. AdapCC pilot groups developed and partially implemented good examples of how to reduce the vulnerabilities of coffee and tea plantations by applying sustainable agriculture practices. Improved plantation management can reduce the risks of soil erosion and landslides and increasing pests and diseases, or prevent to a certain degree from water stress problems or from quality and yield loss due to increased humidity, frostiness or cold spells. The majority of the implemented adaptation measures answer to existing risks and problems that result from climate aspects but also other influencing factors like unsustainable management practices or environmental degradation and deforestation. Although pilot coffee organisations in Latin America knew the threatening scientific predictions of decreasing future suitability of their current coffee growing areas, they were not really able to integrate the knowledge into their long-term strategies and planning. This could be partially traced back to the fact that they mostly do not possess long-term strategies. On the other hand this must be considered as insufficient scientific database in respect of future climate conditions, alternative suitable products or adequate adaptation measures. The data for future strategic planning need to be the more complex the more you want to consider the future quality of the agriculture products and their future marketing options as well as implications for the whole value chains and international markets.

The application of new production opportunities resulting from climate change or more adopted crop varieties could have been only partially integrated into the AdapCC adaptation strategies due to limited time and resources of the pilot initiative. In Kenya with support of public and research institutions the already existing knowledge about passion fruit as future suitable crop with local marketing potential could be implemented as practical measure to prepare for climate change and enhance income opportunities for small-scale tea farmers. Furthermore, some already known more resistant tea varieties could be selected and bred in tea nurseries to be distributed to farmers in the future. There is already existing knowledge of more adopted coffee varieties in Latin America. But the main problem for applying these varieties is the access for smallholder organisations to gene banks and planting materials as well as the lack of knowledge of future marketing potential of more resistant crops.

The second main challenge for implementing adaptation is the lack of financing mechanisms. AdapCC tried to set up a carbon-trading scheme along the Cafédirect value chain. This goal could only partially be achieved. One example of how to access the voluntary carbon market with a reforestation project demonstrates the case study in Peru. The access to carbon markets for smallholder organisations is still very complicated and time and cost intensive. Approved carbon reduction methodologies, capacities in respect to carbon reduction potential and pilot projects implemented into practice are what are needed most. Not only carbon markets offer a potential to receive additional income from environmental services. But it is still unclear how farmers and their organisations can benefit from markets or payments for environmental services.
Besides private sector driven autonomous adaptation measures implemented within the AdapCC pilot cases the institutional and political landscape need to be strengthened to improve framework conditions and support climate change adaptation in the long run. AdapCC served very well as awareness raising pilot measure to attract the interest of public institutions, but could not provide technical assistance to integrate the results into political programmes. Therefore, are needed larger investments from private and public sector, strong partnerships between them and more strategic development cooperation projects.

Farmers, their organisations and traders as well long for insurance products to reduce climate related yield loss. As this is a very innovative topic AdapCC was not able to invest more deeply in this subject, due to its limited time and resources. Nevertheless, this is a topic drawing the attention of various public and private financing and insurance institutions and needs to be followed up.

The above listed questions won't be answered through more single pilot projects. For the private

sector that is trading agricultural products it is rather a main challenge to invest in making available the necessary database to develop and implement technical adaptation and mitigation measures on the long run and to assure the financing for adapting the production systems. For example, to assure the future availability of high quality coffee, large investments in long-term adaptation of the coffee value chain as a whole need to be done today.

This is primarily a responsibility of the private business actors, who should closely cooperate with the scientific and the public sector. Climate change impact assessments, cost and benefit analyses, capacity building programmes as well as funding and insurance solutions shall be planned and implemented jointly by the private and public actors.

Recommendations for designing future climate change adaptation projects in agriculture:

+ Designing adaptation strategies should be scaled up to a **more long-term and strategic level,** considering the **implications for the mainstream sector,** the **future marketing potential** and the **value chain** as a whole. The existing scientific climate maps, predicting future suitability of current production areas, should be designed as **more in-depth studies**, keeping in mind a more complex entity of influencing factors and potential impacts on quantity, quality and markets, but also **new opportunities** resulting from changing climate conditions like **more appropriate crop varieties** or **more suitable alternative products**.

+ Knowledge on **more resistant crop varieties** based on the existing agro-biodiversity should be generated as public knowledge. With support of public, scientific and private institutions **farmers should be enabled to benefit from crops adapted to climate change** and get access to planting material and knowledge.

+ The generation of **carbon credits, climate friendly certification systems** or other systems of **payments for environmental services** could be **opportunities to sustainably finance adaptation in agriculture productions systems**. Furthermore, those measures are not only generating additional income but also have **positive impacts on the enhanced resilience of an agro-ecosystem** as they often contribute to the conservation of biodiversity and natural resources, improve the water storage capacity of soils and enhance agriculture productivity. Hence, **more profound technical and practical knowledge** on how to integrate those opportunities into adaptation strategies need to be generated and spread in the agriculture sector.

+ Build **long-term partnerships between private und public actors** and design **development cooperation projects** to **strengthen the capacities of public institutions to support adaptation to climate change in agriculture in the long run. Scientific work** should form the basis for political decision-making, future **climate change impacts on economies** should be analysed and the **costs and benefits** of adaptation need to be considered.

+ Besides technical adaptation knowledge the **availability of financing and insurance mechanisms** will always be the second most important success factor. Thus, financing options should be made available at public and private levels.

8 Lessons learnt

The described results of the AdapCC pilot initiative, in particular the case studies of developed and implemented adaptation strategies by smallholder coffee and tea organisations, as well as the demonstrated demand and potential to thematically enhance and regionally disseminate those results already contain a number of lessons learnt from adaptation to climate change and the AdapCC process. This final chapter can add some important messages to keep in mind while planning and implementing adaptation to climate change, but is not to be perceived as complete list of all lessons one can learn from AdapCC as a pilot process.

The project offers the opportunity to learn from different experiences:

+ What a site-specific adaptation strategy to climate change for a smallholder coffee or tea organisation should contain;
+ Why a participatory analysis process to design adaptation measures is highly recommendable;
+ What the opportunities and limits of a three years pilot project are;
+ Which results need to be disseminated;
+ Which already started measures need to be followed up;
+ Which questions need to be considered to further promote adaptation to climate change.

The principles for designing adaptation strategies at smallholder farmers' level at page 4 of the present report highlight the main lessons AdapCC learnt from the four pilot cases in Latin American coffee and East African tea sector. Besides those principles, it shall also be pointed out, that adaptation to changing climate conditions for small-scale farmers is possible and should be taken as an opportunity to confront future challenges and secure farmer families' income and livelihood.

Adaptation measures always need to be planned site-specifically, because climate impacts will always be site-specific as well. Affected people need to have the capacity to manage site-specific risks. The main risk is uncertainty.

Planning adaptation to climate change should always include options to contribute to climate change mitigation. Reducing greenhouse gases can be an opportunity to generate additional income from carbon trading or climate friendly certification. Furthermore, emission saving often also contributes to climate adaptation.

Using farmers' knowledge to analyze climate risks and design adaptation strategies empowers them to take action.

By involving different local and international actors into the climate impact analyses and the development of adequate adaptation solutions one can raise high awareness among all stakeholders for climatic threats and adaptation opportunities and motivate them to take action.

The ROA toolkit serves effectively to identify site-specific adaptation measures and at the same time is a proven instrument to sensitize affected people and institutions and to build capacities to confront climate change. The analysis instrument is transferable to other regions and sectors (see AdapCC training handbook).

Like the majority of pilot initiatives AdapCC created transferable examples, but raised as many new questions as it could provide answers. There are still very few practical experiences of successfully implemented adaptation measures. In agriculture sector all private business actors of the value chains as well as scientific and public institutions should combine their resources to further enhance more strategic adaptation strategies in the long run and put it into practice (see recommendations for designing future climate change adaptation projects in chapter 7, page 35).

Last but not least it is important to mention that one of the first lessons learnt was the fact that climate change is happening and is affecting small-scale coffee and tea farmers in all AdapCC pilot regions. The impacts are predicted to be even stronger in the future. Production systems and marketing practices need to be adopted. More in-depth scientific studies, an appropriate political framework and private investments need to be done today to better prepare for tomorrow. As mentioned before, this is a complex challenge that longs for complex answers and strong partnerships between all involved stakeholders.

How farmers perceived being part of the AdapCC pilot group[3]:

in Kenya:

+ Local communities receive programme positively, it is perceived as "eye opener"
+ Strong sense of ownership by the communities
+ Promising results in good agriculture and environmental practices
+ Energy saving stoves bring noticeable, multiple benefits and are therefore adopted
+ Community members benefit financially from new skills acquired with installing jikos
+ Benefits of including women: improved sensitization and income
+ Due to food diversification, vegetables can be sourced locally
+ Framers use their extra time more productively after finishing tea plucking

in Mexico:

+ Good agricultural practices for climate change adaptation are being taken up by farmers and their capacity is being strengthened
+ Farmers get trainings and apply integrated pest management
+ Promotion of sustainable natural resources management & environmental protection
+ Coffee level production can be maintained
+ Perceived increases in farmers incomes
+ Solar driers for coffee are being used
+ Strengthening of producer organisations
+ Women producers are active participants in the project
+ Project contributes to diminish the number of intermediaries in the coffee commercialization chain
+ Project supports farmers with eco efficient stoves

[3] statements from farmers and farmer organisations made in the context of an internal evaluation process in November 2009 in Kenya and Mexico

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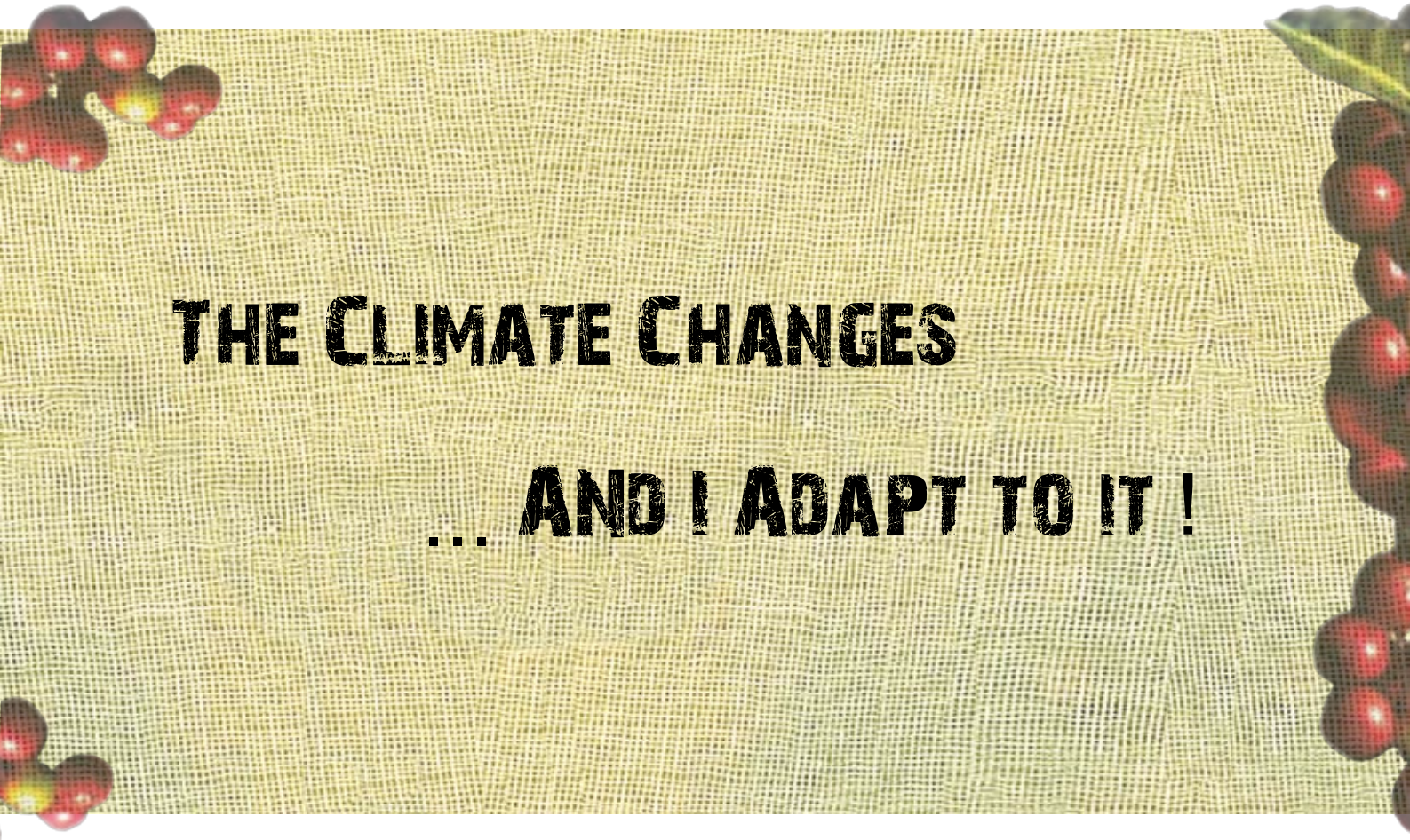

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