TOPIC SHEET

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CLIMATE CHANGE AND AGRICULTURE

HELVETAS Swiss Intercooperation supports many projects in the field of agriculture with the objective of improving the income and living conditions of small-scale farmers and increasing food security. It helps farmers and their organisations to develop their farming techniques, farm management and the processing and marketing of agricultural products, and to establish sustainable value chains.

Agriculture is a key sector that is extremely vulnerable to climate variability and change. This is particularly the case in developing countries due to farmers' great dependence on natural weather conditions. Farmers have to cope with changes that occur from one year to the next (climate variability) and with long-term trends such as trends towards progressively warmer and drier weather (climate change).

Helvetas supports women and men as they plan and adopt measures to reduce the risks and impacts of climate variability and change their systems through promoting and disseminating innovative and appropriate approaches that make their livelihoods more climate-resilient.

HELVETAS Swiss Intercooperation

Switzerland, November 2015

HOW CLIMATE VARIABILITY AND CHANGE AFFECT AGRICULTURE

Throughout history, people have had to adjust to climate variability and cope with climatic extremes. However, data indicates that there is an increasing frequency of events such as changes in the distribution and quantity of rainfall and changes in temperature and extremes in different parts of the world. Not only are variability and extremes increasing, there are also long-term changes in temperature and precipitation. The effects on crop and terrestrial food production are evident in several regions of the world. While positive trends are seen in some high-latitude regions, the negative impacts outweigh the positive ones (IPCC, 2014). Climate-related disasters, in particular droughts, are among the main drivers of food insecurity. In recent years, there have been several periods of rapid food and cereal price increases following climate extremes in key producer regions. While trends (in temperature or precipitation) are important, we are increasingly realising that crops are highly sensitive to extreme daytime temperatures of 30°C or above. If they occur at a critical moment of plant development, the results can be devastating. Several crops and regions are also vulnerable to temperature extremes throughout the growing season.

High levels of CO_2 have a stimulatory effect in most crops, while elevated tropospheric ozone (O_3) levels depress crop yields. This raises the risk of spread of invasive weeds and increased competitiveness with crops, as well as reducing the effectiveness of herbicides. While evidence indicates that there may be changes in the geographical ranges of pests and diseases, the correlation with changes in disease intensity is not so clear. For the major crops in tropical and temperate regions (wheat, rice, and maize), climate change without adaptation will have a negative impact on production if there are local temperature increases of 2°C or more above late-20th-century levels, although specific areas may benefit (IPCC, 2014). «Such impacts are expected to disproportionately affect the welfare of the rural poor such as female-headed households and those with limited access to land, modern agricultural inputs, infrastructure and education» (IPCC, 2014).

There is a range of existing potential adaptation options in both food production and across all food system activities. The capacities of communities to adapt to climate change and increasing risks are limited in many regions. They often lack knowledge and have limited assets and risk-taking capacity. Strengthening the adaptive capacity in the agricultural sector is crucial, given that nearly 70 per cent of people in developing countries live in rural areas where agriculture is the main livelihood activity. There is an urgent need to move from autonomous (spontaneous and ad hoc) to planned adaptation in order to strengthen communities' ability to deal with these changes.

Watershed management linked with rural household asset building

Frequent droughts and increasingly variable seasonal rainfall patterns have increased the vulnerability of rural households in Northern Ethiopia. The degradation of the productive natural resource base due to uncontrolled grazing and ploughing on steep slopes further exacerbates the situation. The project interventions increase the resilience of rural households through awareness- and capacity-building regarding Disaster Risk Management; watershed restoration resulting in recuperation of degraded land and water sources combined with the introduction of sustainable farming; and household asset-building and income generation (e.g. capturing roof water in cisterns for drinking and surface water in ponds for small-scale irrigation, introduction of high value crops, poultry, bee-keeping). The rehabilitation activities contribute to a re-greening of the hillsides in the project area. One effective measure is the allocation of treated hillsides to landless youths in the community and ensuring their land ownership security through formal certification (e.g. this ensures youth employment and land management). The project facilitated land allocation of 2,012 ha to 2,921 landless youth households (32 per cent women) from 2010 to 2014.

CLIMATE CHANGE AND AGRICULTURE – A TWOFOLD RELATIONSHIP

The relationship between climate change and agriculture is twofold: agriculture contributes to climate change in several ways, and climate change adversely affects the agriculture sector in various ways.

Rapid and uncertain changes in rainfall patterns and higher temperatures can also result in geographical shifts of crops and cropping patterns through changes in seasonal extremes, as certain species can no longer be cultivated in certain regions. Although in the short term the introduction of new crops might represent an opportunity in certain regions or countries, the longer-term impacts of climate change are expected to lead to an overall decrease in production (IPCC, 2014).

According to the IPCC, the three main causes of the increase in greenhouse gases (GHG) observed over the past 250 years have been fossil fuels, land use and agriculture. It is generally agreed that about 24 per cent of CO_2 emissions are produced by agricultural sources, mainly deforestation, land conversion and ploughing, the use of fossil fuel-based fertilisers and the burning of biomass (IPCC, 2014). Most of the methane (CH_4) in the at-

Villagers are trained to maintain, record and understand meteorological data (Vulnerability and Adaptation Programme India)

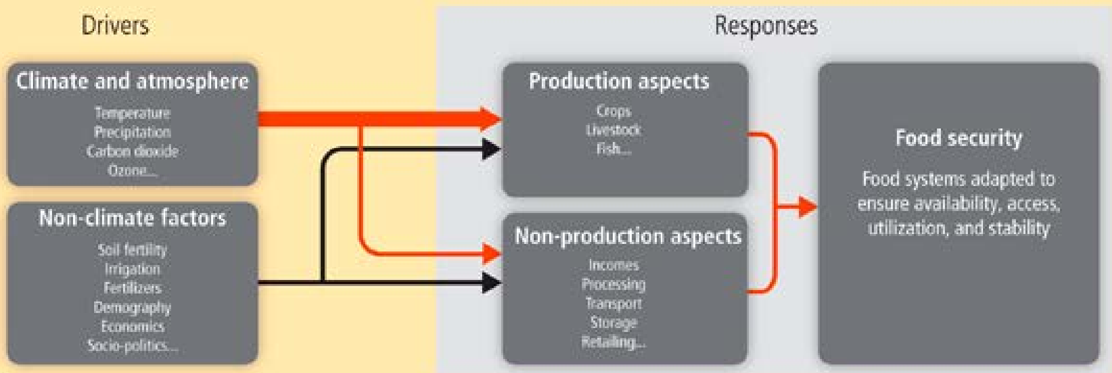
mosphere comes from domestic ruminants, forest fires, wetland rice cultivation and waste products, while conventional tillage, manure deposited on pasture, synthetic fertiliser application and the decomposition of agriculture waste account for 70 per cent of nitrous oxide (N_2O).

Moreover, about 70 per cent of the economic potential for the mitigation of climate change lies in developing countries, where the agricultural sector is often a significant source of GHG emissions but also a major source of employment (UNFCCC 2009). GHG mitigation activities in agriculture have co-benefits for, and offer synergies with, other policy objectives such as food and energy security, rural development and poverty alleviation goals.

The agricultural sector is also affected by other climate-related forces such as the shift to biofuels and changes in plantation crops. Food price volatility may increase due to stronger linkages between agricultural and energy markets, although second- and third-generation biofuels do not pose the same risks.

Since 2010, the United Nation's Food and Agriculture Organisation (FAO) has been promoting climate-smart

Climate and non-climate drivers affecting production and non-production elements of food systems



Source: IPCC, 2014

agriculture as an approach to address the challenges of food security and climate change. It has three objectives: (1) sustainably increasing agricultural productivity to support equitable increases in farm incomes, food security and development; (2) adapting and building resilience within agricultural and food security systems to climate change at multiple levels; and (3) reducing greenhouse gas emissions from agriculture (including crops, livestock and fisheries). It seeks to offer a framework to deal with these three objectives at different scales (farm to landscape), levels (local to global) and time horizons (short and long), taking into account national and local specificities and priorities. However, implementation is a challenge due to lack of tools and experience and to the highly location-specific, knowledge-intensive nature of the possible options.

As many of the climate-smart options are sustainable agricultural practices that Helvetas has promoted for several decades, we are well placed to contribute to this agenda in a very practical manner. For example, Helvetas supports small rice farmers in improving their farming practices and productivity as well as offering them market access by establishing direct long-term partnership with important buyers, with whom we jointly invest in appropriate adaptation and mitigation measures.

HOW TO ADAPT TO CLIMATE CHANGE

Adaptation to climate change is place- and context-specific, and no single adaptation strategy will meet the needs of all communities in one particular region. Sound knowledge of the local context is therefore key. In all cases, specific support to partners (public and private) on issues related to climate change is crucial. A sound understanding of the causes and effects of climate change is required for innovative and efficient solutions.

The working area of Environment and Climate Change at Helvetas recognises three types of projects with their specific requirements:

A. Climate change project: An adaptation and/or mitigation project that is driven by considerations of climate change and concretely addresses risks and impacts of climate change. There are seven facets of such project;

B. Climate change sensitive project: A project whose results are directly affected by climate change;

C. Climate change relevant project: A project that contributes directly to the factors for climate change, positively or negatively, through its activities and actions.

Greenhouse gas emission reduction in a project on organic rice fields

Basmati rice in Uttarakhand (India) is grown under continuously flooded conditions which are a source of CH_4 emissions due to anaerobic decomposition of submerged organic material. Helvetas and Intercooperation Social Development India have been promoting organic rice in this region since 2011. The aim is to enhance the earnings of small and marginal farmers, as organic rice fetches higher market prices than conventional rice. So far, the project has covered 423 ha of farmland owned by about 1,900 farmers.

CH_4 emissions under different conditions are measured: (i) green manure and (ii) farmyard manure and vermi-compost amended continuously flooded fields, and (iii) fields with System of Rice Intensification (SRI) having alternate wet and dry conditions. Measurements indicate that the field with the third option (T5) releases the least CH_4 of all organic fields. Research trials are ongoing to measure CH_4 and N_2O emissions under a combination of organic and water management practices. It will quantify farm-level resource flows and assess the synergies and trade-offs between management strategies that result in agronomic, social and environmental sustainability.

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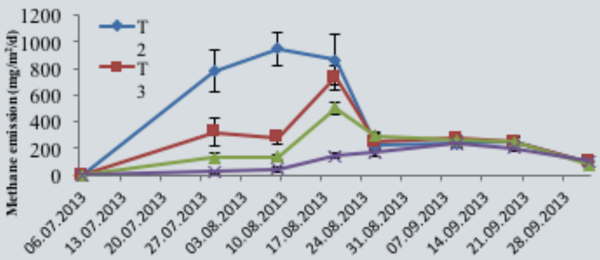
Comparative CH_4 emission flux



T2: Continuously flooded green manure

T3: Continuously flooded with farm yard manure and vermi composting

T5: SRI technology with alternate wetting and drying

T8: Continuously flooded with chemical fertilizer

Source: Rice Project, India 2014

SEVEN FACETS TO BUILD UP A CLIMATE CHANGE PROJECT

1. The project's design is based on a clear analysis of climate projections and trends and a risk assessment.

2. Weather data is monitored/accessed from designated institutions, and project interventions are analysed with reference to this information.

3. Relationships and partnerships are established with meteorological departments, agro-meteorological centres and research institutions for adaptation, as well as with the private sector for mitigation actions.

4. Establishment of relationships with national environment ministries/climate change units for up-scaling and accessing upcoming climate funds.

5. Systematic monitoring and participatory assessment of project outcomes in relation to observed weather patterns for creation of new knowledge and experiences among community members.

6. Focus on long-term institutional sustainability, as adaptation (and mitigation) actions need to continue for the long term unlike classical time-bound project interventions.

7. Look for co-benefits between DRR, adaptation, mitigation and development, and avoid 'silo thinking'.

Source: strategy of the Environment and Climate Change working area, HELVETAS Swiss Intercooperation (2015)

While assessing climate risks, Helvetas projects have found it useful to consider the entire value chains using a market systems approach. The analysis of risks and vulnerabilities in a project context allows one to avoid risk and take up proactive measures to production and other critical activities in the value chain. It helps small-scale businesses to better understand climate-related risks and opportunities throughout their value chains as well as to identify emerging market opportunities and develop a comprehensive risk management approach.

Furthermore, adaptation, mitigation and disaster risk management are complementary strategies to reduce the impacts of climate change and eventually contribute to climate-resilient development pathways. This is a useful unifying framework that enables us to choose the appropriate entry points and actions based on local needs and contexts. Agriculture projects, in particular, provide avenues for interventions in all the four interlinked domains.

The lack of climate models that are downscaled to the subnational levels at which agricultural decisions are taken is a key challenge. Inter-model variations at lower levels are so high that they result in contradicting results on the feasibility of future farming options. In such a situation, a first step for adapting to future climate change is reducing the vulnerability and exposure to present climate variability through measures that offer development benefits now, and reduce vulnerability to climate variability in the longer term, irrespective of the exact long-term climate impacts (often called 'low' or 'no regret' measures). We promote such low/no regret measures that benefit farmers through more sustainable and improved production and lower costs.

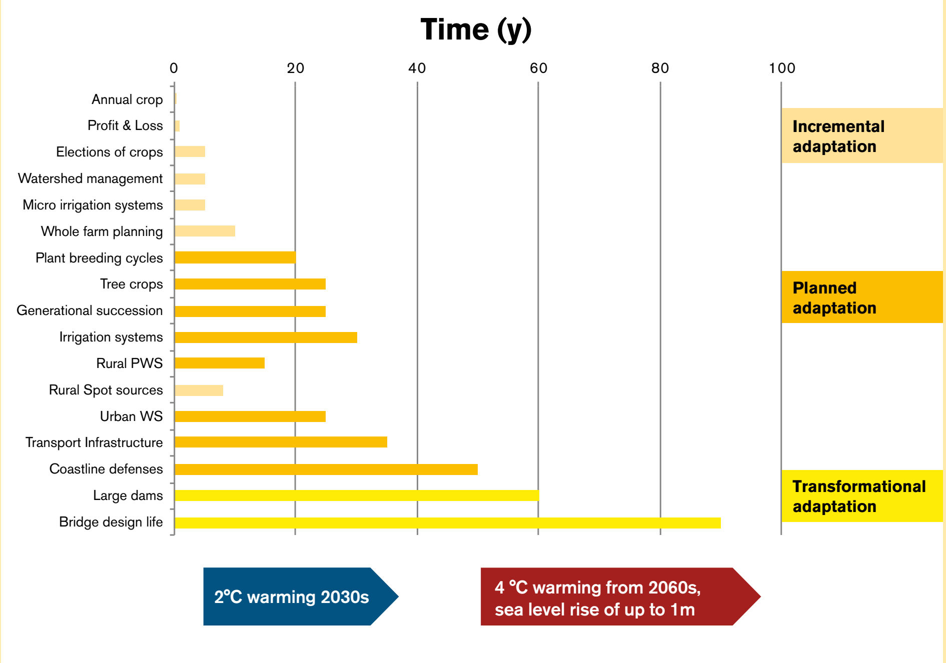
In order to improve access to agro-meteorological advice Helvetas supports the collaboration between meteorological services, agriculture department and farmers so that advice reaches farmers in a timely and understandable manner.

Weather-based farming system

The Vulnerability and Adaptation to Climate Change Programme (India) worked in semi-arid areas where agriculture is primarily rain-fed and variability in rainfall is a long-standing risk. Traditional methods of prediction were failing due to higher variability. Weather monitoring stations are few, and there are several micro-climates within a small region. Agro-meteorological advice, based on weather forecasts from the national entity and their interpretation in terms of agronomic practices in the region, is generated by the agricultural universities, but rarely reaches the farmers.

Village level weather monitoring stations were set up to collect information on rainfall, temperature, relative humidity and wind speed. Villagers were trained to maintain records and understand the data at each centre. This information was then sent to the national forecasting agency to improve the data sets on which long-term forecasts are made. Through this linkage villagers received advice about agricultural operations according to the forecast for the next seven days. Farmers who followed the advisories had better yields. The experiences were pooled among farmers at the end of each agricultural season.

The timescale of different types of intervention compared with the timescales of climate change.



Incremental adaptation
Adaptation actions where the central aim is to maintain the essence and integrity of an incumbent system or process at a given scale.

Planned adaptation
Adaptation is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state

Transformational adaptation
Adaptation that changes the fundamental attributes of a system in response to actual or expected climate and its effects.

Source: adapted from Stafford-Smith et al. (2011)

When planning adaptation actions, the temporal dimension of when the impacts are felt and a good balance of short to long-term measures are crucial. As farmers take agricultural decisions for short time horizons, local, autonomous measures are the basis for long-term adaptation. Traditional practices for dealing with variability are often an important starting point, but need to be complemented and improved with external technical know-how. Risk transfer mechanisms are an important adaptation measure, as proved by our experience in Bolivia.

Bolivia: higher yields due to improved agricultural practices.

Climate variability and micro-insurance

In Bolivia, farmers are confronted with a number of hazards (e.g. droughts, floods, hail and frosts), which are exacerbated by climate variability and change, and often severely affect their crops and livestock. Under the Disaster Risk Reduction Program, small landholders are supported to implement ecological practices and use their traditional knowledge to reduce the negative impacts of extreme events. The project also introduced a micro insurance scheme to compensate for losses in situations where good agricultural practices are not sufficient to cope with climate events.

The micro-insurance scheme is tested with farmers growing potatoes in the highlands at an altitude of 4,000 metres a.m.s.l. and with farmers cultivating peaches and grapes in temperate valleys. Between 2011 and 2012, about 50 per cent of the farmers experienced higher yields due to improved practices or were compensated for their losses due to extreme events. Similar results were obtained for the following year. Thanks to this positive development, more and more farmers are interested and are willing to pay annual premiums for micro-insurance. It is promising to see that several insurance companies have drawn upon the experience and started to invest in micro-insurance schemes for farmers, particularly for high-value crops. See http://www.rrd.com.bo/

Water from the clay pot trickles into the soil and is absorbed by the plant.

A sound understanding of the causes and effects of climate change is required if one wished to come up with innovative and efficient solutions. Helvetas support stakeholders in developing local adaptation plans. We aim to develop, with our partners, a joint understanding of measures to deal with current challenges, future needs and the roles of different actors. Given the long-term nature of adaptation and mitigation actions, it is crucial that stakeholders are involved from the beginning of project design to ensure ownership, continuity and up-scaling.

Local adaptation plans

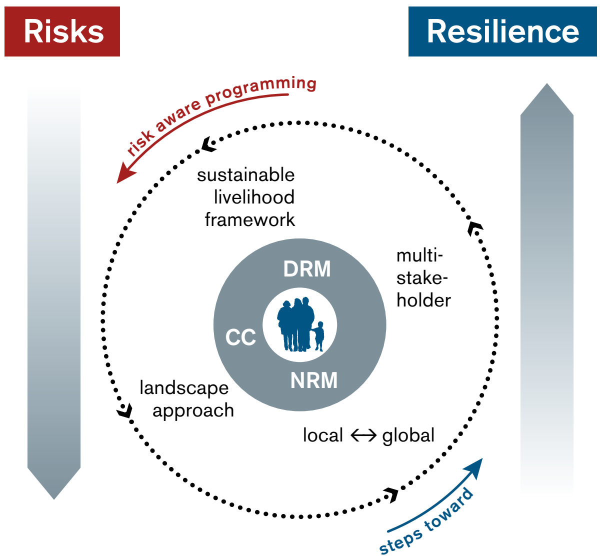
Climate scenarios in selected districts in the province of Khyber Pakhtunkhwa (Pakistan) observe a lack of rainfall and rising temperature in winter, leading to a drought-like situation in most of the districts. This has a direct impact on production of wheat, one of the main staple foods in rural Pakistan. The programme established wheat trials in four locations with the objective of selecting wheat varieties more tolerant to water stress conditions in the wake of the changing climate – namely reduced autumn/early winter rains.

Such initiatives are identified in local adaptation plans, which Intercooperation Pakistan has supported in a number of districts in 2015. These plans highlight the key priorities for coping with changing climate patterns (particularly rainfall and temperatures). As a first step, the methodology and the content of the plan is revised with technical support from Intercooperation Pakistan. The local adaptation planning process is then conducted in two pilot districts and subsequently expanded to other districts.

FROM RISK TO RESILIENCE

The ECC Working Area Strategy

In the Environment and Climate Change working area, Helvetas supports local communities and other stakeholders to manage common-pool resources in a sustainable manner and to address the risks posed by climate change and other hazards in order to develop resilient livelihood systems, as illustrated in the figure below.



Source: strategy of the Environment and Climate Change working area, HELVETAS Swiss Intercooperation (2015)

Research and capacity development

A project in partnership with the Swiss Re Foundation: In the high altitude Andean region in Peru (3,500 m a.s.l.), frost is one of the key risks to food production. While there are several traditional practices for dealing with frost, its increased frequency and greater losses mean that they need to be complemented by external technical know-how and risk transfer measures. In addition, when weather shocks strike, most farmers in a community are affected, and traditional risk pooling among households provides little security. So external actors need to step in. The project has partnered with the Swiss Re Foundation for resources and expertise regarding insurance and agricultural risk management.

The project identifies a set of effective practices and technologies to deal with frost. These are tested by 300 families and their effects are evaluated after 12 months. The dissemination of the validated good practices benefits both the Andean communities and the research institutions by creating a systematic inventory of good practices. This contributes to their preservation and adds to the base of knowledge that might otherwise be lost. The next phase of the project will focus on government and private-sector actions to reduce (residual) risks.

« On this plot, we used to cultivate rice. Today we can only cultivate sorghum, a crop that adapts to drier conditions. »

A farmer from San (Mali)

CLIMATE CHANGE AT HELVETAS

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