

Food security and adaptation to climate change - a position paper -

Frankfurt, August 2009

1. The context

According to the FAO (Food and Agriculture Organisation of the UN), by 2050 the world will need to double food production in order to feed its growing population. Climate change and its consequences will have a decisive impact on productivity in agriculture. If we fail to successfully manage the process of adapting agriculture to climate change, we will have to expect a sharp decline in food production, famine and unprecedented setbacks in the fight against poverty in developing countries. Adapting agriculture to climate change is the key to food security in the 21st century.

Ever since the 2008 food crisis struck, many developing countries have come to recognise how important it is to invest in agriculture and have committed themselves to raising investments in this sector considerably. Development cooperation should support these efforts and, in particular, promote food security on a significant scale through measures directed at climate change adaptation. Whether the trend in the ODA financing of agriculture and rural development can be reversed will determine global food security in the future.

According to the UNFCCC (United Nations Framework Convention on Climate Change), investments in the double-digit billions¹ will have to be made each year to reverse the trend and successfully adapt to climate change. Although the industrialised countries are spearheading the efforts aimed at avoid-

ing emissions, climate change adaptation is not yet of equal political concern in these countries - while in the developing countries it tops the political agenda.



Irrigation in Bolivia

Changing precipitation patterns and the increase of extreme weather events constitute an immediate challenge for adaptation. In the long term, rising temperatures, especially in arid regions, will lead to a situation in which land areas will be used in different ways than before and certain areas will no longer be usable for crop cultivation at all.

Efficient adaptation requires great attention to be paid to both the productive and the social aspects of the target groups. Who should be supported first? For development cooperation, the focus will increasingly be placed not only on landless people and subsistence farmers but also on smallholders - usually family operations - who are more strongly integrated into the market and have a higher production potential. According to the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), this group holds the greatest potential for contributing to food security and to the development of rural areas. At the same time, smallholder farmers are particularly ex-

¹ UNFCCC (2007): Investment and financial flows to address climate change, p 177. Separate data on agriculture are not available. Relevant investment components in: agriculture, forest and fisheries, water supply and infrastructure.

posed to the risks of climate change because, unlike large agricultural producers, they have considerably more difficulty absorbing crop shortfalls.

2. The CO₂ reduction potential of the farming sector

According to the Intergovernmental Panel on Climate Change (IPCC), the agricultural sector contributes some 14% of global greenhouse gas emissions. Three-fourths of these emissions are produced by developing countries. The vast majority (more than 80%) are methane (CH₄) and nitrous oxide emissions (N₂O). They are released mainly by livestock operations, the intensive use of artificial fertiliser in plant production and in the improper disposal of dung, manure and slurry. Rice growing and intensive soil cultivation also contribute, albeit to a lesser extent. Total annual greenhouse gas emissions from agriculture are estimated at approximately 6 gigatonnes of CO₂e².



Farm workers in Gansu, China

In the face of the dramatic global warming trend, every economically sustainable reduction potential has to be mobilised. In agriculture, this potential lies primarily in the avoidance of these emissions and in the storage of organic carbon in the ground, where a reduction potential of up to 30% exists for the agricultural sector at a cost of below USD 20 per tonne of CO₂e. Furthermore, pressure on deforestation to obtain new farmland can be

² CO₂ equivalent (CO₂e), a measurement used to describe the global warming potential of a greenhouse gas. CO₂ is the reference gas; the other greenhouse gases are therefore quantified in CO₂ equivalents.

reduced through the intensification of agriculture and through the rehabilitation of degraded land.

Where such a reduction in emissions is possible, synergies between adaptation and mitigation should be mobilised. However it has to be emphasised that, from our perspective, owing to social, technical and economic considerations the contribution of the agricultural sector to an effective climate policy clearly resides in adaptation and less in mitigation. Adaptation measures in the agricultural sector should therefore be a clear focus of German Financial Cooperation (FC).

3. Climate change and nutrition

The consequences of climate change will affect first and foremost the 2.6 billion people who survive on less than two US dollars per day. According to the UNDP Human Development Report 2007/08, the greatest threat posed by climate change is that of a collapse in agricultural production systems (droughts, irregular precipitation, etc.). This could expose an additional 600 million people to malnutrition. Already today, approximately 5 to 10 million hectares of land, an area comparable to the size of Austria, is lost to agricultural production each year owing to degradation.

Nevertheless, the impacts of climate change vary substantially from one region to another.

According to the OECD, by the year 2050 an additional 26 million people in Latin America and 132 million people in Asia will risk suffering from hunger. Agricultural production in Africa may drop dramatically as a result of diminishing rainfall and desertification - which means that many more people still could lose their livelihood.

Maize harvests by smallholders in Latin America are expected to fall by an average of 10%, and rice production in Egypt may shrink by 11% by the middle of the century. Rice harvests in Bangladesh are forecast to drop by 8% and wheat harvests by 32%.³

³ OECD – Policy guidance on integrating climate change adaptation into development co-operation, 2009, p 40

In order to secure the provision of food in these regions in 2050 as well, productivity must be maintained or increased.

4. Strategic approaches to climate change adaptation

Climate change in developing countries influences productivity in agriculture primarily through the following factors:

- **Extreme weather events** (such as storms and floods) which lead to crop shortfalls, the destruction of plantations and infrastructure, and an increase in the degradation of farmland.
- **More irregular distribution of precipitation**, which results in crop shortfalls, reduced yield potential, deterioration of groundwater regeneration and the loss of usable land.
- **A slow but steady temperature rise**, which will lead to a drastic reduction in the quantity of water available to humans and the environment, loss of the water storage function of glaciers, salinisation of fertile river deltas and to an altered distribution of pests and weeds.

The strategy for securing nutrition under the conditions of climate change builds on optimising agricultural production potential by taking into account the above negative influences. For this strategy to succeed, farmers in the partner countries need information about risks, proposals for adapted production technologies, as well as appropriate infrastructure and financing. Consideration of ecological sustainability criteria and, in particular, the efficient management of the resources of water, soil and agro-biodiversity will be crucial.

4.1. Research, extension services and financial support of adapted technologies

In times of rapidly advancing climate change, traditional experiences with precipitation patterns, frost, heat waves or diseases are frequently devalued. Training and extension systems, which are currently completely inadequate in most partner countries, must be developed in such a way that farmers can adapt to climate change. Where traditional

technologies employed by smallholder farmers contribute to diversifying risk, they should be built upon and promoted.



Harvest in Morocco

Applied research, for example in the areas of breeding, seed management, reduced soil tillage, efficient fertilisation, adapted plant protection or operational organisation and marketing, is becoming increasingly important in the context of climate change.

Equipment and inputs, such as direct sowing machines, adapted seeds for main crops and intermediate crops, plant protection and fertilisers must be available to farmers. The private sector and agricultural associations should cooperate closely to ensure this.

To increase and adapt production, farmers need appropriate financing. They finance their annual consumables (seeds, plant protection, fertiliser, seasonal labour) through short-term loans (six to 12 months) and the necessary transformation of operations (setting up plantations, machinery, storage capacities) via long-term loans that run from five to ten years.

In this context, partnerships between the food or processing industry and organised smallholders (contract farming) may reduce production risks and create a secure sales market - as is practised successfully in Sub-Saharan Africa. German Financial Cooperation can support these schemes in close cooperation with governments, business enterprises and commercial banks.

Technical assistance plays a pivotal role in the promotion of research and consultancy as

well as for the improvement of national adaptation strategies for agriculture. Given the need for long-term support and for strengthening ownership, cooperation in this area can

also be conducted more intensely through long-term sector financing and, assuming transparent and good national adaptation strategies, through budget support.

Possible adaptation measures of the agricultural sector

Climate change/challenge	Adaptation measure
Lack of climate data relevant to development cooperation	Support in the improvement of climate data
	Support in the preparation of regional forecasts and studies
	Basic research in relevant areas (animal and plant breeding, production technology, plant protection etc)
Extreme weather events (storms, floods)	Insurance
	Infrastructure measures
	Construction of storehouses
Fluctuating or declining precipitation	Irrigation and integrated water management
	Supplementary irrigation
	Minimisation of surface run-off (terracing, biological and other physical lining measures)
	Optimisation of production (seeds, fertilisers, plant protection, tillage)
	Adaptation of land use (cropland-pastureland-forest), agroforestry systems
	Crop diversification
Deterioration of the overall water budget (e.g. Andes, Himalayas)	Artificial water storage (cisterns, retention basins)
	Groundwater enrichment (seepage, water discharge brakes)
	Water catchment area management
	Sector measures, investment planning
Temperature rise	Adaptation of land use (cropland-pastureland-forest), agroforestry systems
	Optimisation of production (seeds, fertilisers, plant protection, tillage)
	Additional irrigation
	Protection of river deltas against salinisation from seawater inflow

4.2. Investment in water management

As climate change advances, water management will play an even more crucial role. In almost all intervention regions of development cooperation we expect that climate change will be expressed in changing precipitation (distribution and quantities). Extreme weather events will lead to floods and increased surface water run-off, reduce infiltration and, as a result, hamper the natural regeneration of groundwater. Rising sea water levels will lead to salinisation problems in the deltas of the big rivers.

Investments in the protection and rehabilitation of watersheds, in the improvement of the soil water balance and the creation of artificial water storage facilities (such as cisterns, water retention basins, small reservoirs) are necessary across extensive areas. At the same time, the supply of drinking water must be ensured and water needs to be made available for farming. In order to ensure the continuous and sustainable yields required in the light of climate change, in the future farmers will increasingly be forced to produce crops using additional irrigation.

With a view to the changes in water cycles that are being expected to occur, especially in the Andean countries, Central Asia and Sub-Saharan Africa, German Financial Cooperation should increasingly promote the construction and implementation of irrigation systems, embedded in overarching, integrated water management systems.

The participation of German Development Cooperation in projects of this nature can contribute in a decisive manner to substantially reducing water and land consumption in rural development and to making agriculture, the main consumer of water, appropriately accommodate the water needs of people and nature despite the necessary intensification.

4.3. Adapting farming practices

The spectrum of climate change adaptation measures ranges from a moderate modification of technologies that can be implemented by the target group without much financial effort (e.g. changing over from maize to millet) through terracing and the use of micro-

catchment systems and the construction of irrigation systems, to a fundamental change of land-use systems (changeover from annual crops to plantations or transfer from arable farming to pasture and animal husbandry) and the abandonment of farmland and migration.

While many moderate adaptations can be enabled by technical assistance provided by national and, in part, international experts, the task of German Financial Cooperation will increasingly consist in supporting adaptation measures requiring investments at a broader scale..

Examples:

- Rehabilitation of degraded land, for instance through assisted fallow; alley cropping, crop rotation/alternate crops; adapted fertilisation; integration of animal husbandry with crop farming
- Support for land titling (in particular where land use changes from annual crops to investment-intensive perennial crops such as orchards and forests (e.g. China, Sub-Saharan Africa)
- Financing of simple terracing systems and rainwater catchment (e.g. Burkina Faso, Niger)
- Support for direct sowing systems (e.g. Paraguay)
- Rehabilitation and improvements to the efficiency of irrigation systems (e.g. Egypt, Tunisia, Ecuador)
- Construction of small and medium-sized irrigation systems (Bolivia, Peru)



Direct sowing in Paraguay

4.4. Insurance systems for limiting climate risks and for social security

It is expected that in most years, even in times of climate change, normal yields will be generated. The rising frequency of extreme weather events entailing occurrences of total crop losses, however, can cost smallholders their basis of livelihood. Supporting the introduction of specific insurance systems can help safeguard the bases of nutrition. One example of this is a subsidised crop loss insurance scheme being offered to (poor) smallholder farmers in Brazil named "Crop Guarantee".

Brazilian Crop Guarantee insurance:

How it works: Decisions on joining the insurance fund are made annually. Compensation payments for claims are predetermined (currently approximately EUR 250 per insured family). Farmers with up to 1 1/2 minimum incomes (some EUR 170) are eligible to join the fund. The sowing periods are determined for each region and they have to be respected by the farmer in order to qualify for a claim. The farmer pays an insurance premium of 1% of the predetermined compensation in case of a claim. The municipality pays 3% (for each participating farmer) and the federal state 6% (adding up to 10%). The central government adds another 20%. A claim arises when the harvest drops by at least 50%. The value of the annual compensation and the regional claim is determined by a commission with equal representation (ministries, farmers' associations, NGOs, federal states and municipalities). If no claim is submitted in a region, the funds are used to cover claims in other regions.

The people in the partner countries feel the consequences of climate change very clearly, although statistically the consequences are still hard to prove because of the strong temporal and spatial variations and, in many cases, inadequate climate data.

"Secure" figures on climate change at micro and regional level are also of great importance for the development of index-based insurance systems as well as for the conception of "no-regret" measures in water catchment management and erosion control. Data networks will have to be knit ever more tightly in the future. The improvement of climate data is to be supported where they are immediately relevant to FC projects and programmes. The need for reliable climate models at micro level, however, should not pre-

vent necessary measures from being implemented on the grounds of sub-optimal data. Practical interventions and climate research can and must be developed collaboratively on the basis of current knowledge in order to be able to respond to the demands of climate change in a timely manner.

5. Target group for adaptation and food security

Smallholder families are the immediate target group for adaptation and food security.

In most regions they produce more than 50% of the food and have a considerable potential to contribute to food security. In Sub-Saharan Africa, for example, average yields are 0.5 to 1.5 tonnes per hectare of cereals; by comparison, a German farmer harvests 5 to 8 tonnes per hectare. Even considering the harsh climatic conditions, which will be aggravated by climate change, economically and ecologically sustainable measures can be implemented to significantly improve productivity and yields.

The promotion of agriculture at ecologically advantageous locations and of smallholders who are on a somewhat stronger financial footing is a sound and necessary approach.

It is undisputed that the extremely poor rural population is highly vulnerable. This group of people will benefit indirectly from the above adaptation programmes. However, in order to combine the fight against extreme poverty with adaptation and food production, the focus of production should be complemented by additional rural development / poverty reduction measures in places where approaches are not mutually complementary (basic health programmes, enhanced approach of Conditional Cash Transfer - CCT, payment for environmental services).

Given their high social responsibility for nutrition (including drinking water supply), health and education, women will face more pressure from the climate consequences described above. Both in food security programmes and in the direct fight against poverty resulting from climate change, a gender-sensitive, specific situation analysis and a corresponding course of action are very important.

6. Financing requirements; setting the necessary political course

Greater commitment to adaptation enables climate policy and poverty reduction to be more closely dovetailed. It is an opportunity to broaden the focus of German Financial Cooperation on climate policy from a few emerging countries to all partner countries. Food security and adaptation of agriculture play a prominent role in this regard. Owing to the complex demands of adaptation and the need to operate regionally, project-based approaches will be increasingly complemented by programme and sector approaches that are based on the experience acquired from project work and on national development plans for rural regions.

It is foreseeable that considerable funds will have to be mobilised for adaptation measures over the coming years and decades. Estimates range from USD 28 billion to USD 86 billion a year. As yet, however, these cost estimates are fraught with great uncertainty. Yet it is already discernible that annual investments in the double-digit billions will be necessary for the agricultural sector in developing countries alone and that the cost of inaction will greatly exceed the costs of adaptation.

This scenario challenges development cooperation to increase public awareness of climate change adaptation in agriculture, and to structure its development interventions, taking into account social, economic and ecological aspects.

In this context, cooperation with the partner countries will need to be intensified particularly in the following areas:

- Research and extension
- Water and agriculture
- Adaptation of agricultural practices
- Rural infrastructure
- Agricultural loans
- Risk protection and index-based insurance systems

The implementation of climate change adaptation projects should be harmonized with other donors. After all, it is necessary to ensure the financing of the adaptation measures in the agricultural sector - which will be in a considerable volume, as mentioned above.

7. Conclusion

- Adapting agriculture to climate change is the key to food security in the 21st century.
- Since the early 1990s, the promotion of agriculture has been reduced considerably in development cooperation. Global food security and successful climate change adaptation will depend on whether the trend in the financing of agriculture and rural development can be reversed.
- Changing precipitation patterns and the increase of extreme weather events constitute immediate challenges. As climate change advances, water management will play an even more crucial role.
- Mitigation and adaptation - many farming practices that are important for climate change adaptation also have a positive impact on greenhouse gas emissions. Where such a reduction in emissions is possible, synergies between adaptation and mitigation should be mobilised. Nevertheless, German Financial Cooperation generally should focus clearly on adaptation.
- Investing in agriculture to secure food and adaptation to climate change does not mean that the objectives of combating extreme poverty and adapting agriculture to climate change always coincide - they often complement each other.
- In some partner countries there is uncertainty about what should be appropriate national/regional strategies and sector-specific approaches. Development cooperation can contribute to accelerating the adaptation process substantially by supporting the development of strategies and by financing pilot measures.

For further information please contact:

Dr Karl-Heinz Stecher
Tel ++49 (0)69/7431-8720
E-mail: Karl-Heinz.Stecher@kfw.de

Dr Jürgen Fechter
Tel ++49 (0)69-7431-2813
E-mail: Juergen.Fechter@kfw.de

KfW Entwicklungsbank
Palmengartenstrasse 5 – 9
60325 Frankfurt am Main/Germany
www.kfw-entwicklungsbank.de