Coping with Climate Change and the Role of Agrobiodiversity

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The world's biological diversity is eroding

This concerns in particular the entire agricultural diversity of genes, species and their agrarian ecosystems. Agrobiodiversity is the resource base for food. With species becoming extinct, mankind is jeopardised. Facing the reality of climate change, this aspect is getting increasingly important. Notably for sub-tropical regions, climate induced environmental changes will have severe implications for agriculture and for food security. Agrobiodiversity plays a key role to cope with this challenge.

Climate change - a menace to food security

- Ø The exposure of crops to increasing temperature will reduce species diversity and lower agricultural yields and, global warming will be highest in tropical and subtropical regions.
- Ø Indirect temperature effects will increase soil evaporation, accelerate organic matter decomposition and aggravate pests and diseases.
- Ø In the last century, subtropical regions were most likely confronted with around 3% less precipitation, whereas the northern hemisphere likely experienced 5-10% higher rainfall.
- Ø As a summary conclusion to all these impacts, it is predicted that by 2080 the 40 poorest countries that are predominantly located in tropical Africa and Latin America may lose 10-20% of the grain growing capacity, whereas yield increases are expected in temperate regions.

Adaptation of crops and animals – but how ?

- Ø The adaptation of organisms is a process that requires exposure to the environment, on farmer's fields and considering the wide agro-ecological variation of sites. The predominant conservation method of today: isolated storage, deep frozen in a gene bank is not the answer.
- Ø Adaptation requires traditional breeding techniques; resistance to environmental stress (e.g. drought tolerance) is a multi-genetic characteristic that cannot be incorporated through genetic engineering.
- Ø Adaptation strategies have to address regional and local agro-ecological variations and to offer site-specific solutions. In doing so, they are inappropriate for the corporate sector, that follows the law of economy of scales and aims to distribute a standardized variety/race as widely as possible.

Agrobiodiversity - how much do we need ?

- Ø Genetic resources are crucial to cope with climate change; plants and animals with no economic value so far may become important.
- Ø As the future needs for human survival are unknown, a maximum of genetic resources has to be conserved at the lowest possible public cost.
- Ø An appropriate strategy has to rely primarily on *in-situ* conservation with *ex-situ* gene banks being complementary. *In-situ* may not be less costly, but the costs are mainly borne by farmers, whereas the benefits are private and public.

Urgent action is required

- Ø Awareness about the close relationship between climate change, food security and the role of agrobiodiversity has to be raised.
- Ø Agrobiodiversity conservation must become a basic component of adaptation strategies to climate change.
- Ø A new understanding of appropriate conservation strategies for agrobiodiversity is necessary, by which *in-situ* concepts play a leading role.

Box I: Pastoralists' innovative responses to drought

"For the third year in a row [1997-2000], the southern region of Ethiopia has received insufficient rainfall and endured a deadly drought. Most of the livestock - the source of livelihood for most of the people of this region - have died and all the vegetation has withered. For many in the Horn of Africa, this drought has put them on the edge of famine for months."

In 2000, the Oxfam partner, Action for Development, purchased 120 camels, which are more drought-resistant than cattle because they only need water every 10 days or so - to be used for hauling water. The introduction of camels for water transport has freed women, who used to travel 6-10 hours to bring back as much water as they could carry. Now they can devote themselves to other activities. Camels can also be used to plough the land when there is sufficient rainfall to attempt planting."

"Today, one camel can haul more than enough water for a family. The men have assumed the task of handling the camels, freeing the women to provide care for their families and return to a variety of income-earning activities."

"Adde Lokko Aaro, a mother of six children, lost more than four hundred goats and cattle in the drought and was on the verge of financial collapse. With three camels at the disposal of her village, Adde's responsibilities have been drastically altered: 'The camels bring enough water for a number of households at a time,' Adde Lokko said. 'They [women] don't have to carry water on their backs, our men have started getting involved in the work of fetching water, which is normally the responsibility of women. We are pleased to witness that our camels have shared our burden.'"

Cited from: Oxfam (2002)

Box II: Minor millets save the poor from starvation

"Sankappa is a small farmer owning three hectares of dry land in Vittalpura village of Bellary district in Northern Karnataka, India. This village is situated in the semi-arid Deccan Plateau and receives annual rainfall of 500 mm in two to three months a year, which allows one crop during July to October. Sankappa like his forefathers and other farmers of the village is growing foxtail millet. (…) The amount of rainfall during the last four years dropped continuously in this part of the country. It was below 300 mm in 2003. 'All other crops failed due to extreme drought, and my family and livestock were saved from starvation by the harvest from foxtail millet,' says Sankappa. The (…) varieties grown and conserved by the villagers have excellent drought resistance."

"Eight minor millet crops grown in different regions of Africa, Asia and Eurasia are finger millet (Eleusine coracana), proso millet (Panicum miliaceum), little millet (Panicum sumatrense), barnyard millet (Echinochloa crus-galli and E. colona), kodo millet (Paspalum scrobiculatum), teff (Eragrostis tef) and fonio (Digitaria iburua). Little millet and kodo millet were domesticated in India."

"The long history of minor millet cultivation and its spread to different regions of the world that are notable for extremely harsh farming conditions generated considerable genetic variability in these crops. (…) Global neglect of the minor millets and increasing emphasis on few elite food crop species are precariously narrowing the food security basket. The most disadvantaged by this food production policy are the poorest of the poor (…) The shrinking number of food crops in the regional and global food basket is restricting the opportunity of farmers in difficult regions to use their land resources, environment and traditional knowledge."

Cited from: Bala Ravi (2004).

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