



Climate change and agriculture: Examples from the work of GIZ – Guatemala



A vulnerability analysis involves local people in exploring an area's vulnerability to climate change.

Guatemala: Hope between hurricanes and drought

People in the departments of Huehuetenango and San Marcos in the northwest of Guatemala rely on farming for their living. Over hundreds of years, a mixed cropping system of maize, beans and squash emerged there: known as milpa, this locally adapted cultivation method used to guarantee food security. But increasing climatic risks and rising temperatures are forcing indigenous, small-scale farm families to adapt. This adjustment process is complicated by the destruction of mountain forests, the expansion of cropland, high population growth, the fragmentation of fields and overuse of the soil. Many families grow crops on land less than half the size of a football field.

One consequence of these trends is that the soil has lost organic matter, meaning it cannot hold as much rainwater as before. That causes springs to shrink or dry up completely, in turn causing problems for residents of lower-

lying areas. At the same time, the risk of floods, mudslides and landslides during the rainy season has risen, especially during intense storms such as hurricane Stan in 2005 or tropical storm Agatha in 2010. Climate change is expected to worsen the situation, especially in dry areas and mountainous regions such as San Marcos and Huehuetenango.

Traditional strategies for adapting to climate change

To maintain vital natural resources in the long term, it is necessary to protect the soil, water, animals and plants, and to use them in a more sustainable way. That means that farmers have to adjust their traditional agricultural system to the new situation. Residents of 30 villages of the departments of Huehuetenango and San Marcos have successfully done this: with the support of German development cooperation they have transformed their agriculture.

These initiatives to adapt agricultural systems to climate change were part of a larger project, Reconstruction and Disaster Preparedness in Central America, which is usually known by its Spanish acronym RyGRAC (*Reconstrucción y Gestión del Riesgo en América Central*). This project served Guatemala and El Salvador; it was initiated by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) after the tropical storm Stan in late 2006, with support from the Federal Ministry for Economic Cooperation and Development (BMZ).

Big differences in elevation in this mountainous region result in three major agro-ecological zones that dominate agriculture. Each zone has its own typical farming system. In the cool, high-altitude zone (3,000-3,600 m), potatoes and maize are the main crops, while sheep and a few cattle graze the pastures. The milpa maizebeanssquash combination is typical of the temperate middle zone (2,400-3,000 m), supplemented by potatoes and vegetables. Some larger farms in this zone have small timber or coffee plantings. In



Amaranth helps farmers cope with drought and natural disasters. Climate change may make it a strategic crop.

the hot, low-lying zone, the *milpa* is accompanied by groundnuts and vegetables. Farmers here also plant fruit trees and coffee as cash crops.

Some farmers exploit the potential offered by agrobiodiversity to adapt to climate change and minimize their risks. They increase the diversity of crop species and varieties, and make use of the available agro-ecological niches. For example, they grow varieties with different growing seasons, or sow a mixture of different varieties in the same field – such as varieties of beans that tolerate drought along with those that prefer wetter weather. Other farmers divide their fields into plots which they plant with different varieties. Staggering the planting of major crops reduces the risk of loss, as does irrigation. Still others cultivate fields in all agro-ecological zones. To ensure that their seed retains its adaptability to different growing conditions, the farmers plant the same varieties in the different zones. There is a significant exchange of seed with farmers from other regions and altitude zones who multiply various local varieties. These approaches combine to reduce the farmers' vulnerability to climatic risks.

Developing and adapting tried-and-tested approaches

Promotion of agrobiodiversity

Some families in Huehuetenango and San Marcos still maintain a big range of crop species and varieties. The GIZ project built on this tradition, for example by organizing seed fairs, further developing the *milpa* system, and re-introducing forgotten local varieties of maize, beans, pumpkins and groundnuts in order to expand agrobiodiversity and adapt to the changing climate. In this way amaranth has reappeared in the farmers' fields. The 2009 drought made people suddenly aware of the importance

International seed trade in Cuilco

The second international seed fair was held in Cuilco, Guatemala, in March 2010. About one hundred displays presented the region's still-rich diversity of maize, beans, groundnuts, potatoes and pumpkins. Along with the local exhibitors, small-scale farmers from El Salvador and Peru also showed off their treasures. The five exhibitors with the greatest diversity received awards. At the end of the fair, the farmers exchanged their seed – an important contribution to the conservation of agrobiodiversity. At the same time as the fair, project staff documented the key characteristics of the varieties on display.

In total, the project organized four such international seed fairs. They played a significant role in efforts to restore and expand the diversity of species and varieties in the region and in Guatemala.

of a high diversity of species and varieties. Fields with amaranth planted along with beans and other crops withstood the drought better than others, and yielded well despite the drought. In the same year, the Guatemalan government declared amaranth as a strategic crop for combating hunger and malnutrition.

Gardens in the two departments have become more colourful and diverse as their owners have planted more vegetables and medicinal plants. Fruit trees have become indispensable: along with timber trees they are an integral part of the agroforestry systems that RyGRAC established. Reforestation and the introduction of management plans enable the conservation of forests and enhance the soil's capacity to store water. To reimburse the affected farmers for conserving and protecting forests, PINPEP (a government incentive scheme for owners of small forest plots) will pay them compensation of about \$US 250 per hectare a year for five years. Such compensation is based on management plans developed for 610 hectares of land (*see also the GIZ issue paper on "Payment for environmental services to conserve agrobiodiversity"*).

Soil conservation and erosion control

Unlike in other mountainous regions of Guatemala, terraces for growing crops were unknown in the project area. But with RyGRAC support, farmers have now started building terraces. To protect fields from erosion and landslides, they marked out contour lines, built terraces and planted them with fast-growing forage grasses. On steeper slopes, the farmers strengthened the terraces with stones, fruit and timber trees or fast-growing bushes.



Terracing: an innovation in the project area. Strips of fodder grass help stabilize the plots.

The traditional tillage methods using hand hoes, machetes and planting sticks were retained because they protect the soil. Traditionally, crop residues were burned; farmers instead now work them into the soil to improve its stability. They produce organic fertilizers to improve soil nutrient levels. That results in safer and better harvests, as well as raising the soil's ability to store water.

Technical measures such as drainage ditches and canals protect the fields and drain rainwater into managed channels where it can do no damage. The surfaces of large earth cuttings were stabilized with old tyres or other materials to keep them from slipping during heavy rain.

Improved planning and protection through risk analysis

These improvements in cultivation went hand-in-hand with a comprehensive risk assessment. This enabled hazard

Early warning of floods

Residents in the Rio Sosi river valley can sleep more soundly than people in neighbouring valleys. A new early-warning system now warns them of flooding before it occurs. Gauges in the upper part of the valley collect information on rainfall intensity and river levels, and transmit these via radio to the Municipality of Cuilco. There the data are evaluated, and if necessary the residents of the lower valley are issued a timely warning of the impending flood. Any necessary evacuation measures are also organized in Cuilco. The early-warning system and the rain gauges are connected to the national disaster-prevention system. The valley inhabitants developed the new system in conjunction with RyGRAC and the municipal authorities of Cuilco, Tectitan and San José Ojetenam.

areas to be mapped and appropriate land uses to be planned. The basic data were drawn from a participatory climate risk analysis. In a second step, the villagers discussed with the local administration and the project management about what protective and preventive measures could be applied; proposals were then developed accordingly. New zoning and community development plans are also based on this climate risk analysis. Participatory climate risk analysis was developed by GIZ for residents of areas that are particularly vulnerable to natural disasters. This tool enables the residents to assess potential future threats and risks and take appropriate measures to mitigate them.

Talking with the people

“The field is the farmer’s book.” That was the motto that RyGRAC followed when putting measures into practice together with the farmers. It made it possible to build on the existing empirical knowledge of the local *Mayan* population and of the smallholders. Traditional approaches to adapting agricultural production systems to climate change were retained and supplemented with new scientific findings. From this emerged a strengthened system that is adapted to the challenges of climate change.

Clear ground rules were agreed at the outset of the project. There would be no cooperation without a significant contribution from the local population and the authorities. For example, that meant that the costs of implementing measures were always divided among the three parties: villagers, local government and the project. Families received fruit or timber seedlings or seeds only if they simultaneously implemented soil conservation measures.

Factors leading to the RyGRAC project’s success were:

- Establishing and creating a firm foundation for an alliance between the local villagers, the municipal administrations and policymakers at regional and national levels. This alliance is an important basis of sustaining the adaptability to climate change.
- Ensuring participation, contributions and ownership by local people. These increase the villagers’ interest and sense of responsibility, and impact positively on the sustainability of interventions.
- Strengthening the capacity of target groups and intermediaries so that they could independently identify and implement methods to adapt to climate change on the basis of participatory climate risk analysis.
- Specifically building on the knowledge and experience of local people, so enabling the new methods to be better and more easily embedded in practice.



At a glance

Project area:

Seven municipalities with 30 villages in the departments of Huehuetenango and San Marcos. The project area is home to around 250,000 people of the *Mam* and *Tectiteco* ethnic groups.

Important results:

- Promotion of reforestation on 160 hectares, creation of forest management plans for 450 hectares, compensation payments over five years for a total of 610 hectares of protected forest.
- Introduction and planting of 100,000 fruit trees and 30,000 coffee bushes to stabilize slopes and terraces as well as to improve food security and incomes.
- Establishment of fodder-grass strips along contour lines in fields. These protect the soil from erosion and improve incomes. Farmers sell the fast-growing grasses or use them to feed small livestock.
- Production of natural fertilizers and plant-based pesticides, the establishment of homegardens, the introduction and widespread dissemination of agroforestry methods, the installation of simple irrigation techniques and the promotion of small livestock.
- Promotion of agrobiodiversity by reintroducing and creating value for old, locally adapted varieties and species such as amaranth. The greater diversity has enabled more balanced diets and improved food security.
- Disaster management and mitigation measures based on participatory climate risk assessment and hazard maps.
- As a result of rehabilitation and protection measures supported by the project, the average income of assisted families rose by 40 percent over the four years of the project's life (compared with their level before hurricane Stan in 2005).

Further information

Kohler, A., G. Rengifo, M. Stamer (2011): *Anpassung landwirtschaftlicher Produktionssysteme an den Klimawandel. Ein Beispiel aus Guatemala*. GIZ.

Contact

Annette von Lossau
E annette.lossau-von@giz.de
T +49 6196 79-1473
I www.gtz.de/de/themen/umwelt-infrastruktur/23089.htm

Published by

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Sector project "Sustainable management of resources in agriculture" (Div. 45)
Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 61 96 79-0
F +49 61 96 79-11 15
E info@giz.de
I www.giz.de

The "People, Food and Biodiversity" Issue Paper Series is designed for individuals and institutions engaged in development cooperation. Its aim is to:

- Arouse interest in the issues surrounding food and biodiversity and spotlight the various linkages.
- Showcase new topics and approaches.
- Rapidly and lucidly present proven approaches and experiences.
- Encourage and stimulate you to increasingly take up these issues in your work.

We look forward to your feedback, which helps us bring the series to its full potential.

Further issue papers are available at <http://www.gtz.de/de/themen/umwelt-infrastruktur/22063.htm>