Case Study – Working at both local government and community levels to reduce risk and adapt to climate change in Central America

Central America is vulnerable to a variety of both fast and slow onset climate changes, the most well-known being the regular occurrence of hurricanes. Although there is no clear trend in the annual numbers of tropical cyclones, based on a range of models, it is likely that future hurricanes will become more intense, with larger peak wind speeds and increasingly heavy precipitation. Predictions of average rainfall are less certain, but the trend since 1960 in Nicaragua has been a decrease of 5-6% of average total rainfall per decade. Despite the decreasing trend in total rainfall, the proportion that occurs in 'heavy' events has increased, with the observed maximum 1- and 5-day rainfalls showing significantly positive trends. Increasingly erratic rainfall patterns coupled with rising temperatures will impact negatively on staples such as maize as well as export crops such as coffee, reducing productivity and increasing soil erosion. Downstream siltation of river systems (such as the Rio Lempa) increases the likelihood of floods and reduces the effectiveness of flood protection measures. In 2005, Hurricane Stan destroyed 50% of the coffee crop from the area near the Llamatepeque volcano in Santa Ana, representing 5% of the total national coffee crop. In lowland coastal areas, a sea level rise of 13-55cm by 2015 will erode protective mangrove forests and increase the risk of inundation from storm surges.

With a history of vulnerability to tropical storms and cyclones, Christian Aid partners in both El Salvador and Nicaragua have supported risk reduction and adaptation at both local government and community levels. Unidad Ecologica Salvadoreña (UNES) has been working with the municipality of San Francisco Menendez, on the border with Guatemala, to develop a municipal adaptation strategy. Their engagement with the municipality started in 2006 following the impact of Hurricane Stan in October 2005. Although relatively distant from the epicentre over Mexico, Stan killed 49 people nationally through widespread flooding and mudslides related to associated rain storms. In San Francisco Menendez, 1,816 families were directly affected, losing 850 acres of maize in mainly lowland areas of the municipality. Although evacuation to emergency shelters and other measures were implemented, Mayor Narciso Ramirez described the Municipality as *"not well prepared so the response was stressful"*.

The municipal response has been to establish a risk management network, bringing together all government and NGO stakeholders to cover all parts of the municipality rather than just the low-lying coastal areas (which did have a lose structure of civil protection groups pre-Stan). Smaller-scale floods in 2006 which resulted in 16 families losing housing and land and wind-related emergencies and forest fires in the 2008/9 dry season (winds have caused 2 deaths and destroyed 1,497 houses; 5 wind-accelerated fires have ravaged 170 acres of forest) have reinforced the need for a municipal-wide early warning and response system linked to an overall strategy.

UNES facilitated initial training in 2006 including risk and environmental management, training for civil protection committees, tools and techniques to reform civil protection law and formulating proposals to Congress. Links were also established with the meteorology department of Servicio Nacional de Estudios Territoriales (SNET) to establish an early warning system around flood risks in the Rio Paz valley (together with 3 other municipalities), training a network of local leaders to collect information and interpret/publicise forecasts to their communities. This system uses phone and shortwave radio links to enable local leaders to relay

information to SNET, who process this into a forecast and relay it back to community level.

More recently, the focus has broadened from flood risk reduction to developing a municipal strategy for climate change, initially focusing on the next 5 years but moving towards a longer-term mapping and strategy process. This has involved gathering both scientific and local knowledge, including scientific climate information gathered through downscaling and ensembling information from global circulation models (HadCM3 and ECHAM4) focusing on 2020, 2050 and 2080. In addition, community meetings have involved a total 576 people discussing issues such as risk, vulnerability, water use and management, disasters and poverty, climate change and other environmental issues, infrastructure, agriculture and employment to identify the main causes of climate and environment-related problems and likely future solutions.

Integrating both the science and community understanding aims to produce an adaptation approach that works with the community and can be replicated to other municipalities. As well as rehabilitating flood protection infrastructure such as drainage ditches and cyclone shelters, the municipality has supported a number of pilot projects, including promoting climate-resilient agriculture (use of organic fertilisers, native crop varieties, pasture improvement, fruit tree planting and productive gardens), fuel efficient stoves and reforestation along the Rio Paz to reduce flood vulnerability.

Further south, in the Rio Lempa valley, Procares have worked at community level to reduce flood risks and promote climate-resilient agriculture in a land reform and resettlement scheme on the southern side of the river established through the peace agreement in 1991. Twenty nine communities of about 1,940 families are settled on about 3 hectares per household (both demobilised soldiers and former guerrillas) growing mainly maize, sesame, vegetables and plantains with some poultry and cattle production. As in San Francisco Menendez, the major short-term climate risk is flooding relating to tropical storms and cyclones, a vulnerability that was particularly exposed by Hurricane Mitch.

The response has been to address both the infrastructure protecting the area (flood protection banks and drainage ditches) and to implement an early warning system incorporating the community governance structures (ADESCOs), SNET and Acudespal (a community-based organisation working with small-scale farmers) The link with SNET is two-way, as community radio operators pass information back on the local situation as well as receive information on rainfall, the likely speed of onset of flooding and time available for evacuation. This also incorporates information from the dam on river flow levels and links to both the municipality and the civil protection unit for practical assistance if needed. The early warning system is graded from green (situation normal) to orange to yellow to red (evacuate to storm shelter). As the flood banks alongside the river are able to withstand most situations but would be overwhelmed by a “Mitch” level event, they are checked regularly if level yellow is triggered.

Adapting to more gradually changing conditions is at a relatively earlier stage but significant change is recognised as important if small-scale farming is to remain productive. Communities highlighted the main climate risks around rainfall, temperature and wind, including more erratic onset of rains in May and an increased dry spell at the end of July that stresses crops; increased temperatures, especially in the second half of the dry season (Feb – April); and an increased occurrence of strong dry season winds (Jan – April) which have destroyed mango trees and water melon plantations.

So far the focus has been on diversifying into rice production in areas that are vulnerable to flooding, particularly after the widespread failure of maize in these areas over the last 2 years. Where maize is grown, and local leaders referred to the difficulty of changing an ingrained culture around maize production, there has been a focus on local varieties which are better able to tolerate dry spells, more resistant to disease, store well and give good yields without expensive chemical fertiliser. Rice varieties are also chosen for their ability to yield well without expensive chemical inputs. Other agricultural adaptations include short-season vegetables that can be cultivated before the onset of either major flood or extended mid-season drought episodes and planting more fruit trees (especially coconut, cashew, lemon and mango). Women's groups in particularly have been driving livelihood diversification and a network of 21 groups has now been established.

Farmers highlighted both access to technical advice on agricultural adaptation and both seasonal and long-term information on likely future climate change as priority needs to support their adaptive capacity. Although they have received no formal advice from government agricultural advisors, community members referred to specific older farmers known for their skills in experimenting with different crops as their main source of expert advice. This informal networking extended to local agricultural fairs, where farmers exchange and/or sell seed. Community leaders highlighted the importance in both climate and livelihood support of an integration of local knowledge with the best available science.

In the Matagalpa region of Nicaragua, Movimiento Comunal Nicaragüense (MCN) have focused on building 35 disaster-resilient communities and improving food security. Disaster resilience has encompassed planning, training and infrastructure development. Flood risk mapping (both community and GPS-guided) has enabled communities to develop response plans and identify priority projects to increase resilience to cyclones, including terrace construction, cyclone shelter construction, bridge renovation, sandbagging river banks, relocating risk-prone houses and planting trees in flood prone areas (river banks, eroded gullies). A key factor has been to coordinate this work with local Government, especially Education and Health Departments, to connect communities with the relevant public sector offices and ensuring that response plans are signed off by the Mayor.

Longer-term threats to livelihoods are more related to a variety of changing climate factors, including drought and more recently dry season winds. Community leaders in San Isidro have developed a community-based assessment of past climate change to inform options for adaptation, highlighting particularly severe cyclones (esp. Mitch 98, Felix 07), drought episodes (mid 70s) and recently emerging strong dry season winds (removing house roofs, eroding soil, increasing sickness and headaches) from the north-east. Impact was assessed according to the effects of the phenomenon, the resulting losses and the duration of the event.

Food security support has targeted 291 families, selected by community committees to prioritise the very poor, female-headed households, those with no other sources of support. With an emphasis on diversification, this has included provision of seeds (maize, sorghum, beans; local vegetable varieties ayote, pea, cucumbers, peppers) - selected for their local resilience with some use of community maps for cultivation recommendations (e.g. maize on flat areas, beans on slopes). Livestock (poultry, dairy cows, and pigs) are an asset particularly valued by poorer households and activities, such as provision of dairy cows, piggery and poultry units on credit.

Local crop varieties have been selected based on reduced likelihood of these being stressed by dry spells within the rainy season; less likelihood of rotting as the crop matures prior to harvest and more scope for farmers selecting resilient strains for the subsequent season. Other agricultural livelihood adaptations include tree planting, particularly on vulnerable catchment areas, together with constant education about the importance of trees (cut less, burn less); soil conservation, both dead barriers (rocks) and live barriers (soil banks planted with perennial crops/trees) and terracing; and ditches to capture water and recharge ground water.

Although there is a perception that *"local people know how to adapt better than scientific research does"*, there is an acknowledged need for communities and researchers to collaborate to combine the best of local knowledge with the best science. While the emphasis has been on cyclones and related flood risks, community analysis reveals a more complex mix of climate features that require a short and long-term response that integrates reduction of disaster risk with longer-term adaptation to drought, dry season winds and erratic rainfall patterns. In particular, in both El Salvador and Nicaragua, community leaders highlighted the need for integrated climate and agricultural advisory support that can be used to compliment local knowledge and channels to both local and national government structures and processes that can provide funding to put local adaptation plans and strategies into practice.