

Climate change, poverty and adaptation in Bolivia



Canadian Coalition on
Climate Change
& Development



In July 2009, Oxfam researchers traveled to Bolivia to take a snapshot of how poor families are experiencing climate change and adapting to it. Testimonies collected reveal a widespread perception of unpredictability of rains, warmer temperatures, and extremes of weather. The *Camellones* farming technique shows promise in saving crops from increased flooding, thus improving food security for poor families.

Photo: Mark Chilvers



Country Context

Bolivia is particularly vulnerable to the impacts of climate change for six reasons:

Poverty and inequality: 65 per cent of Bolivia's population — about 10 million people — lives in poverty (under US\$2 a day), and 40 per cent of the population lives in extreme poverty (less than US\$1 a day). Poverty is concentrated among the indigenous population.

Biodiversity: Bolivia is a very ecologically diverse country; climate change impacts vary in each ecosystem. Its 1 million sq. km area (the size of Ontario) includes Andean mountains, Chaco desert, humid and arid valleys, and Amazonian rainforest. More than 60 per cent of Bolivia is rainforest or savannah.

Deforestation: Since 1990 the rate of deforestation has increased to its current 300,000 hectares per year, mainly for soya and cattle production. Deforestation removes natural forms of protection, thus increasing the devastation caused by floods.

The *camellones* (or 'camel humps') system was last used 3,000 years ago. But communities in this jungle region of Bolivia are now reviving the system - with impressive results.

Disasters: Bolivia experiences a wide variety of 'natural' disasters. These include drought in Chaco, flooding in the Amazon and ferocious hailstorms in the highlands. In 2007 — for the first time — Bolivia was among the top ten countries most affected by disasters.¹ In 2007 and 2008 it faced the worst emergencies of the past 25 years.

Glacial Retreat: Bolivia has around 20 per cent of the world's tropical glaciers.² They are a significant source of drinking water for the cities of La Paz and El Alto. Thousands of poor Andean farmers also depend on glacial melt for a portion of their water supply.

Loss of opportunity: The current government of President Evo Morales is pursuing policies aimed at reducing poverty, improving participation by the indigenous majority and enhancing the status of women. Gains on these fronts are threatened by climate change.

¹ Sven Harmeling, Global Climate Risk Index 2009, Germanwatch, December 2008, <http://www.germanwatch.org/klima/cr/2009>. Bolivia entered the list in sixth position.

² James Painter, Deglaciation in the Andean Region, UNDP occasional paper 2007, http://hdr.undp.org/en/reports/global/hdr2007-2008/papers/Painter_James.pdf

The Problem

Poor men and women bear the brunt of climate change. Vast areas of Bolivia are now vulnerable to flooding and drought, placing many Bolivians at risk³. More frequent and more extreme weather events are likely to strike in rural areas, where remoteness often adds to vulnerability.

The frequency and magnitude of damage from weather events has increased in recent years.

- The period from 2001 to 2004 saw the highest number of emergencies declared in the last 70 years.
- In the period from 1997-2007, flooding was the most common extreme weather event, followed by landslides, epidemics and droughts. Around 420,000 Bolivians were affected by flooding over this ten-year period.⁴
- The three years of 2006-2008 have been even worse, with regular flooding, rivers overflowing, land slides, hail and frost. The numbers of women and men affected were very large: 560,000 in 2006/7 and 618,000 in 2007/8, the equivalent of approximately 6per cent of the country's population.
- In 2006/7, the total cost (direct and indirect) was estimated at US\$443 million, and in 2007/8 at US\$547 million⁵ — the equivalent of 3 to 4per cent of Bolivia's annual GDP, a huge sum of money for a poor country.

Cows are isolated by flood waters in a small islet in the Amazon area of Beni, Northeast Bolivia in February 2008. Due to heavy rains and flooding as a result of the climatic phenomenon La Nina, over one-third of the 2.8 million cattle in the region are in danger. Around 40 people have died and 30,000 have been forced from their homes.

The Project

Terrible flooding in Beni between November 2007 and April 2008 motivated women from locations around Trinidad to enlist in a project known as the camellones ('raised fields'), run by the Kenneth Lee Foundation (KLF) and financed by Oxfam.

Camellones is a farming technique that utilizes a technology similar to that developed by pre-Columbian civilizations centuries ago in Beni. The current camellones draw on modern scientific understanding of agro-hydrology. The ancient camellones were hand built; new ones are constructed with tractors and earth-moving equipment.

Agricultural production in Beni is severely constrained by the annual cycle of floods and droughts. The land has long been considered suitable for slash-and-burn agriculture even though the poor quality soil is often exhausted after 2 to 3 years. In contrast, the complex system of water management used in the camellones can provide more nutrients to the soil, supporting more sustainable agriculture.

The project seeks to help poor families survive extreme weather events, now and in the future. Women interviewed in July 2009 were unanimous in saying the camellones offered the possibility of avoiding a repetition of the crop loss caused by the 2007/08 flooding, thereby achieving greater food security in the future, particularly for their children.



Photo: EPA/STR

3 Risk to a person or community is usually defined as a combination of an external threat (disasters) and vulnerability (the likelihood of being affected). If you live in a solid house, then you are less likely to be affected by an external threat. You can live in precarious conditions but are not at risk if your area is not normally subject to extreme weather. In Bolivia, a high percentage of the population is at risk: vulnerability is high and external threats are likely.

4 Oxfam International, Contingency Plan, La Paz, January 2009.

5 CEPAL, Evaluación del impacto acumulado y adicional ocasionado por la Niña, Bolivia 2008, p.4.



In highland regions of Bolivia, a different sort of adaptation will be needed. Mount Illimani looms over Rogelio Churqui Quispe (foreground) and Severino Cortez from Khapi, a small village in the mountain's shadow. Villagers fear that the mountain's glacier is melting so rapidly that in decades to come they will have no water for their farms.

On the Ground

The first modern camellones were built in 2007. Each was an earth platform, measuring about 500 m² and varying between 50 cm and two metres in height, depending on the predicted height of the local flooding and the area's capacity for water run-off. As they are above the flood levels, these raised structures protect seeds and crops from being washed away. The ditches that surround each camellon become canals and can be a source of irrigation and nutrients during the dry season.

As of July 2009, 64 camellones had been completed in five communities near the town of Trinidad in Beni. Of the 400 families that benefited from the project, 280 were strongly committed and 45 were chosen as "champions." Plans are to expand the number of beneficiaries to 1,000 families.

Oxfam's survey found different approaches to working the raised farm beds. In Copacabana, the whole community of 34 families runs six camellones collectively. In Loma Suárez, 30 families each run an individual camellon. In Puerto Almacén, five families each have a camellon but the women and their children all help each other.

Women are the main participants in the camellones and usually play leadership roles. This is partly because men often have to work outside their communities, as fishermen, river sand collectors (areneros), wood collectors or day workers on cattle ranches. The women's commitment reflects their role as the primary food providers for the family.

The observed advantages of the camellones project are many:

- The camellones offer a sustainable solution to flooding and drought by managing the flood waters and preserving water for times of drought. They are a good insurance against the unpredictability of future rains.
- The system can improve food security and diet as a result of better and more frequent yields. In some cases, the camellones are producing up to three crops a year. The KLF says yields from cassava and maize are among the highest produced naturally anywhere in the world. The canals can also be used for fish farming to improve diet.
- The system uses natural fertilizers: an aquatic plant in the canals called tarope, which both purifies the water and acts as a fertilizer when spread over the soil. The canals can also provide fish stock, animal fodder and nutrients for the soil.
- The camellones provide a natural seed bank, which can survive flooding. This is crucial to farmers who have to plant within as few as 15 days of floodwaters receding to take timely advantage of the natural fertility of the soil. It also means farmers don't have to buy more seeds to replant if the crop is flooded out.
- The camellones system, with its better soil quality, reduces the need to cut down surrounding forests. By contrast, individual plots using the traditional slash-and-burn method see the soil exhausted after two to three years of growing maize and rice (though cassava can be grown much longer).

In the case of Copacabana area, the camellones became a community exercise that helped bring the community together after the shattering 2008 flood experience.

The camellones built in 2007 survived the 2008 flooding reasonably well. In 2009, there was little serious flooding so the system was not severely tested. Engineers working with the project know the real challenges to the system will come when more severe flooding and/or a severe drought takes place.

Impacts/Results

These are the main findings of the Oxfam report on climate change in Bolivia:

- Poor women and men and indigenous peoples throughout Bolivia are already experiencing the consequences of climate change. The perception of many villagers and local farmers is that the climate is already changing in terms of the unpredictability of the rainfall, more extreme weather events and higher temperatures, with negative impacts for their livelihoods, including loss of agricultural production, reduced food availability and/or higher food prices.
- In recent years the frequency and magnitude of damage from extreme weather events has increased. Women are often the hardest hit, as they are often the ones responsible for small farms and families, and have fewer alternative livelihoods when crops are lost.
- Women are leading the way in experimenting with ways of adapting to the changes in the climate. The camellones project offers a promising example of poor women using ancient technologies to find a way of improving food security, adapting to flooding and reducing deforestation. However, in most cases local people are ill-equipped to adapt to the present and future impacts of climate change.

Oscar Saavedra, director of the Kenneth Lee Foundation, says that in the camellones project, there is “a harmonious relationship between the soil and the climate, (which) creates more of a balance between the rainy and dry seasons. The logic of managing the water is different. We cultivate the water.”

Or as one of the villagers of Copacabana described it, “flooding is no longer a curse, but a blessing.” Low-income women and men are becoming masters of turning the excess water to their advantage.

BOLIVIA PAYS A HIGH PRICE

Oxfam is particularly concerned about poor communities and families in Bolivia having to pay a high price for a situation for which they have virtually no historical responsibility.

According to widely trusted figures from CAIT (Climate Analysis Indicators Tool), in 2004 Bolivia was responsible for just 0.04 per cent of world emissions of greenhouse gases (GHGs), one of the lowest percentages in the world.⁶ Even when emissions from changes in land use (mainly deforestation) are included, in 2000 Bolivia was responsible for 0.35 per cent of world GHG emissions, compared to 16 per cent for the United States and 12 per cent for the European Union.⁷

Photo: Mark Chilvers



Arminia Guaje, president of the camellones farmers, with her parrot on her shoulder. “The camellones are definitely an improvement,” she says. “We are working more closely together. And it’s better because in the chaco we always lost crops because of the flooding. Now we will always have yucca and corn. We will always have these things. We will always have enough to eat.”

6 <http://cait.wri.org/cait.php?page=yearly>. Bolivia came 90th in the world measured by absolute volume of emissions, 115th by per capita emissions. By the same criterion, in that year USA was first followed by China, the EU, Russia, Japan and India. China has since overtaken USA. Measured by per capita emissions the order was Qatar, Kuwait and the UAE.

7 CAIT, *ibid*. Expressed as per capita emissions, in 2000 Bolivia was responsible for 16.9 tonnes of CO₂ per capita, putting it in 21st position in the world and the highest in Latin America.