

The flooding that devastated the Amazonian department of Beni in 2008 was the worst in at least fifty years, affecting 118,000 people and around three quarters of the total surface area of Beni. In the previous two years there had also been widespread damage from flooding. One local resident of the capital, Trinidad, summed it up when they said, “2006 was a bad year; 2007 was really bad; but 2008 was extraordinarily bad.” The extreme nature of the 2008 flooding is linked to the La Niña weather cycle, which in Bolivia can cause intense rainfall in the east of the country. Whilst the way that climate change will affect El Niño/La Niña in the coming years is poorly understood, there is at least some evidence that it might become more frequent and intense.

Agricultural production in Beni is severely constrained by both the annual cycle of floods and droughts, and poor soil conditions. Slash-and-burn agriculture predominates, whereby the land is productive for 2-3 years before new areas of rainforest are cleared. During the rainy-season large expanses of land are submerged for several months, when water recedes into the tributaries that run into the Amazon, it takes nutrients with it, leaving sandy brown soil where it is difficult to grow crops.

Three thousand years ago pre-Columbian ‘hydraulic cultures’ developed across large areas of northern and central South America. They developed a complex system of water and earth engineering to support agriculture in the context of seasonal droughts and floods. Throughout Beni they built around 20,000 man-made *lomas* (artificial hills), some of which reached a height of 20 metres around a base of 30 hectares. In addition, they constructed 5,000 kilometres of dykes and one million hectares of *camellones* (raised fields).

### The Project

The Kenneth Lee Foundation, supported by Oxfam, is working with communities in Trinidad to build modern *camellones*, based on this ancient system and drawing on modern scientific understanding of agro-hydrology. The system is very sophisticated, producing fertile soil, fish stock, animal fodder, localised drainage and water management, nutrient production and organic recycling. The initial project design supports adaptation to existing levels of climate variability and flooding and it is hoped that through the integration of available climate information, this project can be used as a system for adapting to longer term changes.

### Activities

Five communities are involved in the *camellones* project; in Copacabana the whole village of 34 families collectively run six *camellones*. In Loma Suárez the community of 30 families have opted to run them at the household-level individually, and in Puerto Almacén, five families each have a *camellon*, but the women and children work together on them all. Women are the main participants in the project, and usually have the leadership roles, reflecting their responsibility for providing food for the family.

Each *camellon* measures approximately 500 square metres, and can vary in height from between 50 centimetres to two metres depending on the flood risk in a particular area, and the capacity for water run-off.



### Climate change in Bolivia

- Temperature increases.
- Changes in rainfall patterns (frequency and intensity).
- Reduced agricultural production.
- Glacial melt, more quickly than predicted.
- Impacts on water availability and electricity generation.
- Malaria moving into new areas.

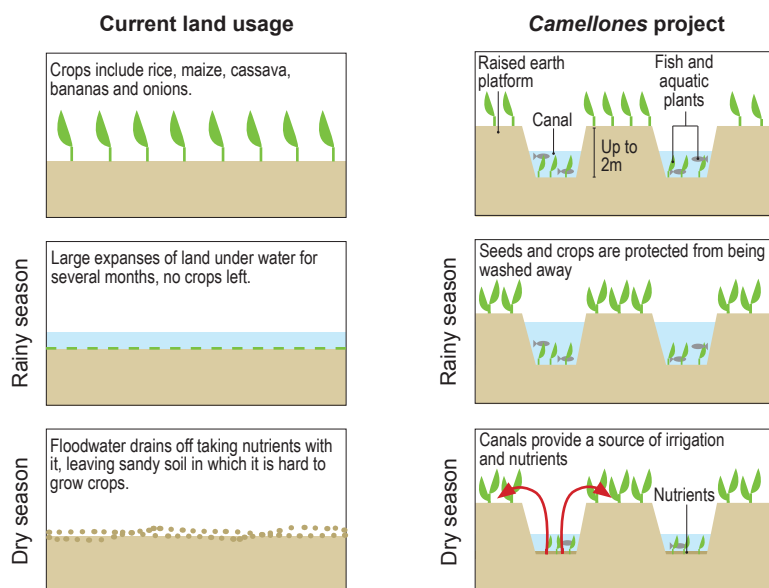
### Objectives

- Support women’s leadership in food production for nutritional diversification and income generation.
- Construct *camellones* for agriculture production and water-management.
- Develop knowledge of *camellones* and their role in climate change adaptation.
- Reduce vulnerability to floods and strengthen post-flood recovery.

*“In the old system we lost a lot of plants and seeds when the flood came. Then we had to wait for the water to go down before we could start replanting... but in this system the land, where the plants are growing, doesn’t get covered with water when the flood comes. So we can still harvest and then we can immediately sow seeds again...”*

Yenny Noza, Local Farmer

This protects the seeds and crops from being washed away as they are above the level of the flooding. Surrounding the raised beds are water channels where a combination of plants and fish produce a fertile environment. Tarope is grown as it both purifies the water and acts as a fertiliser when spread over the soil. The fast-growing, indigenous plants can also be used for animal fodder. Because water surrounds the *camellones*, irrigation is very easy, and once the system is established there is less need for watering.



## Outcomes

### 1. Reduced impacts and harnessed opportunities of floods

The *camellones* offer a sustainable solution to flooding and drought by managing the floodwaters and preserving them for times of drought. Instead of being victims of flooding, low-income women and men are able to turn the excess water to their advantage. The *camellones* withstood even the extreme floods of 2008, and women are able to produce a variety of crops for consumption and income generation. The *camellones* also act as a natural seed bank, ensuring farmers have their own seeds to plant within 15 days of floodwaters receding, enabling them to take advantage of the natural fertility of the soil and avoiding additional costs of replacing lost seeds.

### 2. Improved household nutrition

Soil is more fertile, and in some cases the *camellones* are already producing three harvests a year. Women are successfully producing tomatoes, cucumbers and lettuces on the *camellones*, and fish bred in the channels provide an additional source of protein.

### 3. Income generation

In addition to household consumption, produce can be sold on the local market (currently 80% of tomatoes, cucumbers and lettuces are imported from outside Beni).

### 4. Protection of local rainforest

The need for slash-and-burn agriculture is reduced, thus reducing practices that exacerbate local flooding, soil nutrient loss and climate change.

*"This system not only offers an alternative to cutting down the rainforest but it creates a balance between the dry and wet seasons, enabling people to live with the process of nature rather than challenging it."*

Oscar Saavedra, Kenneth Lee Institute

## Lessons Learned

- Indigenous and modern scientific knowledge can work together to produce effective solutions.
- Natural resource management can support soil fertility and increase yield and reliability of harvests.

## What Next?

- Oxfam hopes to extend the project to 1,000 families (currently 400).
- Oxfam and Kenneth Lee are advocating for this pilot to be replicated with the support of the local government.
- Though successful under current climate variability, further investigation is needed to understand the sustainability of *camellones* in a changing climate.

*"This project shows that solutions often lie within indigenous culture and knowledge. Oxfam has only recognised that the answer was there and we had the sensibility and audacity to "innovate" with a technique perhaps 3,000 years old."*

Simon Ticehurst,  
Oxfam Bolivia Programme Manager

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