

Riverbank rehabilitation to minimize the risk of landslides and flash floods in East Central Nepal



Canadian Coalition on
Climate Change
& Development



In East Central Nepal, local NGO Parivartan Nepal, local farmers and USC have been rehabilitating riverbanks to reduce risks associated with landslides and flash floods. A combination of steep terrain and increasingly variable rainfall make this region prone to these events, which cause destruction of crops, damage to infrastructure and displacement of families. Through a process of community mobilization, a range of sustainable land management actions have been put in place, resulting in stabilized riverbanks as well as improvements in soil fertility, biodiversity and watershed management.



Photo: Kate Green, USC Canada

Janika Kumari from the Dudoli Riverbank Conservation Committee

Country Context

High intensity rainfall is a microclimatic feature of East Central Nepal, and has important implications for the Nepali agro-ecosystem. Heavy rains, combined with a steeply sloped landscape and changing land use practices, lead to soil erosion and land degradation along the Kamala River, which winds through the communities of the Siwalik mountain range. Due to the steep and unstable slopes of the Siwalik range,

the region is also prone to recurrent landslides and flash floods. These events can be devastating, destroying crops, causing damage to infrastructure and displacing families. With climate change, Parivartan Nepal reports that the region is exposed to heavier and more volatile rains, exacerbating existing challenges and bringing about new ones.

The Problem

During monsoon season, the rivers of the Siwalik range swell to kilometre-wide torrents, scouring away soil and leaving boulders where farmers' fields once grew crops. Every year precious land and soil nutrients are washed away, threatening farm families' livelihoods and food security. The denuded riverbanks are drained of nutrients, dominated by sand and gravel deposition and are virtually bare of vegetation—desert-like bands of unproductive land even in times of adequate rainfall.

In East Central Nepal, a few varieties of introduced hybrid maize, wheat and rice dominate the agricultural landscape. As farmers purchase the package of seeds, chemical fertilizers and pesticides for these input-responsive crops, a high level of debt is common. In addition, these crops have a narrow genetic base and are therefore vulnerable to a host of biophysical stresses, including disease, pests and drought and dry spells. They have limited resilience to drought and climate variability. With high debt loads and reliance on climate-sensitive crop varieties, combined with limited options to diversify their livelihoods to include more resilient crops or off-farm activities, these farmers are highly vulnerable to the impacts of climate change. Women have been found to be particularly vulnerable to climate impacts, as they tend to have less access to agricultural resources. Women-headed households are increasingly common with men migrating to work outside the country, leaving women to run the household and the farm, with less adult labour available.

Animal husbandry (goats, cattle and Asian buffalo) is a key element of the farming system and represents an important livelihood diversification strategy for the region. However, animal grazing along the riverbanks has increased erosion and land degradation. Free grazing



Rugged hillsides along the river bank

along the riverbanks is known to increase channel width, decrease water depth, and reduce riverbank stability. Vegetative cover, biomass, productivity, and native plant diversity have declined along the riverbanks under constant heavy grazing. Further, livestock are an important asset that is lost in the event of a flood or landslide.

There is a critical need to stabilize the riverbanks, rehabilitate the land's productive capacity and develop more sustainable farming systems. This is crucial to local food and livelihood security, particularly in the context of increasingly erratic rainfall due to climate change.

Photo: Kate Green, USC Canada

Carefully collecting grasses for animal fodder from a riverbank under protection for one year.



Photo: Kate Green, USC Canada

The Project

Parivartan has successfully mobilized local women and men farmers to enact a host of land management practices to rehabilitate riverbanks. These activities are designed to reduce the risk of floods and landslides, while also addressing issues of watershed management, soil fertility and biodiversity.

The project has five components:

Riverbank Stabilization: Riverbank stabilization reduces the vulnerability of agricultural lands and settlements to water erosion, floods, and landslides. Stable riverbanks add land to the production system by creating more ecological niches to increase diversity of plant genetic resources of both wild and domesticated species. The project uses a combination of physical measures and plantation of fodder, forage and fruit trees to stabilize the riverbanks.

Livestock stall-feeding support and training: Overgrazing and open grazing is a contributing factor to the instability of the riverbanks, as surface cover is key to erosion control on riverbanks. In Sindhuli district, Parivartan piloted training in small home-based animal stall construction and techniques for improved animal health via stall-feeding. These strategies reduce open and overgrazing, and lead to improved animal health, resulting in healthier animals. The reduction in open grazing enables the riverbanks to fill in with grasses.

Community Forestry: Parivartan is engaged in establishing and improving the management systems of existing community forests in various locations within Sindhuli,

Makwanpur and Sarlahi districts. Sustainably managed community forests improve and maintain ecological services, for example, by reducing risks of water and soil erosion and irreversible land degradation processes and by maintaining the quality of nutrient and water resources. Community forests are now major sources of forage for stall-fed livestock, fuel and construction materials.

Sustainable Use of Agricultural Biodiversity: Despite the dominance of commercial agriculture in the region, Parivartan has been supporting pockets of vibrant biodiversity-based farming systems which showcase a diversity of finger millet, oil, fruit, root and vegetable crops grown in symbiotic relationships with the farming communities, their culture, knowledge and practices and with the agricultural resources in situ. Agricultural biodiversity linked to land rehabilitation is enhancing people's capacity to adapt as local and regional climates change and variability in rainfall increases. By growing a wider range of crops and engaging in complementary activities such as wild harvesting, farming households have more options available to them to manage changing climate conditions.

Community Mobilization and Empowerment: The core of Parivartan's work is with farmers, working with their knowledge base to conserve and enhance livelihoods. Community Agriculture Leaders are involved in all levels of planning for training and exchange programs on riverbank rehabilitation and sustainable agriculture practices.

Gender Issues & Women's Participation: Women from riverbank communities are among the most vulnerable at times of flash flooding and carry the burden of rebuilding homes and rehabilitating agricultural lands. The prospect of less flooding is a strong motivator, partially explaining the high female participation rates. Women of all ages organize, implement, manage and learn from the riverbank rehabilitation processes. Each committee that organizes the seeding, planting, construction of bamboo-rock baskets is comprised of between 30-50% women.



Photo: Kate Green, USC Canada

Kids at the new area of Phapherbari, Mwankapur.

Results/Impacts

Since 2001, Parivartan has protected and conserved close to 3000 hectares of vulnerable riverbank land from soil and water erosion. This has had a direct impact on 42 communities, composed of 170 small villages, benefiting over 4000 people directly, and over 70,000 indirectly. White, barren riverbanks have been transformed into lush green fields and biodiverse forests, while vegetative cover on the Kamala riverbanks increased by 20% over nine years.

The area has improved habitats for wild animals and birds, contributing to overall biodiversity. Twenty-one species of plants and 31 types of wildlife are regularly recorded within the well cared for community forests. Native grasses are flourishing, re-established from almost no presence on the riverbanks prior to the land rehabilitation programs began. These grasses are also used for roof thatching and are of cultural significance for rituals and local festivals.

Communities with riverbanks in the process of rehabilitation have experienced a reduction in negative impacts from extreme rainfall events. The riverbank sides are stronger and can withstand even heavy rains. After 3-5 years, the rehabilitated riverbanks show virtually no erosion during regular and extreme rains, and the risk of flash flooding has been reduced. Previously, communities posted watch guards on rainy nights to monitor flood risks and raise the alarm so that people could move to higher ground. This is no longer necessary in the communities with rehabilitated riverbanks. In addition, communities report an increase in fodder supply, better productivity of livestock and improved production on agricultural lands close to the riverbanks.

Parivartan's impact has extended beyond the communities with whom they work. Neighbouring communities have seen the immediate and medium-term impact of the riverbank work, and have begun to take initial steps: reducing open grazing, introducing bio-diverse grass seeding, and fostering shrubs and saplings. The techniques are recognized as economical, sustainable and environmentally positive as fertile lands and vibrant communities are secure in their riverbank sites.

Case study written by by Kate Green, Program Manager Nepal and Public Outreach, USC

LESSONS LEARNED

The process of community mobilization has been key to the success of the riverbank rehabilitation work. Cooperatives, farmers organizations and service clubs are all part of mobilizing the community and involving the wealthy and the poorest households in the success of the early years of this work. Establishment of rules on how rehabilitated land can be used is complex and can take many months to negotiate; however, this is a critical element for the sustainability of the work.

In the physical rehabilitation work, only locally available materials are used, including grass seed, shrubs, seedlings, stone and bamboo. Rather than using cement, re-bar or other engineered structures that will not withstand the power of the rivers, the project aims to restore the natural state of the riverbanks, for the stability and strength of the whole ecosystem. These efforts have reduced the negative impact of heavy rainfall events on communities, protecting homes and agricultural lands from erosion, floods and landslides. Combining these physical protection measures with diverse and sustainable agricultural practices has improved the livelihoods of women and men farmers while also increasing social cohesion within the communities.



Stall feeding example, Sindhuli District, Nepal

Photo: Kate Green, USC Canada

PROJECT PARTNERS

Parivartan Nepal (www.parivartannepal.org) is an NGO committed to work with farmers and their knowledge base to conserve and enhance livelihoods, with a particular focus on riverbank land rehabilitation through agro-biodiversity practices.

USC Canada (www.usc-canada.org) promotes vibrant family farms, strong rural communities, and healthy ecosystems around the world through support for programs, training and appropriate policies.