

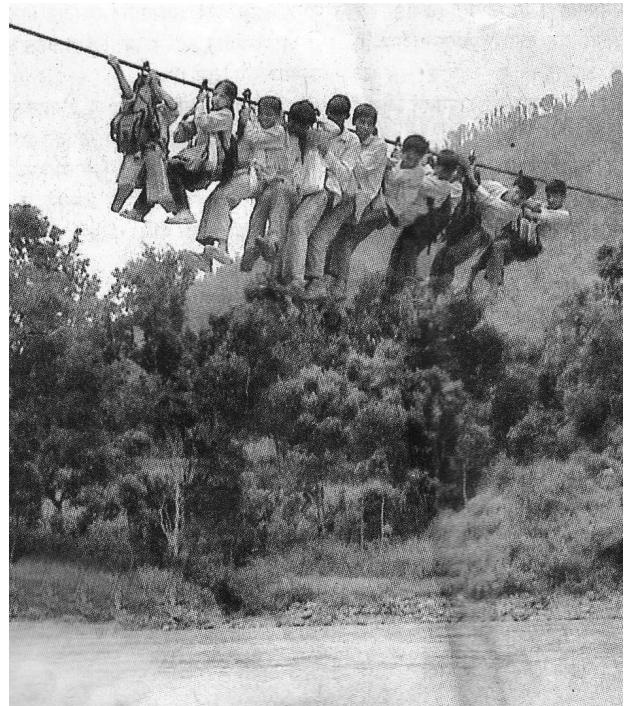
# Gravity Ropeway and Tuin Technology: An Alternative Transportation

Due to the topography of Nepal, most of the time construction of bridges is hardly possible and life is difficult for people living in the remote hills/mountainous areas. Transportation of crops/goods to market and crossing of river without bridge can be exhausting and dangerous. It is generally women and children who carry these heavy loads on their backs, down treacherous, winding dirt tracks. When it rains, or there's a landslide, it's completely impossible to take goods to market. But an alternative means of transportation like **gravity ropeway** and the river crossing **Tuin technology** can provide a sustainable solution to the excluded and isolated people of rural and mountainous regions.

Practical Action Nepal Office, an INGO, promotes alternative transportation in Nepal such as gravity goods ropeway and Tuins since 2001. Since 2008, Practical Action has installed 22 ropeways in Achham, Gorkha, Kalikot, and Tanahu district of Nepal benefiting about 4,689 households. Practical Action's rural transportation work in Nepal is funded by the European Union, Jose Entrecanales Ibarra Foundation-Spain, Rotary Club of St. Helen, and the UK trust funds.

## Gravity Goods Ropeway

Gravity ropeway works solely on gravitational force without using electricity and other external power. Gravitational ropeways are simple and inexpensive to operate as well as environmentally friendly. Gravity goods rope-



Traditional Tuin



Improved Tuin (Practical Action Nepal)



Gravity ropeway (Practical Action Nepal)

way helps to increase the rural productivity. It works two ways - sending produce down from the top by gravity and in the same time a smaller load (one third) is taken up from below to top by the force of goods coming down. It is suitable only for transportation of goods but not for humans.

Two linked trolleys, on pulleys, run on separate 10mm diameter steel wires which are suspended from towers, when the full trolley comes down, pulled by the weight

of its load; it pulls the empty one up and ready for the next load. The trolleys' progress is controlled by another, 8mm wire, looped over a flywheel. A wooden drum brake, with bearing and bracket, governs their speed. The total cost of one ropeway installation is NPR 1,700,000 (US \$24,286). Once installed it does not require any operation costs besides minor regular maintenance. A working committee is formed to maintain and operate the ropeway continuously. It charges a service fee of NPR 2 per kg of vegetables. The committee uses the funds raised through transporting produce to pay the salary of operators, to maintain the ropeway and administrative management.

### **Traditional Tuin**

Due to the lack of proper or alternative means of transportation people either have to swim or use grass rope with wooden pulley or simple boats to cross the rivers. Tuins (Wire bridges) are an indigenous technology and one of the most common structures for river crossing in rural Nepal. It has a single wire rope, pulley and a simple wooden trolley. To cross rivers using such Tuins is dangerous and sometimes life threatening. On June 27, 2011, a Timber Post of Tuin constructed over Trisuli river in Gorkha district broke away and five people lost their lives in the Trisuli river. This type of news is normally seen in the media. Further 2 people lost their life when a Tuin broke away in Rolwaling streams of Dolkha district on last week of July.

### **Improved Tuin**

Practical Action in Nepal developed improvement in the traditional Tuin system to make it easy and safer. Several people have lost their fingers while operating such traditional Tuins and there is always a danger of falling off the trolley while crossing.

Practical Action further developed a new pulley system that makes the pulling of the trolley easier and eliminates the risk of trapping fingers in the mechanism. The pulley and bearing system also reduces friction and lessens the effort required to cross the river. The efficiency has been doubled.

The improved Tuin was developed and tested in Mahestar village about 60 km west of Kathmandu. Based on the experiences at Mahestar, the design was further developed into a double-cable design. The total cost

of one improved Tuin installation is NPR 1,000,000 (US \$14,285) including human resource cost and NPR 700,000 to 800,000 (US \$10,000 to 11,428) without human resource. Although it costs more, improved Tuin provides improved balance and can carry heavy loads at the same time. Double-cable prototypes were then built in the villages of Kalleri, Pimaltar and Balkhu and Hiklung in Dhading and Gorkha districts respectively until 2007.

### **Learning from experience**

The enhanced Tuin is still not feasible for more than 100 meters span as it requires more strength to pull the Tuin from either side of the river banks. Practical Actions' technicians have now improved the design by adding sag control cable and hauling cable to the pulley system. This addition of the sag control cable has made the labor of pulling the Tuin easier from both sides of the river bank even if the Tuin is longer than 100 meters. During the year 2007/2008 Practical Action Nepal with financial assistance from European Union has completed five such Tuins in Fisling and Bhuwanitar in Gorkha, Solung in Tanahaun, Khulalu in Kalikot and Saranigad in Achham districts.

There are many isolated villages in rural Nepal where other conventional type of suspension or motor bridge construction is a distant dream for the local communities. Even though there are villages that have national highway on the other side of the river bank local people have to walk endless hours to get to the nearest bridge to cross the river. To provide access to such isolated and excluded villages, a 100 meter long Tuin can be constructed with a total cost of NRs 750,000 (about US \$11,000). Among that total cost, external support equivalent to NRs. 600,000 (about US \$8,800) is required for wire ropes, steel parts, cement, rods and skilled labor where as an amount equivalent to NRs.150,000 (about US \$2,200) for local materials and labor is being contributed from concerned beneficiaries.

Gravity ropeway and improved Tuin systems are appropriate technology for transportation and highly suitable for the rural and mountainous regions of Nepal.

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