



Upright stones in 'devil's tie': local innovation for riverside terracing.

Photo: Ann Waters-Bayer

Devil's tie bedevils water: an Irob innovation

Asfaha Zigta and Ann Waters-Bayer

Irobland lies on the steep mountainous escarpment that descends from the plateau of Eastern Tigray (2500 m) to the Danakil depression (-100 m). In Yohannes' home near Alitena, annual rainfall is 300-400 mm, from mid-June to mid-August. The area is rich in rock. Alitena is situated beside a river that flows year-round and carries soil-laden water from the plateau. In the 1960s, Yohannes started building a stone wall in one of the curves in the river parallel to the riverbank, to divert water and soil into the space behind the wall. He saw this as a way of creating and irrigating land. In this 800 m² river plot he grew fruit trees (mainly orange), vegetables (mainly cabbage) and maize.

When Yohannes first tried to claim land from the river, he made a wall like the wall of a house and used large flat stones piled on top of each other (see illustration). But when the river flooded, the water lifted the stones and washed them away. He tried again, and the same thing happened. Then he thought if the water lifts the stones, I can try to set the stones upright before the water meets them. He chose a rocky outcrop in the steep wall of the riverbank as a starting point for building an upright line of heavy flat stones, one standing against the next with larger and smaller stones alternating with each other. He wedged more upright stones in a second storey above the first line, until a small wall was built. He did this as an experiment, to see what the floodwater would do with the wall. He observed that the water roared over the top

of the stones but did not dislodge them; Yohannes had outwitted the river by using the force of its own water to push one stone against the other and, in effect, tie them together through pressure. This type of riverside wall became known locally as *seytan madewa* (devil's tie), named after the complicated tie, very difficult to open, that closes the goatskin bag that contains the precious gifts intended for an Irob bride.

Yohannes' field protected by the devil's tie was close to a major long-distance footpath. Over the years, many farmers passed by and saw what he had done. If Yohannes was in the field when they stopped, they sometimes asked him to explain what he had done. The principles were immediately obvious to most farmers, who were accustomed to working with stone to manage soil and water.

In the 1970s, a church-based project deliberately built on the techniques and innovations of the Irob. Yohannes was given the responsibility of supervising community work in building footpaths, wells and check dams around Alitena. When building a large check dam he noticed that floodwater poured over the top and undercut the dam. He suggested using a devil's tie to prevent this. At the point where the water hit the soil below the dam, large flat stones were pounded in upright, slanting towards the top of the dam. The stones broke the force of the descending water and dispersed it, so that some remained in the field while the rest flowed over the next dam down the valley.

Whenever Yohannes supervised teams of community members working on check-dams, he advised them to build the devil's

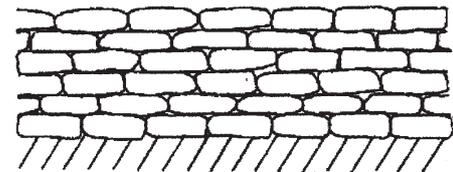
tie wherever appropriate. Many started using the same technology for their own smaller check dams on the terraced fields near their homes. People in nearby villages also observed this technology and use of the devil's tie not only in riverside walls but also below dams spread throughout Irobland.

The devil's tie is an example of indigenous engineering that could stimulate similar innovations in other parts of Ethiopia. In less mountainous areas, it may be difficult to find a rocky outcrop to support the downstream end of the wall of upright stones and other means, such as a cement block, may have to be used. If creative farmers trying to claim land from rivers in other areas met with Irob experts in building the devil's tie, ideas for appropriate adaptation would doubtless emerge. Development agents could help by bringing such farmers together. Also formally-educated engineers could benefit from studying the technical aspects of this ingenious innovation.

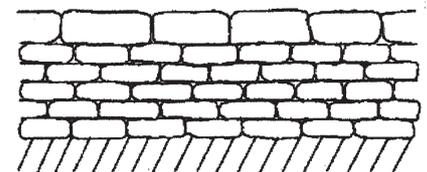
Tragically, two years of war has destroyed much of what Yohannes and his fellow farmers painstakingly built up over decades. After the land mines have been cleared, the Irob will have to summon all their creativity and strength to pick up the pieces and reconstruct.

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1960s: silts traps like house walls



early 1970s: heavy topstones for silt traps



early 1970s: 'devil's tie' for riverside terraces

