By Neale MacMillan

Although they were not always so, the Andean foothills surrounding Lima are today a terrain practically empty of trees or other plants. Between May and November a little rain turns the tops of the hills green. Average annual rainfall here - as along the entire Peruvian coast - is a meagre 1-2cm.

"A hundred years ago, these hills and valleys would have been covered by forests," says Barbara León, sweeping her arm across a bare - save for a few hardy cacti - landscape in the rural community of Collanac, about 30 km southeast of Lima. León, an industrial engineer, is executive director of TECNIDES, a Peruvian NGO. She attributes the loss of the original forests to years of overgrazing by livestock and excessive harvests of wood for household use or to fuel steam locomotives.

In order to encourage residents of Collanac to reintroduce trees and plants to this area, León is leading an IDRC-supported project that is testing a novel irrigation system for peri-urban agriculture. About 2,000 people live in Collanac, a community without electricity, water or sewage services. The average monthly income of $US190 per family is less than half the official poverty level for a family in Lima. With a view to improving family incomes and restoring vegetation, the project is promoting cultivation of two valuable plants: the prickly pear cactus or tuna (Opuntia ficus indica) and the tara tree (Caesalpinea tinctoria). The prickly pear is the host for the cochineal insect, from which carmine - a valuable natural colorant used in the food and textile industry - can be extracted. In addition, fruit from the prickly pear fetches between 50 cents to a dollar per kilo, depending on the season. As for the tara tree, it is excellent for reforestation in arid lands owing to its low demands in water and soil quality.

Moreover, its fruit can be powdered to produce a natural tannin for leather tanning or exported to developed countries as a raw material for the production of gallic acid, a high-value commodity used in the leather, cosmetic and pharmaceutical industries.

Trapping moisture from clouds

An important obstacle to cultivation of tara and prickly pear along the Peruvian coast has been extremely low rainfall. But plenty of water regularly passes by overhead in moisture-laden fog heading from the Pacific Ocean into the Andes. The vanished coastal forests used to trap some of this moisture naturally.

The Collanac project (92-0035) reproduces this water-trapping process artificially using a technology applied in an earlier IDRC project (86-1026) on the Chilean coast. The technology, known as fog collectors, consists of large panels (about 12 m by 4 m) of fine mesh positioned along hilltops. Some of the incoming fog condenses on the mesh, drips into plastic troughs and flows to storage tanks at the foot of the hill. "In principle, each collector should provide enough water to cultivate one hectare," says Barbara León.

The fog collectors at Collanac were built using low-cost materials available locally such as bamboo posts treated with a tar preservative, notes Javier Blosier, an agricultural engineer with TECNIDES. Five
Collectors have been installed (at an altitude of 500 metres), with 15 more collectors partially constructed or planned.

The Collanac community has worked alongside TECNIDES to manage the project and in the construction, maintenance and use of the water from the collectors. "We have a committee that decides how to share the water we capture, depending on things like who is planning on planting," says Cesar Palacios, the president of La Meseta sector.

Norma Verastegui, a social worker with TECNIDES, has been encouraging different forms of community participation in the project. There are some 57 families in the La Meseta sector, migrants from every corner of Peru in flight from economic hardship and the violence sparked by the Shining Path during the past decade. "Their customs are quite different depending on where they are from, which can pose problems when it comes to working together," says Norma Verastegui.

Nonetheless, this diverse community has succeeded in forming womens' and youth clubs. The womens' club is planning to build a community kitchen because it is more economical for them to prepare meals together. They have also begun growing vegetables. It is primarily the women, children and elders who shoulder all the work of gardening and raising livestock. The men leave the community every day to look for work in Lima.

Some families have created productive oases in the dry soil, growing a variety of trees including tara, lúcuma and Schinus molle, cultivating fruits and vegetables, and raising chickens and guinea pigs. A portion of the water for the family and community gardens comes from the fog collectors already installed. Until the other collectors are in service, the rest of the water must be purchased from tanker trucks at a cost of about $US3 per cubic metre.

Making every drop count

Minimizing the amount of water needed for cultivation is the purpose of the second major technology being applied in the project: pottery dispensers that allow just enough water to seep through their porous walls to satisfy the needs of each plant. This technology finds its antecedent in ceramic pots used by the Incas in Peru's arid hills. The modern pottery dispensers are about 6 inches deep, with spouts at each end that allow them to be linked by hose beneath the growing plants. Dispensers of varying rates of seepage - to match the water needs of different plants - have been designed for TECNIDES by Ernesto Huayta, an engineer specializing in ceramics. They save enormous amounts of water. Based on tests with all the different types of trees involved in the project, "the average amount using this system is 4 litres per month per tree," says Huayta. "This is very little water."

Collanac resident Apolinario Crispín says he uses 60 litres of water per month for each tuna plant when he waters by bucket. But the dispenser system requires a mere 4 litres of water monthly to do the same job.

"The dispenser system is an important saving of water, which represents income," says Cirilo Vasquez, the president of Collanac community. Once the dispensers go into full-scale production, they will be sold for less than 10 cents each. Although not many residents have bought pottery dispensers, or the tara seedlings (along with other tree species) that the project raises at a community nursery, Vasquez believes more will. "I think with the dispenser system everyone will buy taras. It was a desert when we arrived, but now it is getting better every year - the people are becoming convinced."

In one dry valley, Leon and Blosier are pursuing experiments to grow tara trees with little or no irrigated water, using various soil mixtures. These experiments also allow them to select the best tara trees: "We have to carry out research to choose the right genetic material for the area that will survive in these difficult conditions," says León.

If the combination of fogcatchers and pottery dispensers proves a success in tuna cultivation and tara afforestation, it is a model of sustainable development that could be adapted to innumerable similar
communities along the dry Pacific coast of Peru and Chile and to other countries such as Namibia, Oman and Yemen. Apart from helping improve the incomes of poor rural residents, this system may lead one day to fulfilling a dream of Barbara Leon, one no doubt shared by many Peruvians: a coastal region whose valleys are once again carpeted in green forests.

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