



## Sustainable grazing systems

### **In Latin America, even small "payments for environmental services" have encouraged livestock owners to adopt silvo-pastoral systems that improve productivity and reduce pressure to destroy native forests**

FAO is helping pioneer in Colombia, Costa Rica and Nicaragua a new approach to slowing the rate of deforestation and erosion of biodiversity: paying livestock owners to plant trees, fodder shrubs and "live fences" in and around pastures where their cattle graze. Under a \$4.5 million project funded by the Global Environment Facility, some 450 farmers are participating in a "payment for environmental services" (PES) scheme that rewards land use improvements leading to increased carbon sequestration and wildlife protection.

The project was launched in 2002 - with support from the World Bank and the multi-agency Livestock, Environment and Development (LEAD) initiative, hosted by FAO - to explore innovative livestock husbandry strategies in degraded grazing areas and to test whether PES might help discourage widespread destruction of forest cover to make way for pasture.

Deforestation for livestock production is particularly severe in Central and South America. While many countries in the region are reducing incentives that encourage timber extraction, cropping and grazing in natural forests, pressure from poor landholders and large scale ranches continues to drive forest clearing. In Nicaragua, for example, an estimated 26% of the country's natural forest area was felled between 1995 and 2000. Traditional pasture management on deforested land is often unsustainable: after a period of high productivity, soil fertility is depleted and grass cover declines. As their production and income fall, many livestock producers have no alternative but to clear more forest - and start again.

**Fodder shrubs and trees.** To break this destructive cycle in the districts of Quindío in Colombia, Esparza in Costa Rica and Matiguas in Nicaragua, the project seeks to introduce silvo-pastoral systems, in which degraded pasture is planted with improved grasses, fodder shrubs and trees. The benefits of silvo-pastoral systems



are already well documented. Fodder shrubs and legumes return atmospheric nitrogen to the soil, and tree roots recycle nutrients from deep in the soil where grasses never reach. Trees and shrubs also function as a "carbon sink" that absorbs carbon dioxide from the atmosphere and deposits it as solid carbon in the soil and in woody tissue. The systems create a rich and varied habitat for native forest flora and fauna, reduce surface runoff, and anchor the soil on steep slopes. Indirectly, they also reduce pressure for further deforestation by halting the cycle of soil depletion and abandonment that drives ranchers to seek "greener pastures".

"The payoff for ranchers and farmers can be substantial," says LEAD coordinator Henning Steinfeld. "Once established, silvo-pastoral systems can support significantly more animals per hectare than natural or improved pastures." Fodder and fruit from trees and shrubs also provide a more nourishing diet for animals, leading to better fed livestock that produce more milk and meat. Mature systems provide significant savings: the high nutritional value of fodder reduces the need for commercial feeds, and nitrogen-fixing plants reduce spending on nitrogen fertilizers. Halting the degradation of pastures increases the value of landholdings, for use either as collateral or for sale.

But while the benefits of silvo-pastoralism are many, two obstacles stand in the way of its widespread adoption: lack of knowledge and the need for substantial initial investment. "Silvo-pastures require knowledge of the value of a wide variety of plants unfamiliar to most cattle ranchers," says Steinfeld. "They are rarely aware of the potential cost savings and productivity gains." They do, however, know that establishing a silvo-pastoral system requires investments of time and money - in Colombia's Quindío district, for example, the cost of planting the tropical leguminous tree *Leuceana* was put at a prohibitive \$1,000 per hectare.

**Land use types.** That is where "payment for environmental services" comes in. Rather than attempting to extract payment from livestock owners for the environmental damage caused by deforestation, the project actively rewards farmers who adopt silvo-pastoral approaches. For that purpose, it has defined 28 main land use types and assigned each an index value between 0 and 1 for both carbon sequestration and biodiversity. The land use types range from degraded pasture (total value 0) and natural pasture with recently planted trees (0.6) to intensive silvo-pastoral systems (1.6) and mature forests rich in carbon-fixing vegetation and biodiversity (2).

To monitor progress and calculate payments, the project established a baseline land use and index value for each parcel of land. Follow-up surveys are conducted each year to identify parcels where farmers have changed the land use profile by planting improved grass, trees or shrubs. After adjusting the index values for parcels where the land use has changed, the total number of points for the farm is calculated again and the farmer is paid for every incremental point.

Payments are relatively modest - in the best case, a hectare of silvo-pastoral land may fix each year from five to 10 tonnes of carbon, which is valued at US\$5 a tonne. A 15 hectare ranch might, therefore, collect around US\$375 for carbon sequestration and a comparable amount for biodiversity conservation, making a total payout of around US\$2 per day.

Early results suggest, however, that the PES approach has proved economically viable for farmers in the three target areas. In Costa Rica, participating farmers have reduced the area of degraded pasture by more than 60 percent and have increased the area of improved pasture with trees almost five-fold. Total payments to farmers in all three countries increased from just \$3,000 in 2003 to \$166,000 in 2004, and reached \$170,000 in Costa Rica and Nicaragua alone in 2005. Since the beginning of the project, an estimated 25,000 tonnes of carbon have been removed from the atmosphere, and more than 500 species of birds - one quarter of which are considered vulnerable or endangered - have been observed nesting and feeding on farms that have adopted sustainable land uses.

"Payments for environmental services do not offer a way out of poverty in and of themselves," Henning Steinfeld says, "The expectation is that even relatively small payments will encourage farmers to make the initial investment and help them stick with it through the first few years until they reach the 'tipping point', when the silvo-pastoral system becomes more profitable than previous grazing practices."

**Replication.** Lessons from the project are now being replicated in other parts of Central and South America. For example, the project recently helped the government of Costa Rica develop an agroforestry PES scheme involving some 700 livestock owners, and a proposal to extend the project approach to a further 4,500 farms has been submitted for financing. In Colombia, the National Livestock Federation is planning to "mainstream" silvopastoral techniques to some 2,000 cattle owners in areas of highly concentrated production, while in Nicaragua the project helped develop a "green credit" scheme to encourage farmers to invest in technologies that increase productivity and conserve natural resources. The PES methodology developed by the project is also being applied in a programme for degraded pasture recovery in Guatemala and Honduras, and will be shared with a recently-approved GEF-funded project for sustainable land management in the semi-arid Sertao region of Brazil.