

Two Unique Cattle Farming Programs in Costa Rica

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Costa Rica is an incredible, diverse country, with vegetation ranging from savannahs to highland cloud forests and extensive lowland tropical rainforests. It is located in Central America, south of Nicaragua and west of Panama. In the densely populated central highlands, coffee is the major agricultural commodity. Near the capital city of San Jose, dairy farms located on the slopes of volcanoes provide milk for most of the country's people. In many of the more remote highland areas, forests have been cleared for production of Brahman cattle for the export market. Heavy rainfall in the highland area has caused severe erosion on the clear-cut steep slopes. As in many tropical countries, the visitor is shocked by the vast destruction of the enormous tropical forests. The soils are poorly suited for crops, and cattle production is marginal.

The heart of Costa Rica's cattle country is in the western province of Guanacaste, near the Nicaraguan border. This region once consisted of interspersed savannahs and tropical deciduous forests. The distinct wet and dry seasons make the area better suited for range cattle than for other types of agriculture, although sorghum, upland rice, and sugar cane are also produced. Almost all of the forest has been cleared, with remnants generally visible only in National Parks and along the rivers.

During August, 1980, the author had the opportunity to study forage grasses of Costa Rica, and was impressed by the contrasts between the traditional small farming systems of the highlands and the large ranches of Guanacaste. Two locations were particularly striking: the small dairy farms of Monteverde province, and Hacienda la Pacifica, a large ranch in Guanacaste province. Although entirely different in size and terrain, these farms share two admirable features: the harmonious blending of traditional and innovative techniques, and the successful combination of agricultural production with wildlife conservation.

Monteverde

Monteverde is a highland community located in the cloud forest near 4,500 ft elevation. Residents include both North Americans and Costa Ricans. The area is isolated from the capital by poor roads, which are often inaccessible during the rainy season. Transportation of milk to populated areas is impractical. Beef cattle are not very profitable on these small farms, generally less than 50 acres. Residents have devised a successful alternative. Dairy cattle are raised on intensively managed pastures. Milk is processed into cheese at a modern cooperative factory and then transported to San Jose markets.

The pasture management system is well suited to the cloud forest environment. Large blocks of forest are left standing between pastures to minimize loss of wildlife habitat. Each farm is divided into at least 30-45 small, fenced pastures, usually less than an acre. The milk cows are rotated each day. This frequent rotation system helps prevent compaction of the extremely porous volcanic cloud forest soil, which averages 12% humus. Rainfall is 100-200 inches during the April-October rainy season. Temperatures average 70-75° F year round, and a dense fog covers the fields every afternoon.

African stargrass (*Cynodon nmenfluensis*) and white clover (*Trifolium repens*) are the dominant pasture species. These species, although perennials, are often replanted annually. After mechanical seedbed preparation, stolons are planted by hand to establish pastures. Growth is slow and insect and disease problems are severe in this cool, wet cloud forest environment.

Milk cows are familiar temperate zone breeds, including Holsteins and Brown Swiss. Milk yields average 30-35 lb/day. Supplementary feeds include green-chopped elephant grass (*Pennisetum purpureum*), molasses, cottonseed meal, and rice hulls.

One of the most impressive features of the Monteverde farming community is the farmers' attitudes and their assistance given in initiating, purchasing, and reserving a 4,000-acre wildlife refuge. The cloud forest refuge is maintained intact, and wildlife is protected from poachers. The Monteverde cloud forest is one of the last refuges of the extremely rare resplendent quetzal, one of the most spectacular, beautiful birds on earth. Over 200 species of birds and 100 species of mammals are found in the reserve, including sloths, tapirs, jaguars, and monkeys. The entire range of the golden toad is found within one small portion of the sanctuary. Six different ecological communities contain 2,000 species of plants.

La Pacifica

Hacienda la Pacifica, a 3,000-acre ranch in the savannahs of Guanacaste, is just a few hours from Monteverde, but in a dramatically different setting. The region receives an average of 65 inches of rain between May and October. Complete weather records have been maintained at La Pacifica for 58 years, showing that annual rainfall varies from 35 to 116 inches. The Hageneur family, owners of the ranch, not only combine modern and traditional ranching techniques, they have also welcomed scientists conducting research on a variety of agricultural and biological projects.

A 600-cow herd is maintained on pastures consisting primarily of African stargrass, pangola grass (*Digitaria decumbens*), *Brachiaria decumbens*, and jaragua grass

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Dairy pasture in the cloud forest of Monteverde. (Note the cloud in the background.)

(*Hyparrhenia rufa*). Pastures are replanted by hand, primarily from stolons, every 10-12 years. A number of palatable native legumes occur, including species of *Desmodium*, *Centrosema*, and *Stylosanthus*. Use of commercial fertilizers on pastures is expensive, and fertilization is limited to use of urea on calf pastures.

At the end of the rainy season pastures are cut for hay before nutritional quality begins to deteriorate. During the dry season, when forage protein can be as low as 2%, supplements such as green-chopped sugar cane, forage sorghums, urea, phosphoric acid, and molasses are fed to the cattle.

Ranches in Guanacaste produce beef primarily for the export market. Most of the cattle are heat-tolerant Brahmans. At La Pacifica the Hageneurs and their ranch manager, Amelia Aragon, conduct an ongoing program of hybridization. Modern artificial insemination methods are used to produce hybrids between Brahmans, Brown Swiss, and other breeds. The objective of the program is to combine production of meat and milk. Although such a combination would not be feasible in developed countries where labor is expensive, at La Pacifica this system is successful. Hybrid cattle are milked in a modern dairy facility, where some unusual problems have been overcome. The daily rounding up of range cattle for milking is an obvious difficulty. Another is the tendency for Brahmans to hold their milk until their calves have nursed. At La Pacifica the calves are allowed to nurse before milking, and are then held in pens adjacent to the milking stalls. Although milk yields are relatively low

using this system, the production of milk is considered supplementary to beef production, and the milk is in demand at local markets.

As in Monteverde, La Pacifica shelters a variety of wildlife, including over 200 species of birds, a troop of 500 howler monkeys, and many small mammals. Over 1,000 acres of forest are reserved for protection of wildlife, mostly consisting of second growth riparian forest along the Corobici River. The Hageneurs have cooperated with biologists in numerous wildlife studies. They maintain the same belief expressed in Monteverde: that agricultural production and natural resource conservation can be compatible if a portion of the land is maintained as a forest preserve.

In a country where one third of the forest has been destroyed in just a few years (Stark, *Science* 81, April 1981), efforts such as these are essential if any tropical forests are to survive the twentieth century.

Both in Monteverde and at La Pacifica, modern innovations have been combined with traditional farming methods in unique ways. In Monteverde, the modern cheese processing facilities provide a market for the products of a traditional small farming system where cattle are grazed on very small pastures using a daily rotation system. At La Pacifica, the introduction of a modern milking facility and artificial insemination program successfully modifies the traditional large-scale ranching system used for beef production. In both locations, a deep concern for wildlife conservation has led to preservation of large habitat reserves.