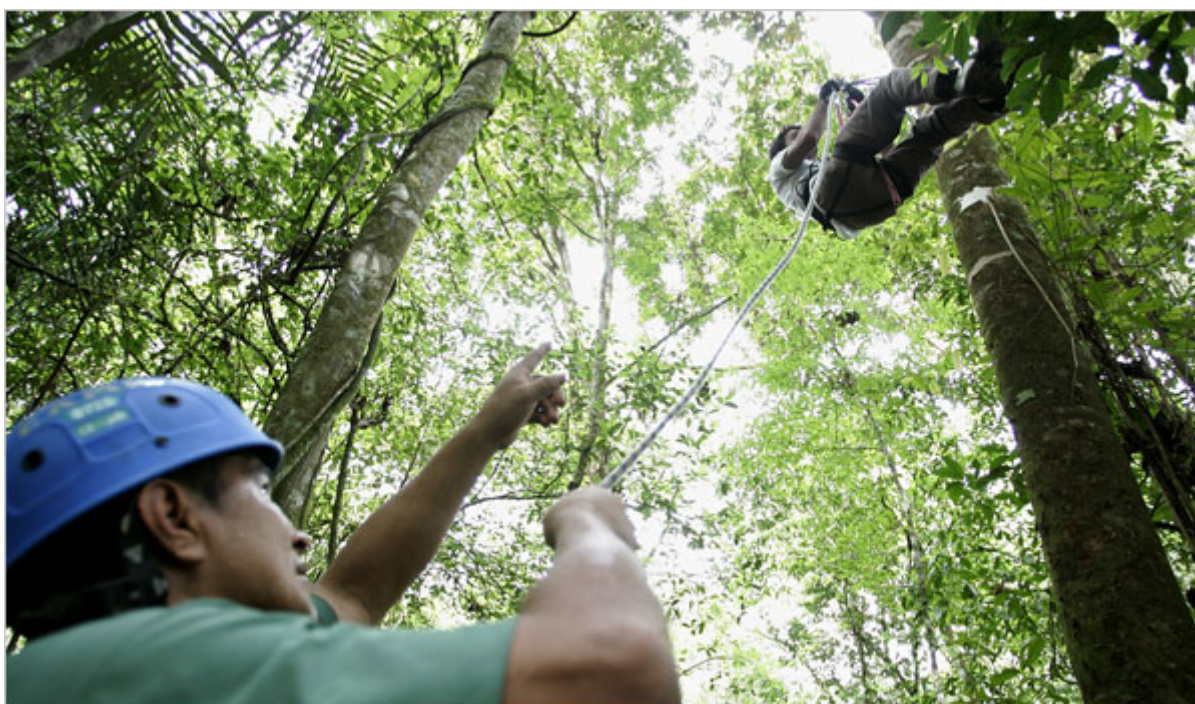


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## Scientists Are Making Brazil's Savannah Bloom



Lalo de Almeida for The New York Times

**Pioneers** In the labs and fields of Brazil, **Embrapa** has become a research leader in tropical agriculture. In Belem, an instructor taught students how to collect seeds.

By **LARRY ROHTER**

Published: October 2, 2007

PLANALTINA, **Brazil** — Anyone curious to know how Brazil has become what the former secretary of state, **Colin L. Powell**, calls an “agricultural superpower” — poised to overtake the United States as the world’s leading exporter of foodstuffs — would do well to start here in this busy network of government laboratories.

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The sprawling labs and experimental fields are operated by **Embrapa**, Brazil's agricultural and livestock research agency, and have become an obligatory stop for any third world leader visiting Brazil.

Although little known in North America, **Embrapa** has in three decades become a world research leader in tropical agriculture and is moving aggressively into areas like biotechnology and bio-energy.

"**Embrapa** is a model, not just for the so-called developing world, but for all countries," said Mark Cackler, manager and acting director of the Agricultural and Rural Development Department of the [World Bank](#). "A key reason that Brazil has done so well with its agricultural economy is that it has invested heavily and intelligently in front-end agricultural research, and **Embrapa** has been at the forefront of that effort."

**Embrapa** owes much of its reputation to its pioneering work here in the cerrado, the vast savannah that stretches for more than 1,000 miles across central Brazil. Written off as useless for centuries, the region has been transformed in less than a generation into Brazil's grain belt, thanks to the discovery that soils could be made fertile by dousing them with phosphorus and lime, whose optimum mixture was established by **Embrapa** scientists.

When the annual World Food Prize was awarded last year to two Brazilians affiliated with **Embrapa**, the citation called the emergence of the cerrado "one of the greatest achievements of agricultural science in the 20th century."

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**Embrapa** also championed the main crop for the region by developing more than 40 tropical varieties of soybeans, which had been thought of as only a temperate zone crop.

“When I was working in India and Pakistan and the Near East countries in the 1960s and 1970s, nobody thought these soils were ever going to be productive,” Norman Borlaug, an American agronomist who won the Nobel Peace Prize for work that earned him the title “father of the Green Revolution,” said in a telephone interview from Iowa. “But **Embrapa** was able to put all the pieces together.”

As a result, Brazil is today the world’s top exporter of soybeans and beef and a fast-rising exporter of cotton, three-quarters of which it produces here in the cerrado. Encouraged by that success, **Embrapa** scientists have turned their attention to wheat. Brazil now imports most of its wheat from nearby countries with temperate climates.

“We think the potential is enormous,” said Roberto Teixeira Alves, general director of the cerrado research center at **Embrapa**. “We launched two new varieties of wheat with good yields just last year, and believe there is also a strong possibility of adapting barley to the region.”

**Embrapa**’s laboratory in Manaus, in the heart of the Amazon, has also been studying ways to make carbon sequestration more efficient. Scientists have been examining what are known as “Amazonian dark earth soils,” small, fertile islands that were built up by pre-Columbian Indian tribes and that have especially high concentrations of phosphorous.

“We don’t know why that should be, but we are trying to understand and reproduce that phenomenon so that we can benefit from it now,” said

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Wenceslau Teixeira, a soil scientist who is in charge of the effort. “These islands have especially stable levels of carbon, which helps retain nutrients and is thus both quite useful and hard to find in tropical soils.”

And although Brazil’s sugar-based ethanol program is largely focused elsewhere, **Embrapa** has an agro-energy division that is concentrating on ways to grow diesel fuel. **Embrapa** scientists have identified some 30 plants that could be used in such programs and are focusing on palm oil.

“Palm oil’s composition is one of the best for production of bio-fuels,” said Maria do Rosario Lobato Rodrigues, the director of the Manaus laboratory, where the research is based. “It has a high capacity to fix carbon, doesn’t require the use of chemical products to produce, and no part of the plant is ever wasted.”

Under **Embrapa**’s newly broadened definition of agriculture, nothing seems off limits, from a tropical hog that is lower in fat and [cholesterol](#) than its American counterpart and has a higher yield of loin and ham, to the extraction of bio-polymers from spiders. At the **Embrapa** executive dining room in Brasilia, there are even place mats made with varieties of natural cotton fibers, which, because they grow in shades of green and tan, could cut costs of dye stocks for textile manufacturers.

Getting adequate financing is always a problem for any public research institution in Brazil. Two years ago, though, the Brazilian Congress passed a law that allows **Embrapa** to profit from its research and has widened the agency’s ability to form joint ventures.

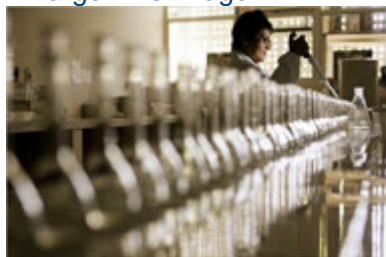
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Lalo de Almeida for The New York Times

A nursery worker tended Cupuacu fruit.

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In Manaus, a chemist analyzed vegetal tissues.

“Being entrepreneurs is new for us, but we need to transform our knowledge into riches,” Silvio Crestana, **Embrapa**’s director-general and a soil-physics specialist, said in an interview in Brasilia. Beyond royalties, he said, the agency wants to attract venture capital.

Initially, most such agreements were with Brazilian companies. But **Embrapa** and BASF, the German chemical maker, recently announced a partnership to develop and market a genetically modified, herbicide-resistant soybean that is expected to be on the market by 2012 and will compete with Monsanto’s Roundup Ready brand.

With the support of multilateral lending and development bodies like the World Bank, **Embrapa** is also trying to raise its profile abroad. Although it has long had exchange programs that have brought scientists from Latin



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America, Africa and Asia to work at its laboratories, **Embrapa** only recently opened its first overseas office, in Ghana, headquarters of the Forum for Agricultural Research in Africa.

“This is a good and potentially important move, because there are plenty of places in Africa, such as Zambia, that have savannahs with soil and rain conditions similar to Brazil’s cerrado,” Mr. Borlaug said. “I think that soybeans and corn, together with beef production and improved pasture grasses for grazing, are all things that will be fit to transfer from Brazil.”

Like the Brazilian aircraft manufacturer Embraer, which has found a profitable niche selling commuter jets, **Embrapa** seems keen to focus on marketing the know-how it has developed in crops and products that are often ignored by research institutions in the industrialized countries of the Northern Hemisphere.

“Brazil has a comparative advantage through its own experience that is very relevant in a tropical context,” Mr. Cackler said. “To take one example, how many American universities are going to put much effort into cassava? It’s just not a priority for them. But tens of millions of people depend every day of their lives on cassava, so we at the World Bank are delighted that Brazil is willing to develop and transfer that technology.”