

# **Farming in Brazil**

*The new agricultural frontier*

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## **Introduction – Brazil, the new agricultural frontier**

With India, China and Russia entering the capitalist system, 3 billion new consumers are all at once entering the world consumer markets. This is creating a surge in demand of a size never seen before for agricultural staples of all types. Soy, corn, sugar, meat, paper... all will have to be produced in quantities that are 2 or 3 times higher than the current world production.

On top of this, the western world is finally discovering the potential of ethanol and biodiesel as an efficient way to produce energy and to reduce the world's dependence on the handful of oil producing nations.

So the multi-billion dollar question is: where will all these products be produced?

Obviously, Europe, the US and Japan are already close to their production limits – not even to mention the high cost of land and labour which make farming hardly competitive with the developing countries.

Of course, it would be ideal to produce those crops in those new capitalist markets themselves. China and India have enormous space and cheap labour. But unfortunately, soil, water and climate conspire against them.

India, for instance, is a large producer of sugar cane – but it is already near its limits for production due to a lack of fertile soil and water. China is already struggling with huge environmental problems and lack of clean water – it is estimated that almost two thirds of its population does not have access to clean drinking water.

In contrast with those, Brazil has all the assets needed to become the farmhouse of the planet. Enormous reserves of uncultivated, but fertile land. A tropical to sub-tropical climate with lots of rain – and almost one third of the whole world's drinking water reserves. Land is cheap, labour is cheap, and production is higher.

As a result, Brazil is becoming the world's new agricultural frontier. Since around 2005, massive investments have started to flow to

Brazil; the beginning of a boom that will undoubtedly grow over the next one or two decades.

## The Brazilian agricultural boom

Brazil has about the size of the US (not counting Alaska), and about 185 million consumers – which makes it the fifth or sixth largest market worldwide for a lot of consumer products.

It has for centuries been exploited by colonial powers as a cheap farming ground for sugar, coffee, soy, and cattle.

Exports, however, have often been limited because of protectionist measures by Europe and the US, who have been known to use subsidies and trade barriers to protect their farmers from the – inevitably – cheaper production from the developing countries.

Until the nineties, Brazil was seen, however, as a volatile, high-risk economy, with sky high inflation rates and unpredictable political swings.

Over the last ten years, however, Brazil has proven to be in control of its economy, with slow but continuous growth and low inflation. Financial markets have been the first to catch on and the 'country risk' of Brazil has dropped to no more than 150 points in 2007 – meaning an investment in Brazil should generate only 1.5% more return than in the 'first world' in order to compensate for its risk.

As a result, money is continuously flowing into Brazil and its currency is not only stable but actually gaining strength year after year. Investments into the stock market were the first to start the flow, but since 2005 also direct investments – in industry and agriculture – have started to rise significantly.

Also, the West has – finally – discovered ethanol as a cheap, environmental and politically safe alternative to petroleum. The Brazilian technology to produce ethanol from sugar cane is cheaper than the corn-based technology used in the US and Australia.

Also here, the numbers are impressive - if one calculates the amount of sugar cane plantations necessary to supply the Brazilian, US, or Japanese markets with alcohol, even to replace

just a part of their petroleum consumption by alcohol, it quickly becomes clear that demand will rise to unimaginable proportions in a few years' time.

While the movement has already started, the agricultural boom in Brazil is just taking off – and those investing now will not only benefit from strong immediate returns, but also from strong valuation increases over the next decade.

## International investments in ethanol

The visit of present George Bush to Brazil in April 2007 was a symbol of the huge international interest in ethanol production in Brazil. Over the next decade, some have investments of up to 100 billion dollars.<sup>i</sup>

But Bush was not the only one showing interest. George Soros, Bill Gates, Richard Branson, Larry Page and Sergei Brin (the founders of Google), Vinod Khosla (founder of Sun Microsystems) – all are studying investments in ethanol.

Soros has already invested \$900 million, via Adeco, in the construction of 3 ethanol plants in Mato Grosso do Sul. Gates has invested \$84 million in CA-based Pacific Ethanol.

Also George Bush's brother Jeb – co-president of the international Ethanol Commission (IEC) – visited Brasil and announced that the Interamerican Development Bank (IDB) is preparing to finance projects in Brasil. A first project of \$570 million is already under way.

Also Brazilian development banks like the BNDES are prepared to finance ethanol projects, and have reserved a budget of 7 billion reais (almost \$3.5 billion dollars) for this.

The BNDES strategy, as announced by its president Luciano Coutinho is to either finance up to 70% of a project or become a shareholder in new projects, owning up to 30% of the shares.

Finally, also the government is aligning a few measures in its 'economic acceleration plan' (PAC) to support the bioenergy industry and improve logistics for new refineries. Today, Brasil has about 350 sugar cane plants but the target is to add at least another 80 to 100 plants.

## Big players in the Brazilian ethanol industry

Today's leader in the Brazilian sugar cane industry is COSAN, a conglomerate lead by Rubens Ometto, and producing over 1 billion litres of ethanol per year.

That leadership may soon be challenged by Infinity Bio-energy, a company founded in March 2006 that targets no less than world leadership in ethanol distribution.

Lead by Sergio Thompson Flores, this company, with half a billion dollars in cash to buy sugar cane plants, has already bought 3 plants and announced construction of another 5. By early 2007, it had already invested \$230 million purchasing Cridasa (in Espiritu Santo), Usinavi (Mato Grosso do Sul) and Alcana (Minas Gerais).

By the next harvest, it should be milling around 4 million tonnes of cane – but the objective is to mill 28 million tonnes by 2010.

Based on the current productivity – 85 litres per tonne - that should be enough to produces 2.3 billion litres of ethanol.

Infinity's investment comes from international investors, like Stark, Och Ziff Management and Merrill Lynch; and 74% of its capital (around \$400 million) is floated on the London Stock Market. On top of that, it plans to get listed on the Brazilian stock market Bovespa in 2007.

It entered Brazil when it took integrated the U.S. 'Evergreen' fund which owned 100% of Alcana and 51% of Cridasa.

Its strategy is to produce in regions that do NOT have a tradition in sugar cane; and Infinity will focus on the south of Mato Grosso de Sul and the north of Espiritu Santo, near the borders with Minas Gerais and Bahia. Construction of 3 new plants is already announced for Mato Grosso do Sul, in the region of Navirai. The next two should be in Espiritu Santo, near Cridasa, and in the south of Bahia.

The logic is that in those areas, the company can lease land much cheaper than in Sao Paulo, where 60% of the sugar cane production is concentrated today.



Apart from sugar cane, the company is studying an investment in biodiesel; where it would concentrate on crops with high oil yield, like mamona and dende.

Within the industry, Infinity's plans are received with mixed feelings. Some hope it will bring extra dynamics and international exposure for the industry<sup>1</sup>. Others fear that their lack of specific know-how may lead to mistakes (some whispering that the R\$260 million paid for the Navirai plant are way to much) and hence, a loss of credibility of the Brazilian industry in international markets.

## **Brazilian investors in the ethanol industry**

But it's not only the international players that are making big investments in the Brazilian ethanol industry.

Ex-Petrobras president Henri Philippe Reichstul is reportedly leading an investment fund worth about \$2 billion.

Jorge Lemann (Ambev), the second richest man of Brazil; ex-Central Bank presidents Gustavo Franco and Arminio Fraga; and celebrities like F1 pilot Emerson Fittipaldi.

## **Overview of the Brazilian ethanol industry**

Early 2007, Brazil counted some 336 ethanol plants, and the number is expected to rise to over 400 in 5 years.

To realise that growth, Brazilian and foreign groups are expected to invest about \$15 billion.

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<sup>1</sup> Like Jose Pessoa, experience president of the hononymous plants in Pernambuco, and president of the Syndicate of Sugar and Alcohol producers of Mato Grosso do Sul. Dinheiro Rural, Feb. 2007.

According to Jose Luiz Liverio, vice president of operations of Dedini S.A. (which produces about half of the ethanol plant equipment in Brazil), some 189 projects are being studied – although of course, not all of those will be realised.

## The dark side of the ethanol boom

Sugar cane planters are preparing for a new golden era – the first being the 17<sup>th</sup> century when many planters acquired fortunes exploiting cheap slave labour.

Today's new boom is slightly different, but the labour relationships are often not very far from the 17<sup>th</sup> century system.

The manual harvesting of sugar cane is a very demanding, exhausting job and pays very low minimum wages – often related to output which drives workers to make very long hours.

## Food versus ethanol?

Early 2007, ethanol production all at once got bad press as some studies<sup>2,3</sup> alerted that increasing production of ethanol might reduce food production, and hence raise the price of food staples and creating all kinds of side effects including increased famine in the poorer countries<sup>4</sup>.

Indeed, in the US, corn production for ethanol could create and imbalance between the 'four F': food, feed, fiber and fuel.

The quantity of corn used for fuel production has tripled between 2001 and 2006 – reaching 55 million tonnes, or about 1/6<sup>th</sup> of the country's corn production; but producing only 3% of the fuel needed for all US cars. It is said that the quantity of corn needed

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<sup>2</sup> An article published by C. Ford Runge and Benjamin Senauer in 'Foreign Affairs

<sup>3</sup> Lester Brown, director of the Earth Policy Institute, is one of those believing that the US, today the largest corn exporter worldwide, would see dramatic increases in corn prices provoking hunger and revolution in the poorer countries

<sup>4</sup> Eduardo Athayde is director of the World Watch Institute in Brasil – [wwiuma.org.br](http://wwiuma.org.br)

to produce 1 tankload of fuel for a van, would be sufficient to feed one person for one year.

For instance in Iowa, where 55 ethanol plants are being planned, Bob Wisner from the Iowa State University has calculated that those will use up *all* corn production of the state.

Not unsuspectingly, Hugo Chavez voiced this problem loudly at the Latin America Energy Summit held in Venezuela, and even Fidel Castro sent a message from his sick bed to qualify investments in ethanol production as an 'internationalisation of genocide'.

Brazil, being one of the largest ethanol producers worldwide, obviously gained a lot of attention.

Reality, however, shows that the increasing surface cultivated with sugar cane has not slowed down the Brazilian food production. In fact, its latest cereal harvest, no less than 125 million tonnes, represented an all-time record.

Reason behind this, is that Brazil has excellent conditions to increase sugar cane areals without prejudice to other crops. A strategic workgroup has identified 12 new frontiers suitable for sugar cane plantation, without any legal or environmental issues.

Those are located in Sao Paulo, Minas Gerais, Mato Grosso and Goias; and total about 80 million hectares – about the size of Germany and Spain summed up.

## **The tortilla march**

The origin of all this press actually lies in Mexico, where tens of thousands of citizens went on the streets to protest against the

steep price increase of corn – over 400% - which is mostly imported from the United States.

In the US, ethanol is produced from corn – and as the output got suddenly directed to ethanol rather than tortilla flour the quantities available for exports dropped dramatically.

Over the last year, the price of corn on the Chicago and New York markets increased by 50%.

In Brazil, the percentage of sugar cane production used for ethanol is expected to decline as well – from 53% in 2005 to 41% in 2010 and 33% in 2014<sup>5</sup>. However, this will come largely from increase of total production rather than cannibalisation.

### **The impact on forests**

In Asia, especially in Malaysia and Indonesia, large portions of native jungle are being destroyed to make place for dende palm plantations (which makes for an excellent source of bio-diesel).

In Brazil, ecologists are more concerned about the conversion of cattle farms to sugar cane farms – pushing the cattle farms to move to previously uncultivated areas. This is, for example reported in Mato Grosso<sup>6</sup>

In the US, currently only 14% of corn production is converted to ethanol, but by 2014, the proportion is expected to rise to 36%.

This causes more of a problem in the US than it would cause in Brazil: because hardly any land is available for expansion, corn production for ethanol does cannibalise food production – raising not only the price of corn but also those influence by it, like poultry.

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<sup>5</sup> Sources: USDA, Unica, Agroconsult

<sup>6</sup> According to Sergio de Zen, professor in economics at the Luiz de Queiroz High School of Agriculture in Sao Paulo

Texas – of all states - has overnight transformed from a cattle farming state to an ethanol producer, with two of the country's largest ethanol plants expected to come on line this year in Texas.

In total, 16 billion dollar worth of investments are being planned for 80 new plants in the next few years.

However, the US technology, based on corn, is not only one third more expensive – it also produces only half the ethanol output per hectare that the Brazilian plants produce. Finally, its production process consumes about 4 times more energy than the Brazilian technology.

An import barrier – 54 dollar cents per gallon – keeps the US farmers safe for the moment, but it is not unlikely that these barriers will soon be lifted. In fact, this barrier was only created in 2002, the year in which Bush approved a \$190 billion support package to the corn lobby, thanks to the efforts of Senator Grassley,

## **New technology**

All of this does not take into account the potential to improve productivity through new technology. This certainly is possible in the corn / sugar farming areas itself – but also by converting Brazil's extensive style of cattle farming – leaving cattle run wild on huge estates, to a more intensive cattle farming. Some farmers have already started leasing half of their land to ethanol producers – while keeping the same number of cattle on the remaining half.

## Cellulose-based ethanol

But the most spectacular advance could come from cellulose-based ethanol. This would make it possible to produce alcohol from virtually any plant material (including the leaves of corn and sugar cane).

During president Bush's recent visit to Brazil, both countries signed a research treaty targeted to realise this technology over the next 5 to 10 years. Cellulose based production could almost double the current output per<sup>7</sup> hectare – from currently 7000 liters per hectare per year.

That is why Amory Lovins – one of the new gurus of ecology – does believe in ethanol; albeit in ethanol derived from wood and grasses, which would offer at the same time greater productivity and less pollution (as they require less – fossil – fuel for their production<sup>8</sup>).

Research on this is being done, amongst others, in Dupont's labs in Wilmington, Delaware. The US, of course, has special interest in this. Given the limitations of corn-based ethanol production, it would benefit enormously if ethanol could be produced from wood, grass, or rest products of other crops. It is expected, however, that it will take another decade before an economically viable technology for this gets developed.

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<sup>7</sup> Marcus Jank, president of ICONNE (Instituto de Estudos do Comercio e Negocacoes Internacionais)

<sup>8</sup> For each unit of non-renewable energy required in production, sugar cane generates 8.3 units of energy; 5.5 times more than corn.

## **Plant construction in Brazil**

Most of the Brazilian ethanol plants are constructed by Dedini – while TecnoSteel has constructed the 5 largest biodiesel plants of the continent, with a joint capacity of nearly 660 million litres per year.

The largest plant of the continent, from the Brasil Ecodiesel group, was inaugurated in Feb. 70 in Iraquara, Bahia, near the Chapada Diamantina. With an investment of 33 million reais, the plant can produce 120 million litres of fuel per year and crush 800 tonnes of seeds per day, including soy, sunflower and pinhao-manso.

Backed by the “Desenvolve” program from the Bahia government – generating tax reliefs of up to 90% - the programme has generated work for 600 employees. But more importantly, it reaches about 34000 small farmers – 24000 through individual contracts and 10000 through cooperatives.

The sales of the production is guaranteed by a contract with Petrobras.

## **The US ethanol industry**

In the U.S., only two states produce sugar cane in significant quantities – Hawaii and Louisiana.

Ethanol production therefore is concentrated in the 'Corn Belt' (Iowa, Ohio, Illinois, Missouri and Indiana), together with Nebraska, Kansas, Minnesota and Wisconsin.

Those so-called 'red states' – the most conservative ones, with strong support for president Bush – are very happy with the president's initiative to multiply ethanol production; although it was one of their strongest supporters, senator Grassly, that the U.S.



levied the import tax of \$.54 per gallon, to protect producers from the cheaper sugar-cane based imports.<sup>9</sup>

Today, the US counts about 110 ethanol plants – with another 60 under construction. These produce about 19 billion litres of ethanol per year; but Bush wants that to rise sevenfold by 2017.

The US government spent about \$3 billion in subsidies for the industry in 2006 (51 cents per gallon), and plans to double this. Without this, US produced ethanol would be more expensive than gasoline to the end consumer.

While consumers seem to be favourable to the initiative, and the subsidies keep the producers happy, others<sup>10</sup> criticize the idea – both because the US doesn't have space, forests, water and clean air to spare for this increase, and because of the high cost of the corn based production.

Even if the whole production was channelled towards fuel, the US industry wouldn't be able to supply the quantity needed for Bush's objective.

Also, as ethanol production cannibalises the use of corn for other products – increasing the cost of, amongst others, cattle feed – the balance for the US farming industry may be zero.

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<sup>9</sup> Update magazine, Feb. 2007 (publication of the American Chamber of Commerce in Brazil)

<sup>10</sup> One of the fiercest enemies being Prof. Patzek, from the University of California (Berkeley)

## New frontiers elsewhere

Europe, with Germany leading, is more focussed on bio-diesel, usually produced from beetroot – and its production is expected to rise fivefold by 2010.

Asia is already producing ethanol from manioc (Thailand) and corn (China). India, one of the largest sugar producers worldwide, has no incentives yet to encourage more ethanol production.

Africa could be a new frontier as well, as signaled by the investments of Associated British Foods in Illovo, the world's fourth largest sugar producer, with factories in Mozambique, Tanzania and Zambia – and plans is to start producing for the European market as of 2009.

## World supply and demand

The US and Brazil together represent over 70% of the world ethanol production, currently some 50 billion litres.

Country	Ethanol production <sup>11</sup>		Biodiesel production	
	2006	2012	2006	2012
US	18.5	54.1	1.4	5.2
Brazil	17.4	35.4	0.2	2.4
Europe <sup>27</sup>	3.1	6.0	6.5	14.9
India	2.0	2.1	0.2	1.5
China	3.8	5.1	0	5.1
Argentina	0.2	0.2	0	4.7

<sup>11</sup> Sources: Card, F.O. Licht, Unicom IDB-OMC, Icone, Toeffler, Abiove, World Watch Institute

Indonesia	0.2	0.2	0.2	4.9
Malaysia			0.2	7.4
Thailand	0.4	2.8		
Russia	0.8	0.9		

## World demand for bio-energy

In the United States, the objective of George Bush is have bio-fuels run 15% of all cars ten years from now, as part of his strategy to reduce gasoline consumption by 20%. That would represent no less than 132 billion litres – more than two and a half times the current world production.

Brazil could produce such amount using some 200 million hectares of sugar cane – three times the surface currently used, but still only 10% of its total farming surface.

In fact, his proposal to Congress included plans to multiply alcohol production sevenfold. That number is not surprising, if one knows that today only 2% of US cars are using ethanol, in a mix known as E85 (85% of ethanol, 15% of gasoline), and that less than a thousand out of 175000 gas stations offer ethanol to the consumer. Even in California, there are only 4 – and none at all in New York.

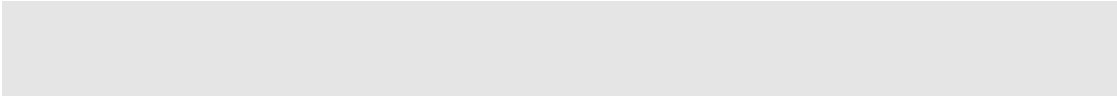
But with retail prices for gasoline rising above \$3 per gallon, ethanol suddenly became the next hot thing.<sup>12</sup>

In Europe, biodiesel should be replace 5.75% of all diesel consumed by 2010, good for a total of 10 billion litres.

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<sup>12</sup> Update Magazine, published by AmCham Brazil, Feb. 2007

Worldwide, some 40 countries have already started mixing ethanol with gasoline; in percentages varying from 2 to 10%.<sup>13</sup>



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<sup>13</sup> “Brazil will have one new ethanol plant per month until 2012”, Estado de Sao Paulo, March 4, 2007.

## Biodiesel

Biodiesel is produced most efficiently from palm species like dende, which exist on a large scale in Malaysia and Indonesia, and other tropical locations like Brazil. In theory, many poor countries could greatly benefit from biodiesel production, as the crops are easy to grow on small farms with limited investment. This would allow the poor to benefit more from the eco-fuel boom than ethanol, which is controlled by large plants and leads to little distribution of income to the poor.

In Brazil, production of bio-diesel is small when compared to ethanol, although a large number of crops with very high oil content can easily be cultivated: mamona, soy, cotton, sunflower, dende, peanuts, babacu, pequi, pinhao and beets.

A number of government programs<sup>14</sup> aims to increase the production of bio-diesel by small farmers.

The crop most used for bio-diesel today is mamona – good for about 80% of total production, and (so far) quite concentrated in Bahia – the number 1 producer of mamona in Brazil, with a market share of 92%.

From the 452 towns selected by Embrapa for their excellent conditions for mamona, 189 are located in Bahia.

Bahia also has excellent conditions for soy farms; and especially in west Bahia.

Sunflower seeds, one of the top 4 crops used worldwide for oil production – thanks to their oil content of 30 to 50%. Finally, pinhao-manso can be cultivated even in infertile grounds and up to an altitude of up to 1000m, and harvested up to 6 months a year.

Petrobras is now launching its first projects, in Candeias (Bahia<sup>15</sup>), Montes Claros (Minas Gerais), and Quixada (Ceara), which are

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<sup>14</sup> Like the PNPB – national biodiesel production plan, launched in October 2002; also know as “Probiodiesel”, through the Ministry of Science and Technology.

scheduled to start operating end 2007. Each plant will produce up to 57 million litres per year, from animal and vegetal fats. The investment has been around 230 million reais; and the project is meant to tie in with “family farming”; make sure that some 70000 small family producers can be included in the value chain. While most of those will only cultivate the crops, and sell them to large production plants, Embrapa has devised mini-plants that allow for production of up to 500 litres of biofuel per day.

Until now, 7 biodiesel plants are operating in Brazil – with a capacity of 123 million litres per year; while another 16 are under construction and a further 14 are pending regularisation. President Lula’s growth acceleration plan – PAC – even includes 46 new plants by 2010. Of course, numbers from political plans are not always that reliable.

The BNB – Banco do Nordeste do Brasil is providing financing, and the Embrapa research institute and Ceplac are supplying the project with technology.

The BNDES finances projects up to 80% - even 90% for projects with the “social fuel” label; covering the whole production chain from farming, over storage, production and distribution logistics.

Such financing is available at low rates – TJLP+1% or +2% for small companies (without resp. with the ‘social’ label); and TJLP+2 or +3% for larger companies.) In good Brazilian tradition, however, guarantuees are still required – yet “only” 100% of the loan value instead of the usual 130%

Also soy is used – with a potential of generating up to 500 kilogrammes of oil per hectare.

Today, the leading bio-diesel country is Germany, which broadly commercializes B100 biodiesel (100% biodiesel); good for a significant part of the European production of over 1 billion litres per year.

In Brazil, gas stations, by law, will have to mix 2% of biodiesel with their diesel as of 2008; and 5% as of 2013; but the government is trying to spread the use of B5 as of next year. This should reduce Brazil’s bill for imported diesel by some \$1.2 to 1.8 billion per year.

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<sup>15</sup> The Rede Baiana de Boicombustiveis supports the industry with research

Apart from economical and social arguments, biodiesel also has ecological advantages – exhausts from pure (B100) biodiesel generate 40 to 60% less pollution than fossil diesel.

