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COMPETITIVENESS OF BRAZILIAN BIOETHANOL IN THE EU

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The new EU legislation on biofuels, which allows a full exemption of petrol tax in the member states, has led to a positive investment climate particularly in Germany. At the same time, the fact that bioethanol can be produced at much lower costs in other parts of the world than in Europe should not be ignored. This article, therefore, aims to analyse the production costs of bioethanol in Brazil, the world's largest producer and exporter.

Tax exemption

Last year, EU institutions agreed that the energy-based share of biofuels should be 2% by the end of 2005, increasing 0.75 percentage points a year until it reaches 5.75% by the end of 2010. To achieve this objective, it was also decided that member states could grant exemptions from petrol tax as long as these did not lead to an overcompensation of the difference in production costs relative to conventional fuels.

Under the regulations, the proportion of renewables in fuels can reach up to 5% by volume without needing to be labelled. However, if bioethanol's share were to reach 5.75% by energy content, labelling would be required since the volumetric share would be more than 8%.

The petrol tax on 95-octane petrol in Germany is now 65.45 Euro cents per litre and is, therefore, the maximum ethanol tax reduction which the country would be permitted under EU law. This tax exemption has already been operative for several years but only for pure biofuels such as biodiesel. In accordance with the new German legislation, the renewable share in blended fuels is also tax exempt.

Production costs of bioethanol in Germany

A calculation of the net production costs of bioethanol in Germany was presented in Vol. 1, No.11 of the World Ethanol and Biofuels Report published in February 2003[2]. These costs worked out at €50/hl depending on plant configuration and raw material prices to which outlays on distribution and blending have to be added. This is the value which has to be compared with the long-term selling price of petrol of about €25/hl. However, it should be remembered that this price is

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[2] Henniges, O.; Zeddies, J.: Fuel Ethanol Production in the USA and Germany – A Cost Comparison. F.O.Licht's World Ethanol and Biofuels Report, Vol. 1, No. 11, February 11, 2003.

Table 1: Sugar cane production costs in the Centre/South region

	1. Year (Planting)	1. Harvest	2. Harvest	3. Harvest	4. Harvest	5. Harvest	6. Harvest
Yield, t/ha		120	110	100	90	80	70
Mechanical processes $/ha	207	439	408	376	345	313	229
Manual processes, $/ha	122	15	15	15	15	15	2
Pesticides, fertilizers, $/ha	228	95	95	95	95	95	0
Sub-total, $/ha	557	549	518	486	455	423	231
Depreciation of planting, $/ha		116	116	116	116	116	116
Total, $/ha		665	634	602	571	539	347
Costs per t, $/t		5.54	5.77	6.02	6.35	6.74	4.98
Average costs per t, $/t		5.90					
Costs inclusive interest for farm land, $/t		8.53					

Source: modified in accordance with AGRIANUAL 2004, S. 225 FNP Consultoria & Agroinformativos, São Paulo (Exchange rate 3 Rs/$)

Thus, within the cost calculation, $116/ha are allowed for each year. Since in this case it is assumed that the cane is harvested mechanically, the largest share of the variable costs is machinery related.

Over time, as the result of decreasing marginal yields, the costs per tonne of sugar cane increase from $5.54/t in the first season to $6.74/t in the 5th season. However, they drop to $4.96/t in the last year because no further costs for pesticides, fertilizers and their application are incurred. On average, the variable costs of production add up to $5.90/t. The fixed costs which have to be apportioned are dependent on individual farm sizes and the equipment used. For ease of comparison, they will be ignored for the purposes of this exercise. As a consequence of the favourable conditions for sugar cane growing, the price for farm land in the state of São Paulo at an average value of $2500/ha is by far the highest in Brazil. Hence, at an assumed interest rate of 10%, an additional $250/ha or $2.63/t have to be included as opportunity costs. As a result, the notional cost of production rises to $8.53/t.

In 2003, the average price for sugar cane was about $10/t which will be considered as a benchmark in the following calculations. As a basic principle, the price of sugar cane is still primarily dependent on the world sugar price. Since it has fallen to very low levels in recent years, the cost of the cane used for ethanol production has also declined.

Ethanol production

The following calculations assume an ethanol recovery of 85 l/t of sugar cane, which is about the average for the state of São Paulo. Therefore, sugar cane costs per hl of alcohol amount to $11.76/hl (Table 2 shows the breakdown of costs in relative and absolute terms). Since most of the factories produce both sugar and alcohol, certain benefits from synergies can be assumed. For the production of ethanol, B-molasses and thin juice are used. Thus, sugar of low solubility is fed into fermentation instead of being recovered at a higher cost.

The following example is based on a factory processing 1.3 mln tonnes of cane per year. Of the total, 650,000 t are used for alcohol production. According to the opinion of one expert consulted, the cost of constructing an attached distillery with a capacity of 550,000 hl of anhydrous ethanol per year is $6.4 mln. This figure breaks down into 20% for buildings which have an economic life of 20 years, and 80% for machinery which is used for ten years. This results in an investment cost share of $1.63/hl, assuming an interest rate of 10% per year. This portion of the costs would be higher if the investment expenditure for the sugar refinery were to be proportionately charged to ethanol production. On the other hand, it must also be acknowledged that, for the most part, the facilities are in practice utilised for considerably longer than is assumed above.

A plant of this scale employs about 300 people, half of whom can be charged to ethanol production, which results in labour costs of $0.34/hl. Expenditure on insurance, repairs and fees contribute another $0.58/hl to total costs.

Further costs of $2.78/hl are incurred for operating inputs including steam and energy. It is obvious that, as the result of burning bagasse, operating costs are very low compared with ethanol plants based on sugar beet or grains, which have comparably high levels of expenditures on steam.

In Brazil, most plants burn bagasse to meet only their own energy requirements. As a result of low selling prices of about 3.3 US-cents/kWh, investments in more efficient but also more expensive co-generation systems would hardly be profitable. At present, steam-operated, low-pressure systems burn all the bagasse which is produced. In the future, gas-operated turbines which work at 82 bar and higher temperatures could be viable if, in addition, the resultant trash is burnt.

Since the total energy content of sugar cane can be evenly split between the sugar, the bagasse and the trash (leaves and tips), respectively, the potential for energy production would increase considerably. On the other hand, it would not be practicable to collect 100% of the trash.

The conversion of trash and bagasse into ethanol can also be considered. Theoretically, a tonne of cane could produce an additional 38 litres per of ethanol, if a yield of 140 kg dry matter is assumed for each bagasse and trash

Only when technologies which allow either greater energy recovery or a higher ethanol yield become available will the co-products have to be brought into the cost calculation. For the time being, there is therefore no income from the bagasse as a co-product. Equally, no costs are included in the calculation for 'bagasse' as the energy feedstock.

pump, domestic fuel ethanol demand in the US is itself rather high at present.

Ethanol's competitiveness against petrol

In addition to the relative competitiveness of ethanol of various origins, the key question is whether it is competitive against petrol. Table 3 breaks down the present selling price of petrol in Germany and also shows a possible pricing structure for ethanol. Experts assume that bioethanol will be priced the same as petrol, so that petrol blended with 5% ethanol will also cost about €1.13/l. Thus, the advantage for the consumer might be limited to the possibility that the increase in the price of fuel might not be so great.

This calculation shows that the potential profit margin for ethanol in Germany could be between €20 and 40/hl, so that the oil companies are being given a substantial incentive to use ethanol blends. However, it is also clear that this profit margin would even be higher if imported Brazilian ethanol were to be used. There is, therefore, a risk that, based on these potential profits, the authorities might reduce the tax exemption for biofuels at some stage.

Table 3: Composition of selling prices of petrol and EU ethanol in Germany (EUR/hl)

Price at the pump	Gasoline 113.00	Ethanol 113.00
Purchase price	25.00	50.00-70.00
VAT	16.00	16.00
Petrol tax	65.00	0
Distribution	5.00	5.00
Denaturation/Blending	0	2.00
= Profit margin	2.00	20.00-40.00

Source: ARAL and own calculations

Conclusion

In the preceding sections, it has been shown that Brazilian ethanol production costs are not only much lower than in the EU, but are also lower than petrol prices. Brazil's superiority is underlined by the fact that there is a great potential for expanding production by limiting sugar output and/or increasing the area planted to sugar cane. However, it has to be borne in mind that a significant expansion in production can only be achieved with higher production costs. Thus, the import of bioethanol from Brazil seems to make sense from an economic point of view.

Under these circumstances, since EU bioethanol production is supported by a number of national governments, it can only be maintained if major tax reductions are granted and high import tariffs imposed.

The question remains as to who should benefit from the tax reductions in Germany. From a Community standpoint, it does not make much sense for tax revenues to be transferred to a few Brazilian companies. In this regard, it will be interesting to see what comes out of the Mercosur negotiations.

From an environmental point of view the option of using ethanol from sugar cane should be considered in any case, be it by direct imports or indirectly by applying the flexible mechanisms of the Kyoto Protocol.

If the biofuel targets of the EU Commission shall be achieved with the instrument of tax reductions alone, heavy tax losses for the member states' budgets will occur in any case. On the other hand ethanol promises a huge potential for value adding in the agricultural and processing sector. In the interest of a growing European ethanol industry, that is still in its infancy the present, ideal fiscal conditions should be maintained.