# International Competitiveness of Sugar Production

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**Paper prepared for presentation at the 13th International Farm Management Congress, Wageningen, The Netherlands, July 7-12, 2002**

# INTERNATIONAL COMPETITIVENESS OF SUGAR PRODUCTION

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## ABSTRACT

*Sugar market is one of the most protected markets for agricultural products world wide. In almost every sugar producing country the sugar market is regulated in some way. With an increasing liberalisation of agricultural trade in the „Millennium Round" of the WTO trade negotiations, the question of international competitiveness is of increasing importance. Based on empirical studies, in this article the competitiveness of sugar production in the most important sugar producing countries is analysed, including the whole production process from beet or cane production in the field to sugar processing in the factory. Special emphasis is focussed on the different location factors and their influence on competitiveness, so that finally, conclusions can be drawn on future development of the world sugar market and the single production locations.*

*From the countries included in this study, at present only Brazil, Australia, Thailand and partly South Africa would be able to produce sugar under world market conditions. While Brazil and Australia profit from favourable natural, economical and political location factors, in Germany high opportunity costs as well as high environmental and social standards predominate the advantages of high efficiency in the sugar industry. In the United States partly disadvantageous climatic conditions together with high opportunity costs are responsible for the insufficient international competitiveness of sugar production. Low productivity in Thailand and South Africa is overbalanced by low wages as well as comparatively low environmental and social standards. Without standardised environmental and social regulations, a liberalisation of the world market would force movements of sugar production from beet to cane areas with favourable natural, economical and political conditions.*

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**INTRODUCTION**

The sugar market is one of the most protected markets for agricultural products world wide. In almost all sugar producing countries the sugar market is regulated in some way. As the further globalisation and liberalisation of international agricultural trade is expected to be one of the central issues in the „Millennium Round" of the WTO trade negotiations, the question of international competitiveness of different production locations is of increasing importance. Based on empirical studies, in this article the competitiveness of sugar production in the most important sugar producing countries is analysed, including the whole production process from beet or cane production in the field to sugar processing in the factory. Special emphasis is focussed on the different location factors and their influence on competitiveness, so that finally, conclusions on future development of the world sugar market and the different sugar production locations can be drawn for a liberalisation scenario.

**THE WORLD SUGAR MARKET**

The significance of the world sugar market on the one hand results from a largely inelastic demand in the industrialised countries, and on the other hand from a production area that is limited to a great extent because of the climatic requirements of beet and cane. Sugar is produced in about 120 countries with different levels of economic development. In 1998 the world sugar production of 130 mill. t exceeded the consumption by about 5 mill. t and lead to an increase of world sugar stocks to about 40 % of the consumption (WVZ, 1999). In general, the world market for sugar is only of marginal importance, as only around 30 % of the world sugar production is exported and in almost every country the domestic sugar market is protected. Additionally, around one third of world sugar exports (35 mill. t, AGRA-EUROPE, 25/99) is based on preference agreements or long-term contracts (ISO, 1997; VSZ, 1991). Consequently, only around 20 % of the world sugar production is traded under free market conditions.

By far the biggest sugar producers in the world are Brazil, the EU and India (Figure 1), whereas they play different roles on the world market, because of the different importance of their domestic consumption. The USA, Thailand and Australia on the other hand take different positions on the world market as exporting or importing countries despite of their similar production volume. More than 80 % of the world sugar exports are realised by only ten of the most important sugar exporting countries (Brazil,

EU, Australia, Thailand, Cuba, South Africa etc.), whereas the demand is determined by a lot of small importing countries.

**Figure 1:   Production and consumption of sugar in 1998 [million tons raw value]**
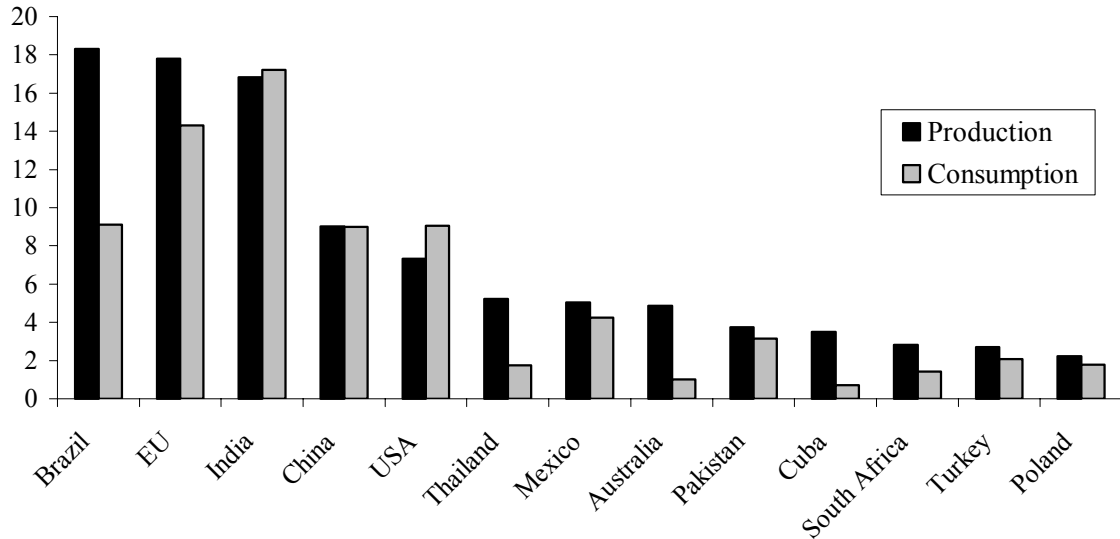


Source:     USDA, 1999

**THEORY OF COMPETITIVENESS**

Competitiveness can be measured by various indicators. While the balance of payments characterises the competitiveness of nations (NIELSEN et al. 1995), for branches like the agricultural or food industry often the degree of self-sufficiency, comparisons of prices or market shares are used (SCHUELE, 1999). For more detailed information on international or domestic competitiveness of branches, the method of Domestic Resource Costs (DRC) or Private Resource Costs (PRC), are suitable, respectively (BOJNEC, 1999). However, all these aggregated indicators characterise a static situation and ignore reasons for differences in competitiveness.

The concept of competitiveness includes various aspects on a spatial level (firm level, branches of trade, national) as well as on a timely level (short term, long term). Put simply, the international competitiveness of branches like the sugar industry expresses the ability of domestic firms to compete with foreign firms (NIELSEN et al., 1995). This ability is based on different factors. On the one hand these are the firms' cost levels which are influenced by the national level of wages and interest rates as well as the currency exchange rate. On the other hand, it is the firms' productivity, which is relevant for the unit costs. Additionally, competitiveness is influenced by national policies concerning taxes, regulations and subsidies.

**Competitiveness of sugar production is influenced by the following location factors:**

|  | Field (Beet/Cane Production) | Factory (Processing) |
|---|---|---|
| **natural location factors**<br>- temperature<br>- rainfall<br>- topography | - sugar yields,<br>- need for irrigation/draining,<br>- possibility of machinery use | - crushing campaign |
| **economic location factors**<br>- opportunity costs of labour, land and capital<br>- productivity | - wages, land prices and interest rates<br>- unit costs | - wages, land prices and interest rates<br>- unit costs |
| **political location factors**<br>- subsidies:　　- product prices,<br>　　　　　　　- factor prices | - beet/cane prices,<br>- prices for water, energy etc. | - sugar prices,<br>- prices for water , energy etc. |
| - taxes | - taxes on income, property and energy etc. | - taxes on income, property and energy etc. |
| - regulations: - social standards<br>　　　　　- environmental standards | - non-wage labour costs,<br>- costs, caused by regulations for fertiliser and pesticide use | - non-wage labour costs,<br>- costs, caused by regulations for air emissions, effluents, waste |

As competitiveness is determined by various location factors, conclusions on the competitiveness of sugar production under current and liberalised market conditions can only be drawn from an analysis of the current natural, economic and political production conditions and the expected development of the different location factors. Therefore, in this article a detailed analysis of inputs and outputs of sugar production on the different locations is carried out. The data base consists of own surveys, information from local research, governmental and political institutions, literature, laws and statistics.
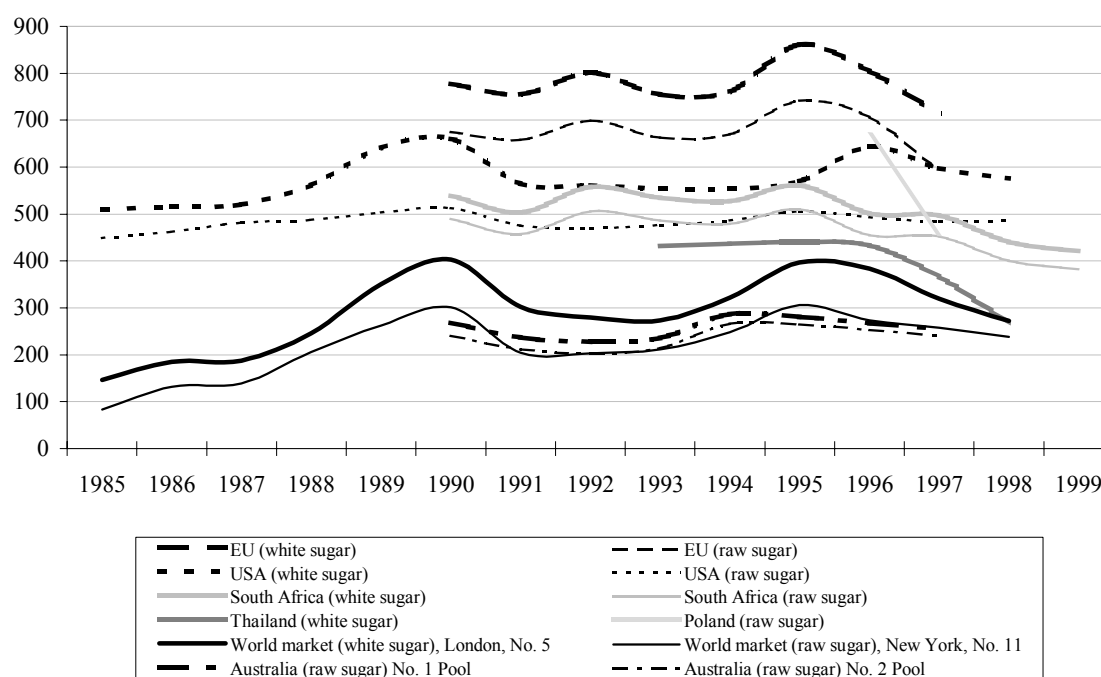
## COMPETITIVENESS OF SUGAR PRODUCTION

Concerning the international competitiveness of sugar production, at first the outputs, that are influenced by the national sugar policy are analysed. Following, the input side is investigated, which is characterised by the technical efficiency, the national factor prices as well as environmental and social standards.

### Sugar policy

National sugar market regulations cause varying protection levels in the different countries. With producer support estimates (PSE) of 54 %, 52 % or 46 %, OECD (1998) shows the highest domestic price support of the sugar market for the EU, USA and Poland, respectively, while for Australia, with 5 % the lowest protection level is presented. Corresponding to the protection level, considerable differences in the national sugar prices can be realised (Figure 2).

**Figure 2: National and world sugar prices [US$ per ton of sugar]**



| | | |
|---|---|---|
| – – EU (white sugar) | – – – EU (raw sugar) | |
| ····· USA (white sugar) | ······· USA (raw sugar) | |
| South Africa (white sugar) | South Africa (raw sugar) | |
| Thailand (white sugar) | Poland (raw sugar) | |
| World market (white sugar), London, No. 5 | World market (raw sugar), New York, No. 11 | |
| –·– Australia (raw sugar) No. 1 Pool | –··– Australia (raw sugar) No. 2 Pool | |

Source:    USDA, 1998a, 1998b, 1999; ASMC, 1998; SASA, 1999; WVZ, 1998; WVZ, 1999

The highest price support of the investigated countries is found in the EU, with intervention prices of around 1300 DM per ton of white sugar (WVZ, 1998). Not far below the EU level, sugar prices in the USA are located, where the domestic sugar market is protected by import tariffs. In the past, whole sale prices for raw and white sugar amounted to about 850 DM and 1000 DM per ton, respectively, in the average (USDA, 1999). In Poland, South Africa and Thailand the export market is mostly liberalised, while the domestic prices are supported to a varying extent. Based on public fixed minimum prices whole sale prices for white sugar currently range between 700 an 750 DM per ton in Poland and South Afrika (SASA, 1999). In Thailand, where domestic white sugar prices are constantly fixed at 12000 Baht per ton, the supporting effect decreased remarkably with the currency devaluation (520 DM per ton). In India, white sugar prices are fixed at around 680 DM per ton, excluding around one third of the sugar production, that must be provided at a price of around 550 DM to support poor people. In Australia, sugar prices are generally based on the world market. The only instrument of market control is the single desk channel for the marketing of the whole Australian sugar (QSC, 1998). Mostly liberalised sugar marketing is realised in Brazil. As around half of the sugar produced in Brazil is used for alcohol production, beside the world sugar market, the alcohol market, that was supported comparatively high between 1983 and 1999, has big influence on the domestic sugar price development.

**Production Costs**

Production costs for sugar are mainly contributed by raw material, transport and processing costs with varying shares between the countries (Figure 3). Whereas the processing costs generally are less important in the cane sugar industry, they weigh much more in the beet sugar industry. On the whole, the variance in the raw material costs between 120 and 720 DM per ton of sugar and in the processing costs of 100 to 600 DM per ton is considerably high. Less proceeds from by-products, the production costs for sugar range from about 260 DM per ton of sugar in Brazil to around 1300 DM per ton in Germany.

**Figure 3:  Production costs for sugar, 1997/99 [DM/100 kg of sugar]**
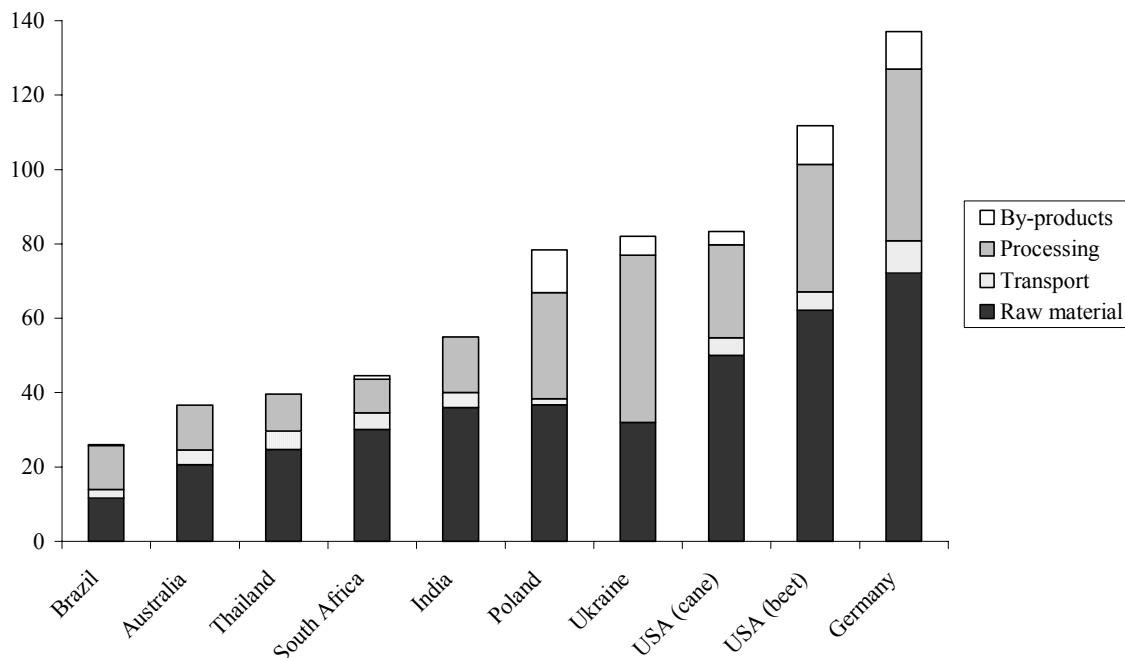


Source:    USDA, 1999; DPI, 1998; MI, 1998b; FGV, 1997; ORPLANA, 2000; VSZ, 1997; WVZ, 1998; own surveys

**- Raw material costs**

A substantial part of the sugar production costs results from the raw material costs, that amount to 40 to 70 % of the whole production costs and range from 120 DM per ton of sugar in Brazil to around 720 DM in Germany. With agricultural production costs from 190 DM per ton of cane in Brazil up to 580 DM per ton of beet in Germany, the differences in production costs of beet and cane are much smaller than the differences in the agricultural output which corresponds to the raw material costs of the sugar industry. So, considerable producer rents can be realised in the United States and Germany, but also in India and the Ukraine (Table 1).

**Table 1:    Productivity and opportunity costs in sugar beet and cane production, 1997/99**

| | | Sugar beet | | | | Sugar cane[4] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Poland | Ukraine | USA | Ger-many[1] | Brazil[2] | Australia | Thai-land | South Africa[3] | India | USA |
| Beet/cane yield | [t/ha] | 39,5 | 19,5 | 46,1 | 60,3 | 68,5 | 97,7 | 42,5 | 53,6[2] | 73,8 | 74,4 |
| Sugar content | [%] | 13,9 | 11,2 | 14,6 | 16,6 | 11,5 | 14,0 | 10,0 | 11,5 | 9,9 | 11,7 |
| **Sugar yield** | **[t/ha]** | **5,5** | **2,2** | **6,7** | **10,0** | **7,9** | **13,7** | **4,3** | **6,2[2]** | **7,3** | **8,7** |
| **Output** | [DM/ha] | 2022 | 710 | 4163 | 6506 | 1096 | 3371 | 1275 | 2144 | 2908 | 4352 |
| - [DM/100 kg of beet/cane] | | 5,12 | 3,64 | 9,03 | 10,79 | 1,60 | 3,45 | 3,00 | 4,00 | 3,94 | 5,85 |
| **- [DM/100 kg of sugar]** | | **36,76** | **32,26** | **62,13** | **65,1** | **13,97** | **24,61** | **29,65** | **34,58** | **39,83** | **50,00** |
| **Costs** | [DM/ha] | 1890 | 525 | 3775 | 5084 | 1525 | 3129 | 1313 | 1903 | 1720 | 5003 |
| - [DM/100 kg of beet/cane] | | 4,78 | 2,69 | 8,19 | 8,43 | 2,23 | 3,20 | 3,09 | 3,55 | 2,33 | 6,73 |
| **- [DM/100 kg of sugar]** | | **34,36** | **23,86** | **56,34** | **50,79** | **19,30** | **22,84** | **30,53** | **30,69** | **23,56** | **57,51** |
| **Labour costs** | **[DM/100 kg sugar]** | **8,80** | **4,16** | **10,84** | **8,98** | **4,7** | **5,11** | **10,21** | **8,40** | **11,95** | **17,36** |
| Labour demand | [h/ha] | 180 | 150 | 30 | 24 | 200 | 35 | 400-500 | 400-500 | | 50 |
| Labour costs | [DM/h] | 2,70 | 0,61 | 25,00 | 37,40 | 2,10 | 21,40 | 1,00 | 1,20 | 0,45 | 30,00 |
| **Machinery costs** | **[DM/100 kg sugar]** | **12,45** | **6,69** | **11,97** | **14,99** | **3,70** | **7,34** | **2,14** | **5,71** | **1,66** | **13,70** |
| **Land costs** | **[DM/100 kg sugar]** | **1,27** | **0** | **9,93** | **10,63** | **2,30** | **3,65** | **4,65** | **4,03** | **0** | **8,17** |
| Land rent | [DM/ha] | 70 | 0 | 665 | 850 | 200 | 500 | 200 | 250 | 0 | 711 |

[1] South Germany; [2] Center South; [3] per hectare under cane (area harvested: cane yield 71,4 t/ha; sugar yield 8,2 t/ha; [4] including transport (output/costs), except USA

Source:    USDA, 1999; DPI, 1998; MI, 1998b; FGV, 1997; ORPLANA, 2000; VSZ, 1997; WVZ, 1998; own surveys

A comparison of land and labour productivity with land and labour prices in agriculture shows, that the comparatively high efficiency in the United States and Germany is overweighed by high factor prices in contrast to Thailand, South Africa and India, where production costs are much smaller, despite a very low productivity. In Australia the highest land and labour productivity, combined with favourable economic conditions leads to very high competitiveness of raw material production. Only Brazil partly manages to beat Australia, especially with the newest currency devaluation.

**- Processing costs**

The essential parts of the processing costs, ranging from around 100 to 600 DM per ton of sugar including by-products, stem from labour, energy, machinery and buildings.

**→ Labour costs**

The highest labour costs with 180 DM per ton of sugar are found in Germany, where they are more than twice as high as in all the other countries, although labour productivity in Germany with 300 kg of sugar per hour is the highest after Australia with around 330 kg per hour (Table 2). On the other hand labour costs in Thailand and South Africa with about 10 to 40 DM per ton of sugar are considerably low, despite a very low labour productivity of 82 and 74 kg of sugar per hour, respectively. In comparison to the productivity, much higher labour costs in Germany, are based on higher agreed wages compared to other countries, which are an expression of the high opportunity costs of labour in Germany as well as extended privileges of labourers (i.e. number of annual working days etc.). Additionally, with nearly 10 DM per hour there is a high amount of non-wage labour costs in Germany, that represents a comparatively high standard of social security.

**Table 2:    Labour productivity and labour costs in the sugar processing industry**

| | Sugar beet | | | | Sugar cane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Po-land | Uk-raine | USA | Ger-many | Brazil | Aust-ralia | Thai-land | South Africa | India | USA |
| **Labour productivity** **- kg of sugar/hour** | **40** | **:** | **149** | **303** | **150** | **333** | **82** | **74** | **35** | **264** |
| - relation to Germany | 13% | : | 49% | 100% | 50% | 110% | 27% | 24% | 12% | 87% |
| **Labour costs**[1] - wage [DM/hour] | 1,39 | 0,50 | 14,30 | 19,56 | 1,10 | 12,76 | 0,70 | 1,93 | 1,13 | |
| - non-wage[DM/hour] | 0,84 | 0,19 | 4,77 | 9,97 | 0,50 | 3,57 | 0,05 | 0,36 | | |
| **- total [DM/hour]** | **2,24** | **0,69** | **19,07** | **29,53** | **1,60** | **16,34** | **0,75** | **2,29** | **1,13** | **19,1** |
| - relation to Germany | 8% | 2% | 67% | 100% | 5% | 55% | 3% | 8% | 4% | 65% |

[1] minimum wage
Source:    own surveys, various labour acts and sugar industry awards

**→ Energy Costs**

Whereas cane sugar industry has the possibility to burn bagasse as a by-product, fuel costs in beet sugar industry range from 30 to 70 DM per ton of sugar, depending on energy prices and the energy efficiency. With similar energy prices, fuel costs in Poland with about 50-60 DM are about twice as high as in Germany, because of a lower efficiency. Compared to the energy demand of German sugar industries of 29 kWh per ton of beet (WVZ, 1999), energy efficiency in Poland with an energy demand of about 42 kWh is around 30 % lower. Additionally, a lower sugar yield per ton of beet leads to higher energy costs per ton of sugar in Poland. In the cane processing industry, the energy efficiency often is even lower, as bagasse usually is not scarce.

**→ Costs of Machinery and Buildings**

The essential part of the sugar processing costs in Germany stems from depreciation and the maintenance of machinery and buildings. With almost 300 DM per ton of sugar they are about three times as high as for the average of all other countries, and around 10 times as high as in South Africa and Thailand. The main reason for the substantial differences in depreciation costs is the length of the crushing campaign. Whereas in South Africa sugar cane is harvested from March through December and mills can be operated up to 300 days p.a., the period of sugar beet harvesting and processing in Germany with about 90 days p.a. is very short (Table 3). Consequently, the processing capacity to produce one ton of sugar in Germany needs to be around three times as high as in South Africa. Additionally, prices for buildings, equipment and installing, the technical standard as well as the current value of the equipment, that represents potential performance reserves, in Germany are very high, compared to many of the other sugar producing countries. Moreover, measures to fulfil environmental requirements concerning air emissions, effluent and waste disposal are reasons for the significant amount of costs for machinery and buildings in the German sugar processing industry.

**SUMMARY AND CONCLUSIONS**

From all countries included in this study, Brazil and Australia are the only ones with a rather liberal, unprotected sugar market, while in all other countries at least the domestic market is affected by regulations. A comparison of the production costs shows, that over time, only Brazil, Australia, Thailand and partly South Africa would be able to produce at world market prices.

**Table 3: Structure and technical standard in the sugar processing industry, 1997/99**

| | Sugar beet | | | | Sugar cane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Poland | Ukraine | United States | Germany | Brazil[3] | Australia | Thailand | South Africa | India | United States |
| Length of campaign [days] | 100 | 54 | 140-230 | 90 | 240 | 160-180 | 120 | 240-300 | 117-206 | 100-150 |
| | Oct.-March | Sept.-Dec. | Sept-May[1] Apr.-Nov[2] | Oct.-Dec. | April-Dec. | July-Dec. | Nov.-Feb. | March-Dec. | Nov-April[5] Oct.-July[6] | Okt.-Dec.[7] Okt.-Apr.[8] |
| Factories/mills [number] | 74 | 195 | 30 | 39 | 236 | 29 | 46 | 15 | 400 | 32 |
| Crushing capacity | | | | | | | | | | |
| - per plant [t/day] (TCD)[9] | 2200 | 2828 | 5500 | 8500 | 5200 | 8600 | 10000 | 5100 | 2253 | : |
| - total [t/day] | 162800 | 551550 | 165000 | 331500 | 1230000 | 249400 | 460000 | 76500 | 901200 | : |
| Sugar production [million tons raw value] | 2,239 | 1,9 | 3,6 | 4,527 | 15,1 | 4,874 | 5,227 | 2,808 | 15,5 | 3,09 |
| Capacity utilisation [t of sugar/TCD[9]] | 13,7 | 3,4 | 21,8 | 13,7 | 24,6[4] | 19,5 | 11,4 | 36,7 | 17,2 | : |
| Current value | low | low | medium | high | medium | low | high | medium | low | low |
| Environmental standard | low | low | medium | high | med./low | low | low | medium | medium | medium |

[1] Red River Valley (Minnesota/North Dacota) (230); [2] California (200); [3] Center/South; [4] including alcohol production; [5] Uttar Pradesh (117); [6] Tamil Nadu (206); [7] Louisiana (100); [8] Florida (150); [9] tons crushed per day

Source: USDA (1999); ZUCKERWIRTSCHAFT (var. years); MI (1998a); ASMC (1998); SASA (1999); Anuario JornalCana 98/99; POSPELOWA und SCHINKE (1997); own surveys

While Brazil and Australia profit from favourable natural, economic and political location factors, in Germany high opportunity costs as well as high environmental and social standards predominate the advantages of a high efficiency in the sugar industry. In the United States disadvantageous climatic conditions in parts of the country together with high opportunity costs are responsible for the insufficient international competitiveness of sugar production. Low productivity in Thailand, South Africa, India, Poland and Ukraine is outweighed by low wages as well as comparatively low environmental and social standards. In Poland and the Ukraine, mainly the low efficiency of the processing industry is responsible for the high costs of sugar production. The Indian sugar industry is mostly handicapped by governmental regulations concerning cane and sugar price fixing as well as structural development of the industry.

**Influence of different location factors on the competitiveness of sugar production**

| location factors | sugar beet | | | | sugar cane | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Po-land | Ukrai-ne | USA | Ger-many | Brazil | Aust-ralia | Thai-land | South Africa | India | USA |
| **Field (beet and cane production)** | | | | | | | | | | |
| **natural** | | | | | | | | | | |
| - temperature | + | + | + | + | ++ | ++ | ++ | +- | + | +- |
| - rainfall | + | -- | +- | + | ++ | +- | +- | +- | +- | +- |
| - topography | + | + | + | + | ++ | + | + | -- | + | + |
| **economic** | | | | | | | | | | |
| - land productivity | - | -- | +- | + | + | ++ | -- | - | +- | +- |
| - labour productivity | -- | -- | + | ++ | - | ++ | -- | -- | -- | + |
| - land prices | ++ | ++ | - | -- | + | + | + | + | - | - |
| - wages | ++ | ++ | - | -- | ++ | - | ++ | ++ | ++ | - |
| **political** | | | | | | | | | | |
| - price support | + | + | ++ | ++ | -- | -- | + | + | ++ | ++ |
| - energy tax | -- | +- | ++ | -- | ++ | ++ | ++ | - | + | ++ |
| - social standard | - | + | - | -- | ++ | - | ++ | ++ | ++ | - |
| - environm. standard | + | ++ | - | - | ++ | ++ | ++ | ++ | ++ | - |
| **Factory (processing)** | | | | | | | | | | |
| **natural** | | | | | | | | | | |
| - length of campaign | -- | -- | + | -- | ++ | ++ | ++ | ++ | ++ | - |
| **economic** | | | | | | | | | | |
| - labour productivity | -- | -- | + | ++ | - | ++ | - | - | -- | + |
| - energy efficiency | -- | -- | -- | ++ | - | +- | +- | +- | +- | +- |
| - land prices | ++ | ++ | - | -- | + | + | + | + | - | - |
| - wages | ++ | ++ | - | -- | ++ | - | ++ | ++ | ++ | - |
| **political** | | | | | | | | | | |
| - price support | + | + | ++ | ++ | -- | -- | + | + | + | ++ |
| - energy tax | +- | +- | ++ | -- | ++ | ++ | ++ | ++ | + | ++ |
| - social standard | - | + | - | -- | ++ | - | ++ | ++ | + | - |
| - environm. standard | ++ | ++ | - | -- | + | ++ | ++ | + | + | + |

+ (positive influence on competitiveness)          - (negative influence on competitiveness)

Based on these results the consequences of a liberalisation of the world sugar market can be derived. The affected countries can be divided in four groups of winners and losers. First, there are the low cost producers with favourable natural, economical and political conditions like Brazil, Australia, Thailand and South Africa, that would be the clear winners of a liberalisation. Then there are the naturally, economically and politically less favoured cane and beet areas, where a liberalisation of the international sugar market would cause a decrease in sugar production. On the one hand this is to be expected for the United States and especially for the EU. On the other hand there are a lot of small, less competitive cane sugar producers, often developing countries, that profit at present from preferential import quotas with guaranteed sugar prices of the United States and the EU and would suffer from a liberalised sugar market. For another group of important sugar producers, disposing of considerable sugar production reserves, because of large potential cane areas, favourable natural conditions and existing deficits in productivity, the development of sugar supply is much more difficult to predict. This is true, on the one hand for the big sugar cane producers India, China and Cuba and on the other hand for the important beet sugar producers in Middle and Eastern Europe. There, productivity growth and participation at a liberalised world market is depending very much on policy changes in these countries and therefore not to be expected in the near future. The fourth group is including all the sugar importing countries that would suffer from increasing and volatile world sugar prices related to a sugar market liberalisation.

Without standardised environmental and social regulations, a liberalisation of the world market would force sugar production to move from the less favourable beet and cane areas to those cane areas which display favourable natural, economic and political conditions. But, because of natural restrictions as well as competing crops, most cane sugar producers, dominating the world market, dispose of limited possibilities for extending sugar production. This is especially true for Thailand, South East Asia, Middle America and South Africa. Higher potential for extending sugar production is only found in Australia and especially in Brazil, which is the most insecure factor for the world sugar market in future. The high potential of extending sugar cane area as well as large capacities for sugar and alcohol production allow high fluctuations of brazil sugar supply on the world market.

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