

NICOLE SCHÖNLEBER

COMPETITIVENESS OF SUGAR AND SUGAR SUBSTITUTES IN THE EUROPEAN UNION WITHIN GIVEN AND ALTERNATIVE POLITICAL FRAMEWORKS

*From Department of Agricultural Economics
of the University of Hohenheim, Stuttgart*

ABSTRACT. The objective of the study is to analyse the competitiveness of sugar and alternative sweeteners (in particular isoglucose) in the EU within given and alternative political frameworks of the CMOS. The present situation of the European sugar market and the possible impacts of options of the future reform (from 2006) of the CMOS on the EU sugar market are analysed.

Key words: sugar, sugar substitutes, competitiveness analysis, reform of the European Common Market Organisation of Sugar

Introduction

The European sugar market is characterised by a higher regulation intensity than other common agricultural markets. Since the introduction of the Common Market Organisation of Sugar (CMOS) in 1968, many changes of this regulation have been enforced. However, the sugar production within a production quota system is maintained until now. In 2001, the council of the European Ministers of Agriculture decided to proceed the CMOS in its main features for another period of five years, until June 2006. With the enlargement of the EU on May 1st 2004 the CMOS has been assigned to the new member countries.

Currently, a reform of the Common Market Organisation of Sugar is discussed. Reinforced pressure to a reform by, e.g. current claims of the WTO to liberalise protected markets, induces the EU to negotiate changes of the CMOS. The EU commission has been authorised in 2003 to present a report about the CMO of Sugar. This report discusses the impacts of options of the future reform of the Common Market Organisation of Sugar.

Besides regulations as for example determination of sugar minimum prices as well as sugar imports and exports, the production quantity for sugar and for sugar substitutes

(e.g. isoglucose (HFCS) (since 1981) and inulin syrup (since 1994)) is determined. Table 1 depicts the actual production quotas of all EU member states.

Table 1
Production quotas of the EU countries in 2003/04 (t) (Bartens and Mosolff 2004)
Kwoty produkcji w krajach Unii Europejskiej w 2003/04 roku (t) (Bartens i Mosolff 2004)

Country Kraj	Sugar Cukier	Isoglucose Izoglukoza	Inulin syrup Syrop inulinowy
EU-15 – UE-15	14 257 469.9	296 434.1	316 141.6
Germany – Niemcy	3 356 144.6	34 836.2	–
France – Francja	3 707 445.9	19 515.4	24 188.3
Italy – Włochy	1 537 190.9	19 984.9	–
United Kingdom – Wielka Brytania	1 128 557.7	26 776.8	–
Spain – Hiszpania	991 265.6	81 790.1	–
Netherlands – Holandia	850 615.9	8 957.0	79 851.5
Belgium/Luxemburg Belgia/Luksemburg	808 214.5	70 357.7	212 101.8
Denmark – Dania	413 467.2	–	–
Greece – Grecja	314 694.1	12 691.1	–
Ireland – Irlandia	197 497.6	–	–
Portugal – Portugalia	79 055.2	9 762.4	–
Austria	381 547.5	–	–
Finland – Finlandia	144 794.9	11 762.5	–
Sweden – Szwecja	365 005.5	–	–
CC-10 – Kraje kandydujące-10	2 958 393	206 955	–
Hungary – Węgry	401 684	137 627	–
Poland – Polska	1 671 927	26 781	–
Slovakia – Słowacja	207 432	42 547	–
Slovenia – Słowenia	52 973	–	–
Czech Republic – Czechy	454 862	–	–
Estonia	–	–	–
Latvia – Łotwa	66 505	–	–
Lithuania – Litwa	103 010	–	–
Malta	–	–	–
Cyprus – Cypr	–	–	–

The substitution of sugar is not limited only to **nutritive sweeteners** such as isoglucose or inulin syrup which are quoted by the CMO. Further alternative sweeteners (see Table 2) like **dietetic (calorie reduced) sweeteners** (e.g. polyols) or **high intensity sweeteners** (aspartame, cyclamate, etc.) are used in food production.

Table 2

Types of sweeteners (Schiweck 1999)
Typy środków słodzących (Schiweck 1999)

Nutritive sweeteners Pokarmowe środki słodzące	Dietetic calorie reduced sweeteners Środki słodzące o zmniejszonej kaloryczności	High intensity sweeteners Silnie stężone środki słodzące
sweetness: ~ 1 słodkość: ~ 1	sweetness: ≤ 1 słodkość: ≤ 1	sweetness: > 30 słodkość: > 30
Sugar, invert sugar, fructose Cukier, cukier inwertowany, fruktoza Isoglucose, glucose syrups, glucose, malto-dextrins Izoglukoza, syropy glukozowe, glukoza, maltodekstryny Lactose, lactose and whey hydrolyzates Laktoza, hydrolizaty laktozy i serwatki Honey, fruit juice concentrates Miód, koncentraty soków owocowych Isomaltose, leucrose Izomaltoza, leukroza	Fructose Fruktoza Sugar alcohols (polyole): sorbit, xylit, mannit, isomalt Alkohole (poliole): sorbit, ksylit, mannit, izomalt Poly-dextrose Polidekstroza Hydrogenated glucose and maltose syrups Uwodornione syropy glukozowe i maltozowe Pentite, erytrite Pentyt, erytryt Neo-sugar, coupling sugar Neo-cukier, cukier sprzężony	Saccharin, cyclamate, aspartame, acesulfame-K (NutraSweet, Natreen etc.) Sacharyna, cyclamat, aspartam, acesulfam-K (NutraSweet, Natreen itp.) Thaumatococin, dihydrochalcone, alitame Thaumatococin, dihydrochalkon, alitam Glycyrrhizin, steviosid, monellin Glycyrrizin, steviosid, monellin

Besides consumer preferences, etc., cost savings due to the use of alternative sweeteners are the main reasons for the substitution of sugar in the food industry. However, the substitution of sugar by different sweeteners is technically limited. Chemical and physical characteristics restrict the use of sugar substitutes in food production industry. For instance, the application of liquid sugar in chocolate production is not possible as chocolate is a dry product. With the usage of any liquid sugar, for example, the hygroscopicity would increase in a way that chocolate would not be mouldable anymore.

Nutritive sweeteners are the main competitors of the common beet or cane sugar. Isoglucose stands in the first place because in its characteristics it is very similar to sugar (see Table 3). The disadvantage of this starch based sugar is its physical form. Isoglucose can only be produced and marketed in a liquid form meaning that only in food items produced on water basis sugar can be replaced by isoglucose. Isoglucose, as well as other glucose syrups are mainly applied in the soft drink industry (Lindsay 2002).

Table 3

Characteristics of sugar, isoglucose and inulin syrup (Evaluation... 2000)
Charakterystyka cukru, izoglukozy i syropu inulinowego (Evaluation... 2000)

	Sugar Cukier	Isoglucose Izoglukozza	Inulin syrup Syrop inulinowy
Sweetness Słodkość	1	0.9-1	1.2
Content of fructose (%) Zawartość fruktozy (%)	50	55	80-85
Content of glucose (%) Zawartość glukozy (%)	50	41	10-15
Calorie value (kJ/g) Wartość kaloryczna (kJ/g)	17.6	17.6	17.6
Form Forma	crystalline, liquid krystaliczna, ciekła	liquid ciekła	liquid ciekła
Raw material input Surowiec	sucrose (sugar beet, cane) sacharoza (buraki cukrowe, trzcina)	starch (corn, wheat, potatoes) skrobia (kukurydza, pszenica, ziemniaki)	inulin ¹ (chicory) inulina ¹ (cykoria)

¹Inulin is an amyloid polysaccharide which can be found in roots of many plants such as Jerusalem artichoke or chicory.

¹Inulina jest polisacharydem skrobi, który występuje w korzeniach wielu roślin, takich jak topinambur lub cykoria.

Here no technical problems occur during the production processes. A further advantage of isoglucose is, that the production costs are far below those of the common sugar production in the EU. With a reform of the CMOS isoglucose would probably replace sugar in many areas due to its low production costs.

The most important types of **dietetic calorie reduced sweeteners** are fructose and polyols. These sweeteners are characterised by low calorie value, a low sweetness level as well as the applicability for diabetics.

Due to a very high sweetness level **high intensity sweeteners** have a growing market share in the sweeteners section. High intensity sweeteners are especially used for producing “light”-products. Besides their favourable sweetness these sweeteners do also show negative characteristics, e.g. metallic taste. Due to this fact the use of high intensity sweeteners in the sugar processing food industry is limited (**Schiweck** 1999).

A new trend in food processing industries is the usage of “blends”. “Blends” are mixtures of different sweetener types, e.g. isoglucose and high intensity sweeteners. The main advantages of “blends” are lower costs in production and processing.

Aim of the study

The objective of the study is to analyse the competitiveness of sugar and alternative sweeteners (in particular isoglucose) in the EU within given and alternative political frameworks of the CMOS. First, the present situation of the European sugar market will be described. Second, the possible impacts of options of the future reform (from 2006) of the CMOS on the EU sugar market will be analysed.

Methodological approach

The evaluation of the competitiveness of sugar and its substitutes in the EU shall be carried out by the identification and comparison of production constraints and production potential of different member states.

For the presentation of the current situation an extensive data collection in all important sugar and isoglucose producing EU member states will be accomplished. Of main importance is the investigation of those factors influencing competitiveness such as production costs of the whole product chain, i.e. from raw material production to processing. The future potential on production of alternative sweeteners and the technical substitution of sugar shall be identified on the basis of an extensive survey of industrial consumers. It is planned to develop different questionnaires for specific applications which will be employed only in those EU countries most important for alternative sweeteners production (see Table 1).

For the derivation of market changes of specific sugar substitutes due to a reform of the European CMOS the collected data will be supplemented by analyses of international sugar markets of countries using different market regulation schemes but showing similar sweetener production and consumption structures (e.g. USA, Canada).

Examples of production structures of sugar and isoglucose producing countries in the European Union

The sugar production of the EU member countries in 2003/04 amounts to 14.3 M. t for the EU-15, plus 2.9 M. t of the EU new member countries. The most important sugar producing countries in the EU are France and Germany sharing almost 50% of the sugar production of the EU-15 and more than 40% of the EU-25. Out of the new member countries (EU + 10) Poland is a significant sugar producer with 10% of the total production quota of the entire EU (see Table 1).

Spain, Belgium/Luxemburg and Germany hold the highest production quotas for isoglucose of the EU-15 quota quantity of 296 434 t. This year in May, Hungary entered the EU with an isoglucose production quota of 137 627 t and thus, it became the largest isoglucose producer of the EU-25. The quota only of Hungary is equal to 46% of the EU-15 total production quota and 67% of the production quota of the new member countries (EU + 10).

The number of sugar and isoglucose producing plants in Germany and Hungary can be seen in Table 4, in comparison to the USA, the world leading isoglucose producer and consumer, as well as sugar producer.

Table 4

Number of sugar and isoglucose producing plants in different countries (Sugar... 2003)
Liczba przedsiębiorstw produkujących cukier i izoglukozę w różnych krajach (Sugar... 2003)

Country Kraj	Sugar Cukier	Isoglucose Izoglukoza
Germany – Niemcy	28	1
Hungary – Węgry	5	1
USA	ca. 60 ok. 60	17

It appears that the isoglucose producers both in Germany and in Hungary have a monopoly position. The monopoly position offers the enterprises an explicit advantage in pricing of isoglucose. In 1997 the price of isoglucose in Hungary was about 270 €/t. Due to the introduction of the national sugar market regulation in Hungary in 2001 the price of isoglucose increased. In 2003 the price reached already 470 €/t. With the implementation of the Common Market Organisation of Sugar of the EU in May 2004 it can be assumed that the isoglucose price will increase up to 580 €/t. The sugar price took an increase as well in the last years. In 1997 the sugar price counted already ca. 580 €/t. Starting with May 2004 Hungarian sugar price will adapt to the EU sugar price of 630 €/t.

The German price of isoglucose is geared to the sugar price as well. The current price of isoglucose (HFCS-55) is approximately 5% below the current sugar price, whereas the Hungarian price is 10% less than the local sugar price. Table 5 shows the current sugar and isoglucose prices for selected countries in comparison to the world market price.

Table 5

Current market prices of sugar and isoglucose (Sugar... 2003, Lindsay 2002, own survey)
Bieżące ceny rynkowe cukru i izoglukozy (Sugar... 2003, Lindsay 2002, badania własne)

Country Kraj	Sugar Cukier (€/t)	Isoglucose (55%) Izoglukoza (55%) (%)
Germany – Niemcy	630	-5
Hungary – Węgry	580	-10
USA	515	-30
World market Rynek światowy	180	- ¹

¹An international trade of isoglucose does not exist because of high transport costs. Therefore, no world market price for isoglucose exists.

¹Międzynarodowy handel izoglukożą nie istnieje z powodu wysokich kosztów transportu, stąd też nie ma światowych cen rynkowych izoglukozy.

As a result of a study (**Sweet fifteen...** 2002) the average production costs in the EU are about 460 €/t for sugar and around 240 €/t for isoglucose. Assuming this production costs it appears that a reform of the European Common Market Organisation of Sugar could cause considerable changes of the sugar and isoglucose production structures, as well as changes in the consumption of both sweeteners.

The present sugar distribution in Germany divided by different recipients can be seen in Table 6. A detailed consumption structure of isoglucose could not be found out due to industries maintaining a low profile. The possible recipients of isoglucose (Table 6) are marked with an X.

Table 6

Sugar sales quantities in Germany by recipients (t of white sugar)
(Jahresbericht 2002/03 2003)
Sprzedaż cukru w Niemczech według odbiorców (t cukru białego)
(Jahresbericht 2002/03 2003)

Recipients Odbiorcy	Sugar 2001/02 Cukier 2001/02
Households – Gospodarstwa domowe	483 242
Processing – Przetwórstwo	2 373 445
Chocolate Czekolada	369 194
Sugar confectionary Wyroby cukiernicze	250 458
Long life bakery products Produkty piekarskie o przedłużonej trwałości	132 202
Bread, pastries Chleb, ciasta	91 842
Nutriments, bakery improvers Pożywki i polepszacze piekarskie	197 471
Spreads, canned fruits and vegetables Pasty, owoce i warzywa konserwowe	174 745
Ice cream Lody	31 934
Dairy products Produkty mleczne	152 449
Wine, champagne Wino, szampan	49 722
Beer, spirituous beverages Piwo, napoje spirytusowe	65 580
Soft drinks, juices, fruit wine Napoje, soki, wina owocowe	478 466
Chemical and pharmaceutical products Produkty chemiczne i farmaceutyczne	26 661
Others Inne	352 721
Unknown recipients – Nieznani odbiorcy	144 549

It is assumed that the structure of sugar and isoglucose sales in Hungary is similar to the one in Germany. The main part of the produced isoglucose is marketed to the (soft) drink industry.

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KONKURENCYJNOŚĆ CUKRU I INNYCH ŚRODKÓW SŁODZĄCYCH W UNII EUROPEJSKIEJ PRZY OBECNYCH I ALTERNATYWNYCH ZAŁOŻENIACH POLITYCZNYCH

Streszczenie

W artykule przedstawiono konkurencyjność produkcji cukru i alternatywnych środków słodzących, a w szczególności izoglukozy, na terenie Unii Europejskiej. Opisano również aktualne oraz zaproponowano nowe, alternatywne założenia polityczne dla CMOS w świetle przyszłej reformy rynku cukru w Unii Europejskiej.