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## **PROSPECTS OF THE POLISH SUGAR MARKET – CHOSEN ISSUES**

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**ABSTRACT.** The aim of the paper is to present the possible development scenarios for Polish sugar industry. Polish sugar industry requires serious reorganization. The only effective way of this process is to apply economic mechanisms (e.g. using one of given scenarios) and support them with foreign capital influx.

**Key words:** sugar, sugar beet, sugar industry, development scenarios

### **Introduction**

From the beginning of the 90's the Polish sugar industry has been very fragmented, especially in comparison to the west-European sugar industry. In 1990, the existing multi-factory companies were divided. As a result, 78 independent factories were established, 70 of which were state-owned. All the sugar factories tried to develop, but, in fact, they were fighting for survival. The State Treasury, being the formal owner of the state-owned companies, had no influence on their rational development in spite of the fact that it was then necessary to make decisions leading to sugar industry concentration and enabling, from the one hand, to develop some of the factories and, on the other hand, to gradually close factories with a less favourable localization after their complete utilization. The existing structure of the industry which is backward, in comparison to the European Union countries, is the effect of such a situation.

### **Current sugar industry condition**

Much lower concentration of sugar production in Poland results in the fact that most of Polish sugar factories diverge drastically from standards adopted in the European

Union. As sugar industry requires much capital and as it is very sensitive to a production scale, low production concentration results in, among others, very low productivity rates of the whole Polish sugar industry. What is more, processes of privatization in sugar industry were carried out extremely slowly. In 1995 – when, on the basis of law regulations, the process of commercialization and reorganization started - as many as 62 sugar factories from 76 existing legally were still state-owned, 5 were operating as one-man state enterprises while 9 were included in 7 companies which were privatized on the basis of a worker-planter privatization (Table 1). After 1995, the current ownership structure of the industry has been shaped as a result of:

- foreign investors entering companies already privatized,
- foreign investors taking part in raising capitals of state-owned sugar companies financially threatened,
- so called regional privatization carried out after 1998,
- establishing Krajowa Spółka Cukrowa S.A. in 2002,
- finalization in 2003, after a lawsuit, of the sale of Śląska Spółka Cukrowa S.A.

Table 1

**Ownership structure of the sugar industry in Poland (%)**  
**Struktura własności przemysłu cukrowniczego w Polsce (%)**

Specification Wyszczególnienie	Former division of the market Poprzedni udział w rynku	Current division of the market Aktualny udział w rynku
Krajowa Spółka Cukrowa S.A.	32.34	39.44
Südzucker	8.50	25.25
Saint Louise Sucre	16.75	
Pfeifer & Langen	15.80	15.80
British Sugar Overseas	10.87	10.87
Nordzucker	8.64	8.64

From an objective point of view, reorganization is a necessary process (competitiveness of sugar industry in the European Union) quitting it, which is highly probable, may prove to be really expensive. According to the causes listed above, a process of reorganization is a difficult one. The Polish sugar industry, as a result of desisting from reorganization process, is not, currently, able to compete with the west-European industry (Table 2).

The cost of a ton of sugar in small, medium and large factories and in Poland are presented in Table 3.

It is possible to draw conclusions similar to those referring to reorganization of sugar factories in connection with a structure and quality parameters of sugar beet cultivation. The number of sugar beet fields (planters) is much too high comparing to the Western Europe and quality and cultivation of crops is territorially diverse. Such big differences can also be noticed as far as profitability of sugar beet cultivation is concerned.

Table 2

**Structure of the sugar industry in Europe**  
**Struktura przemysłu cukrowniczego w Europie**

Country Kraj	Number of factories producing: Liczba zakładów produkujących:			Yearly production for one factory (thous. t) Roczna produkcja na jedną cukrownię (tys. t)
	< 5 (thous. t per 24 h) (tys. t na dobę)	5-12 (thous. t per 24 h) (tys. t na dobę)	> 12 (thous. t per 24 h) (tys. t na dobę)	
France – Francja	3	23	11	120
Germany <sup>1</sup> – Niemcy <sup>1</sup>	2	17	5	125
Germany <sup>2</sup> – Niemcy <sup>2</sup>	1	6	1	125
Great Britain – Wielka Brytania	2	6	1	160
Spain – Hiszpania	3	12	0	80
Belgium – Belgia	0	6	2	125
Poland <sup>3</sup> – Polska <sup>3</sup>	51	5	0	25-35

<sup>1</sup>Without the area of former GDR. <sup>2</sup>Area of former GDR. <sup>3</sup>In the process of change.

<sup>1</sup>Bez obszaru dawnej NRD. <sup>2</sup>Obszar dawnej NRD. <sup>3</sup>W trakcie przemian.

Table 3

**Costs of 1 t of sugar in small, medium and large factories in Poland (EUR)**  
**Koszt wytworzenia 1 t cukru w małych, średnich i dużych cukrowniach w Polsce (EUR)**

Specification Wyszczególnienie	Poland Polska	Small factories Małe zakłady	Medium factories Średnie zakłady	Large factories Duże zakłady
Raw material (sugar beet) Surowiec (burak cukrowy)	216.69	207.40	189.54	206.63
Costs of remunerations Koszty wynagrodzeń	57.87	40.53	48.90	78.71
Costs connected with remunerations Koszty związane z wynagrodzeniami	22.44	19.58	18.47	25.64
Energy – Energia	22.69	15.56	17.94	32.98
Other costs – Inne koszty	50.71	38.72	54.95	48.31
Depreciation – Deprecjacja	21.72	15.41	17.49	32.26
Taxes – Podatki	9.17	4.37	8.29	14.69
Interests – Odsetki	38.79	28.37	26.93	58.78
The sum of costs – Suma kosztów	440.62	369.95	382.52	498.01

## Sugar beet cultivation

Natural, high production values of soil constituted a basic criterion while deciding upon taking up sugar beet cultivation on a farm and while popularizing this idea in Polish regions. First of all, it regarded rich soil (chernozem) of such districts as: Wrocław, Szamotuły, Kościan, Sandomierz, Sochaczew, and Zamość.

In the 80's, the Ministry of Agriculture and Food drew up indexes of evaluation of agriculturally utilized areas. According to this criterion, the following former districts were recognized as exceptionally favourable agricultural lands (having the highest quality index): Zamość, Wrocław, Opole, Kraków, and Elbląg. The districts of Lublin, Przemyśl, Legnica, Tarnobrzeg, and Tarnów were defined as having very favourable quality criterion. The districts of Ostrołęka and Nowy Sącz had the lowest index of value of agricultural lands.

Southern and western districts can be characterized as having the longest vegetation season. In these districts there is also the most favourable water balance during vegetation season of sugar beet. Temperature of active vegetation (more than 10°C) occurs from the end of April until the beginning of October, depending on the region, and lasts, on average, more than 150 days. On the area of majority of the districts sums of active temperatures meet the needs of sugar beets.

The main, biggest region of beet and sugar production, mid-west macroregion includes the districts of: Opole, Śląsk, Wielkopolska, Kujawy, and Pomorze Gdańskie. The area of the districts constitutes more than 60% of the general area of sugar beet cultivation in Poland (Fig. 1).

There was an analysis carried out in three Polish regions: Wielkopolska, Dolny Śląsk, Podkarpacie. The analysis referred to costs of sugar beet cultivation and profits in comparison to rival crops such as wheat and rape.

Table 4 shows the profitability of sugar beet cultivation in the described regions and in Poland. The Table shows that the district of Dolny Śląsk is the best as far as profitability of sugar beet cultivation is concerned in comparison to the analysed regions.

**Table 4**  
**Profitability of sugar beet cultivation in the regions and in Poland (EUR/ha)**  
**Oplacalność uprawy buraka cukrowego w wybranych regionach i w Polsce (EUR/ha)**

Specification Wyszczególnienie	Wielkopolska	Dolny Śląsk	Podkarpacie	Poland Polska
Income Przychód	1 161.80	1 214.90	1 049.32	1 112.28
Gross margin Marża brutto	407.84	468.74	382.04	404.05
Profit Zysk	-136.15	-91.31	-161.27	-128.41

Table 5 shows profitability of sugar beet cultivation in comparison to alternative crops (wheat and rape) in some individual regions and in Poland. The analysis carried out shows that in every given region sugar beet is the most profitable to cultivate. The

Table 5

**Comparison of profitability of crops (EUR/ha)**  
**Porównanie opłacalności wybranych upraw (EUR/ha)**

Specification Wyszczególnienie	Sugar beet Burak cukrowy	Wheat Pszenica	Rape Rzepak
<b>Poland</b>			
<b>Polska</b>			
Income Przychód	1 112.28	534.84	403.20
Gross margin Marża brutto	404.05	215.19	20.79
Profit Zysk	-128.41	-121.44	-306.56
<b>Wielkopolska</b>			
Income Przychód	1 161.80	650.00	423.34
Gross margin Marża brutto	407.84	236.46	18.73
Profit Zysk	-136.15	-167.83	-357.37
<b>Dolny Śląsk</b>			
Income Przychód	1 214.90	676.50	472.80
Gross margin Marża brutto	468.74	351.84	96.27
Profit Zysk	-91.31	-3.84	-237.05
<b>Podkarpacie</b>			
Income Przychód	1 049.32	495.00	337.50
Gross margin Marża brutto	382.04	188.71	38.44
Profit Zysk	-161.27	-127.99	-278.24

cultivation of wheat turns out to be only a bit more profitable in Dolny Śląsk (analysis on the level of profit).

In all three regions, wheat is the most competitive crop in comparison to sugar beet (analysis on the level of profit).

On the level of gross margin, cultivation of sugar beet outstrips significantly both rival crops (Figs 2, 3, 4).

### Possible scenarios of industry development

The process of production concentration (subject and object perspective) is the only effective instrument for sugar companies to remain on the national market and for the Polish sugar industry to remain on the European market. In most scenarios, which are possible to foresee (Table 6), sugar beet cultivation is more profitable comparing to alternative crops and large sugar factories (100 000-150 000 t of sugar production)

**Table 6**

**Main scenarios of sugar industry development between 2004 and 2006 and after 2006**  
(exchange rate: 1 EUR = 4 PLN)

**Główne scenariusze rozwoju przemysłu cukrowniczego w latach 2004-2006 i po 2006 roku**  
(kurs wymiany: 1 EUR = 4 PLN)

Scenario Scenariusz	Limits of sugar production Limity produkcji cukru (t)		Sugar intervention price Cena interwencyjna na cukier (EUR/t)		Sugar beet price Cena buraka cukrowego (EUR/t)		Notes Uwagi
	limit A	limit B	limit A	limit B	limit A	limit B	
1	2	3	4		5	6	7
0	1 520 000	102 200	462.50		30.71	21.31	continuation of conditions, which have been existing so far in the Polish sugar industry during 2003/04 campaign kontynuacja warunków z roku 2003/04 dla polskiego przemysłu cukrowniczego
I	1 580 000	91 926	631.90		46.72	28.84	conditions currently binding in the European Union and amounts of limits negotiated by Poland warunki łączące sytuację UE i limity wynegocjowane przez Polskę
II	1 580 000	91 926	519.10			28.84	levelling prices of sugar beets A, B to the amount B and decreasing sugar intervention price, production margin remains the same – only the price of sugar beet decreases zrównanie cen dla A i B do poziomu kwoty B i spadek ceny interwencyjnej, marża produkcji zostaje taka sama, tylko cena buraka spada
III – 13%	1 374 600	79 976	631.90			47.67	reduction of sugar production limits and, in consequence, reduction of sugar beet cultivation areas by about 13%; the price of A and B sugar beets is the same, the intervention price remains the same redukcja limitów produkcyjnych i w konsekwencji redukcja obszarów uprawy mniej więcej o 13%; cena buraków A i B jest taka sama oraz cena interwencyjna pozostaje bez zmian

Table 6 – cont.

1	2	3	4	5	6	7
III – 25%	1 185 000	68 945	631.90		47.67	reduction of sugar production limits and, in consequence, reduction of sugar beet cultivation areas by about 25%; the price of A and B sugar beets is the same, the intervention price remains the same redukcja limitów produkcyjnych i w konsekwencji redukcja obszarów uprawy mniej więcej o 25%; cena buraków A i B jest taka sama oraz cena interwencyjna pozostaje bez zmian
III – 45%	869 000	50 559	631.90		47.67	reduction of sugar production limits and, in consequence, reduction of sugar beet cultivation areas by about 45%; the price of A and B sugar beets is the same, the intervention price remains the same redukcja limitów produkcyjnych i w konsekwencji redukcja obszarów uprawy mniej więcej o 45%; cena buraków A i B jest taka sama oraz cena interwencyjna pozostaje bez zmian
IV	–	–	284.36 (–55%)		21.45 (–55%)	eliminating sugar production amounts, retaining custom protection, reducing the sugar intervention price and sugar beet price by about 55% likwidacja kwot cukrowych, zachowanie ochrony, obniżenie ceny interwencyjnej dla cukru i buraków cukrowych mniej więcej o 55%

ensure financial surplus guaranteeing sources for indispensable modernization and sugar factory development. Economic simulations carried out for scenarios of changes in the European sugar industry and in the chosen regions (Dolny Śląsk, Podkarpacie and Wielkopolska) indicate a relatively big reserve of profitability of sugar beet cultivation with regard to alternative crops (wheat and rape).

In May 2004, Poland joined the European Union. It is necessary to define directions of changes in the sugar industry and its derivatives as far as industry regulations currently applied in the European Union are concerned. Current solutions binding in the European Union will be valid until 2006. It is, then, necessary to define possible direction of changes in the field of sugar market regulation and their effects on operation of sugar industry and sugar beet cultivation in Poland.

### Conclusions on sugar beet cultivation

For the scenarios from 0 to III, the highest profitability of production (gross margin) can be seen in the region of Dolny Śląsk, while the lowest profitability in the region of Podkarpacie (in this case, it is lower than the average for the whole Poland). In the sce-

nario number IV, we can see significant changes in comparison to profitability of alternative crops. With such a dramatic reduction of the sugar beet base price, wheat gross margin will be higher than gross margin of sugar beet cultivation. Analyzed regional disproportions in crops profitability will not undergo any change in any of the scenarios.

In scenario I, introduction of mechanisms applied in the European Union will lead to an increase in gross margin and in profitability of sugar beet cultivation with regards to alternative crops (wheat and rape) (Table 7). Sugar beet cultivation will become a source of extraordinary allowance resulting from the mechanism of retaining alternative crops gross margin, with regards to sugar beet cultivation, with a simultaneous, irregular increase in sugar beet cultivation profitability.

**Table 7**

**Calculation of sugar beet cultivation profitability in the individual scenarios for Poland**  
**Kalkulacja opłacalności uprawy buraka cukrowego według poszczególnych scenariuszy dla Polski**

Specification Wyszczególnienie	Scenario – Scenariusz				
	0	I	II	III	IV
Sugar beet price (EUR/t) Cena buraka cukrowego (EUR/t)	32.0	48.6	30.6	50.6	22.8
Income (EUR/ha) Przychód (EUR/ha)	1 289.61	1 958.40	1 234.89	2 041.17	918.53
Gross margin (EUR/ha) Marża brutto (EUR/ha)	581.37	1 250.17	526.66	1 332.94	210.29
Profit (EUR/ha) Zysk (EUR/ha)	48.91	717.70	-5.80	800.48	-322.17

Realization of scenario II will lead to a decrease in gross margin (a measure of sugar beet cultivation profitability). In spite of a decided decrease in the sugar beet base price, their cultivation is still the most profitable (rape as well as wheat generate unequivocal lower profit on the level of comparison of gross margin and profit – in the case of sugar beet cultivation loss is the lowest).

Realization of scenario III leads to reduction of cultivation areas; at the same time, alternative crops (alternative crops are cultivated instead of sugar beet) do not compensate for incomes which farmers have been gaining so far. In the case of scenario III, there will be an unfavourable relocation of farmers' incomes. There will be no change in regional diversity of agricultural incomes (sugar beet, wheat, rape). A decrease in sugar beet cultivation areas is a serious consequence of implementing the given scenario. Assuming that changes will be proportional, estimated loss of farmers, being a result of scenario III implementation, will amount to no less than:

- a) with crop reduction by 13% – EUR 44 M. at a scale of the whole Poland,
- b) with crop reduction by 25% – EUR 84 M. at a scale of the whole Poland,
- c) with crop reduction by 45% – EUR 152 M. at a scale of the whole Poland.



## **Conclusions regarding sugar factories**

In every scenario, large sugar factories have the highest total costs for a ton of sugar, while small factories have the lowest costs. The reasons of such a paradox should be looked for in high costs of work in large factories (social character of employment) and in irrational policy of energy cost evaluation.

In scenario I, an irregular increase in sugar price (intervention price will raise by no less than 35%) will guarantee operating profitability to sugar factories. Paradoxically, small sugar factories will experience the highest increase in operating results, while large factories will experience the lowest increase. Such a paradox may lead to continuation of desisting from reorganization in the Polish sugar industry.

In scenario II, changes have also symmetrical character, which means that only operating results will be decreased. Its diversity will not undergo any changes.

In scenario III (-13%, -25%, 45%), there will be a proportional decrease in operating results; at the same time, unfavourable relations existing so far will be retained (the highest profitability in small factories and the lowest in large ones). Analyses carried out indicate that when production limits are reduced by 25%, sugar factories will find themselves on the verge of production profitability, which may, in turn, lead to unfavourable, from economic point of view, mechanisms of state intervention (profitability levelling). Undoubtedly, factories will not be able to gain any surplus necessary for modernization. Analyses carried out show that when sugar production limits are decreased by 45%, large factories will make losses.

In scenario IV, only small sugar factories will be profitable. Analyses carried out indicate that sticking to custom regulations, which are currently binding, will protect the Polish market from sugar import (Table 8).

## **Conclusions on scenarios**

### **SCENARIO 0**

- if the scenario is carried out, obsolete production structure and low work effectiveness together with high consumption of energy while manufacturing sugar, will be preserved;
- there are no mechanisms which would streamline sugar beet cultivation structure (significant dispersion of farms, their small size) with lack of alternative crops, at the same time;
- if the scenario is continued, the Polish sugar industry will not be able to find financial means for development and possibilities of reducing debts (left over from the previous times) should be assessed as very limited.

Sticking to solutions applied so far (lack of mechanisms adopted in the European Union), may lead to stagnation of the Polish sugar industry with a necessity of regular (every three years, on average) interventions which eliminate surplus of sugar supply (it has been estimated that such a surplus amounts to 10-15% of one year sugar production).

**Table 8**

**Calculation of sugar factories profitability in the individual scenarios for Poland  
(EUR/t of sugar)**  
**Kalkulacja rentowności cukrowni według poszczególnych scenariuszy dla Polski  
(EUR/t cukru)**

Specification Wyszczególnienie	Scenario – Scenariusz						
	0	I	II	III – 13%	III – 25%	III – 45%	IV
Sugar intervention price Cena interwencyjna cukru							
Poland Polska	462.5	631.9	519.1	631.9	631.9	631.9	284.36
Total costs Koszt							
Poland Polska	435.17	545.46	424.89	564.91	571.87	590.21	377.01
Bracket Przedział	376.86- -496.11	488.47- -604.69	366.90- -485.42	506.09- -626.47	510.67- -636.49	522.72- -662.90	316.93- -440.25
Profit made Zysk							
Poland Polska	73.58	132.69	140.46	113.24	106.28	87.94	-46.41
Bracket Przedział	15.96- -131.3	76.78- -189.09	83.25- -197.86	55.00- -171.46	44.98- -166.89	18.57- -154.84	106.33- -13.09

A necessity of reorganization of the Polish sugar industry results not only from objective conditions (changes in the European Union industry), but it is a subjective consequence of a very bad financial situation of Polish sugar factories, especially those which have not yet initiated a process of reorganization of costs and production concentration.

Economic analyses indicate that shortage of capital requires its influx from the outside sources (direct foreign investments).

#### SCENARIO I

- implementation of the European Union solutions on the sugar market (sugar beet base prices and sugar intervention prices) may lead to a paradox of quitting reorganization;
- irregular increase in sugar beet cultivation profitability may result in the fact that desirable mechanisms of crop concentration (reducing a number of planters with simultaneous mechanism of increasing plantation areas) may turn out to be ineffective;
- paradoxes of sugar production costs (social character of employment and high consumption of energy during sugar production) may be preserved. That will

result in the lack of competitiveness and to generating financial surplus insufficient for industry development.

Irregular increase in sugar beet cultivation profitability and operating profitability of sugar factories may lead to curbing reorganization processes (concentration of production).

Lack of reorganization mechanisms in the Polish sugar industry will make, in a relatively short time, it uncompetitive on the European sugar market and, in consequence, may cause a very rapid bankruptcy phenomena which will be strengthened by a fact that the supply on the Polish sugar market will still be bigger than the demand (production will be bigger than national needs plus foreign commercial balance).

#### SCENARIO II

- reduction of sugar intervention price and reduction (levelling) of sugar beet base price will not lead to changes in relations of analysed numbers (gross margin in the case of sugar beet cultivation from regional perspective and in comparison with alternative crops profitability and with operating results of small, medium and large sugar factories);
- sugar beet cultivation is still more profitable than alternative crops;
- sugar factories are less able to finance investment needs themselves; sugar production profitability may still fuel desisting from reorganization processes.

Simple reduction of intervention prices (sugar) and base prices (sugar beet) will not force the Polish sugar market to introduce mechanisms of production concentration in such a way as to ensure that the industry is competitive with the west-European sugar industry.

Possibilities of sugar beet cultivation reorganization should also be considered with scepticism.

#### SCENARIO III

- reduction of sugar production limits with no major changes in sugar intervention prices and only with levelling of base prices of sugar beet B with base prices of beet A will not introduce significant mechanisms forcing the Polish sugar market to initiate reorganization process (changes in raw materials and production base);
- reduction of production limit will result in an unfavourable, for farmers, relocation of incomes (incomes from alternative crops will not compensate for loss of incomes caused by a decrease in sugar beet cultivation areas);
- reduction of operating results of sugar factories is not sufficient as to induce introduction of economic mechanisms of sugar industry reorganization.

An option of reduction of sugar production limit by 13% will only cause a stabilization of the Polish sugar market (levelling of supply with demand) not inducing introduction of effective mechanisms of reorganization on the sugar market.

An option of reduction of sugar production limit by 25% and 45%, apart from stabilization of the Polish sugar industry (levelling of supply with demand), may induce reorganization mechanisms on the sugar market. However, it must, be taken into consideration that state intervention directed towards levelling of sugar factories profitability or significant delay in necessary reorganization processes will be the most probable mechanisms.

At the same time, it is certain that in scenario III costs borne by agriculture (partial loss of incomes) are not effective, which means that they will not guarantee industry reorganization (mechanisms of state intervention are more probable). It is also essential that, with such a dramatic reduction of sugar beet cultivation areas (by 45%), there is little likelihood that cultivation of alternative crops on the equivalent area will guarantee farmers sale of the crops (a problem with demand for wheat and rape). It can be assumed that, in this case, it will be necessary for farmers to look for other uses of the land, including making land lie fallow.

#### SCENARIO IV

- the most radical option of the Polish sugar market development will lead to essential changes in agricultural production profitability ( a bigger gross margin in the case of wheat than in the case of sugar beet);
- there will be dramatic changes in sugar production profitability, depending on a size of a sugar factory. Large and medium factories will become unprofitable (57% of production potential of the Polish sugar industry).

Sugar beet cultivation will not disappear. There are no alternative crops free from limitations on demand (wheat and rape). It is highly probable that freed prices of sugar beet will cause a decrease in raw materials costs of sugar production (sugar producers will have more freedom of choice of a sugar beet producer).

In the case of sugar producers, the aforementioned state intervention seems not very probable (costs of such actions concerning 57% of sugar producers could turn out to be too high). It is obvious that, in the described case, reorganization changes will be induced. Analyses carried out indicate, however, that with no influx of foreign capital, necessary changes will be difficult or even impossible to carry out.

Calculations show that with a threshold price, obtained by sugar producers, amounting to EUR 284.36 for a ton, guaranteeing 5% production profitability would require lowering a sugar beet price to EUR 12.63 for a ton, which means quitting sugar beet cultivation. In order to ensure that sugar beet cultivation is as profitable as wheat cultivation, it would be necessary to fix a sugar beet price so that it amounts from EUR 21.45 to 27.80 for a ton of sugar beets. For the sugar market, it would mean a necessity of fixing sugar price in a price bracket of EUR 349.61-397.19 for a ton. It leads to the conclusion that solutions accepted in scenario IV require modifications – their acceptance means desisting from sugar beet cultivation or slump in economic situation of sugar producers.

Price differentials described here, indicate, unambiguously, that the Polish sugar industry faces necessity of profound reorganization changes. If the said changes are desisted from or delayed, the industry may collapse (it will not be competitive enough with the west-European sugar industry).

It cannot be contradicted that resignation from any sugar market regulations (apart from custom protection) will lead to a decrease in sugar beet cultivation profitability and a price ensuring sugar producers cost reimbursement may achieve level insufficient for realization of necessary financial surplus. At the same time, it is not out of the question that lack of custom protection may lead to a decline in the sugar industry in Poland and in Europe. The only way to counteract is to raise production scale (to lower unit costs of sugar production), bearing in mind limits occurring in this field (infrastructure, ecology, regional division of sugar beet cultivation).

### Conclusions resulting from a chosen sugar factory analysis

Economic results of sugar factory X prove that reorganization plans of the Polish sugar industry are reasonable (Table 9). Since 2000, X has been following an extensive process of reorganization involving the changes given in the Figure 5.

**Table 9**

**Sugar factory X before and after the reorganization and Poland (on the basis of the data obtained from X factory and other data)**  
**Cukrownia X przed reorganizacją i po reorganizacji oraz Polska (na podstawie danych otrzymanych z cukrowni X i innych danych)**

Specification Wyszczególnienie	1999	After reorganization Po reorganizacji
Production limit (A + B amount) (t) Limit produkcyjny (wielkość A + B) (t)		
Poland – Polska	18 895	24 991
Sugar factory X – Cukrownia X	28 300	68 494
Sugar production (t) Produkcja cukru (t)		
Poland – Polska	23 756	31 046
Sugar factory X – Cukrownia X	36 080	68 494
Average sugar beet processing during 24 h (t) Przeciętna wydajność w ciągu doby (t)		
Poland – Polska	3 000	3 205
Sugar factory X – Cukrownia X	4 500	5 300-5 600
Sugar production for one employee (t) Produkcja cukru na jednego pracownika (t)		
Poland – Polska	80.80	115.06
Sugar factory X – Cukrownia X	113.81	391.39
Consumption of limestone (% of sugar beet) Zużycie wapna (% buraków cukrowych)		
Poland – Polska	4.76	4.29
Sugar factory X – Cukrownia X	3.90	2.66
Consumption of energy per 1 t of sugar beet (kW·h) Zużycie energii na 1 t buraków cukrowych (kW·h)		
Poland – Polska	30.12	28.79
Sugar factory X – Cukrownia X	32.25	21.14

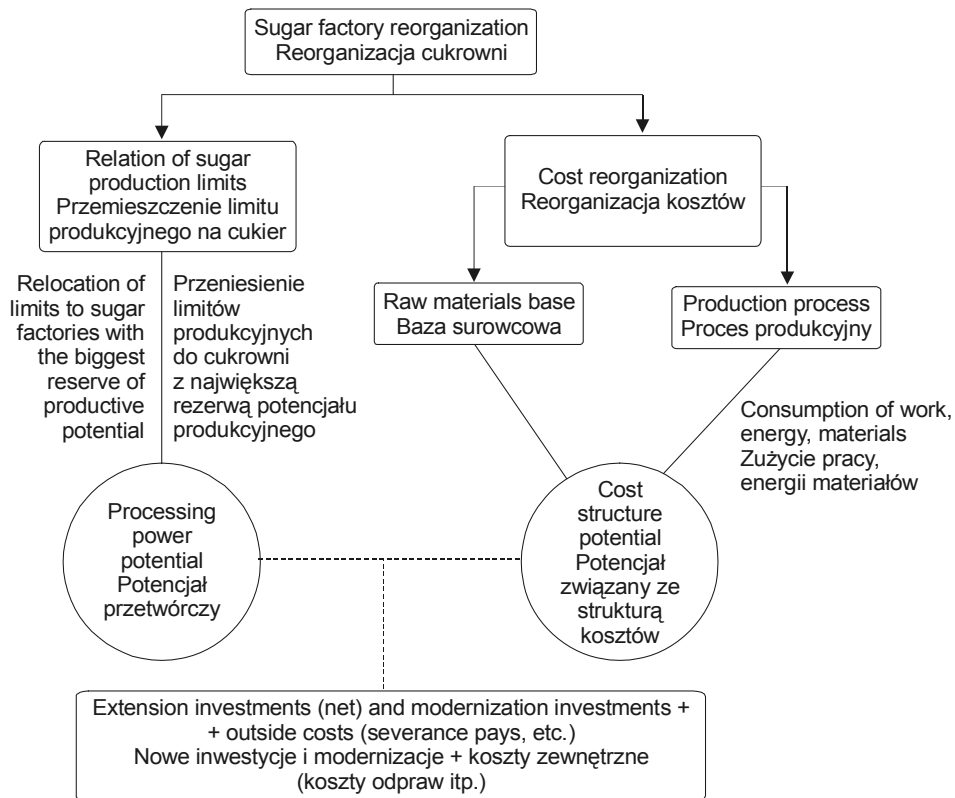


Fig. 5. Sugar factory reorganization  
Ryc. 5. Reorganizacja cukrowni

Application of reorganization mechanisms above-mentioned has given the following effects:

- a reduction of number of sugar beet planters,
- an increase in area of an average plantation,
- an increase in sugar beet yield,
- a decrease in a general cultivation area,
- a reduction of employment,
- a rise in sugar production,
- an increase in sugar beet processing during 24 h,
- an improvement in sugar beet quality parameters,
- a radical reduction of costs of energy and raw materials.

Average incomes from 1 t of sugar obtained by X are about 0.2-0.3% lower than the average in Poland. However, as far as total costs for 1 t of sugar are concerned, they are much lower in X than the average for Poland, what is presented in Table 10.

The given data indicates that the process of sugar production concentration is absolutely indispensable to the process of sugar beet cultivation concentration.

**Table 10**

**Comparison of total costs of X factory to the average for Poland in the individual scenarios**  
**Porównanie kosztów całkowitych cukrowni X do średnich w Polsce w poszczególnych**  
**scenariuszach**

Scenario Scenariusz	Total costs for 1 t of sugar are lower in X than the average for Poland by about: Koszty 1 t cukru z cukrowni X są niższe od przeciętnej w Polsce mniej więcej o: (%)
0	10.4
I	8.5
II	10.5
III – 13%	8.6
III – 25%	8.9
III – 45%	9.7
IV	12.1

While considering options of sugar industry development in Poland, it can be concluded that the following phenomena are highly probable (when approaching option IV):

- firstly, deterioration of sugar production and sugar beet cultivation profitability together with phenomenon of accepting offers, made by sugar beet producers to sugar producers, according to the lowest price,
- intensification of reorganization processes in sugar industry (sugar producers) with effects of scale effectiveness (production concentration),
- intensification of reorganization processes within the confines of already existing parameters of sugar factory operations (streamlining costs and, in consequence, elimination of paradoxes described above).

### **Simulations of effects of the option IV introduction**

In scenario IV, assuming that the price of sugar beet is lowered, wheat, but not rape, becomes a rival crop. While calculating profits for farmers in all described regions, it is more profitable to cultivate wheat. While calculating gross margin, farmers in Dolny Śląsk and Podkarpacie gain more profits cultivating wheat, but farmers in Wielkopolska cultivating sugar beet.

An analysis has been carried out. Profitability of sugar beet cultivation in scenario IV has been compared to other crops. As in scenario IV there is a better profit on wheat than on sugar beet in every Polish region, it has been calculated how much a farmer would have to be paid for sugar beet so that profits on sugar beet achieve the same level as profits on wheat. Table 11 illustrates the results.

It has been also calculated how much sugar would cost so that, with the average Polish price or sugar beet amounting to EUR 28 for a ton, sugar factories could gain 5% profit. Table 12 shows calculations for Poland. As it can be concluded, with the average sugar beet price in Poland amounting to EUR 28 for a ton, as assumed in scenario IV, a sugar

Table 11

**Sugar beet prices – scenario IV**  
**Ceny buraków cukrowych – scenariusz IV**

Price – Cena (EUR/t)	Wielkopolska	Dolny Śląsk	Podkarpacie	Poland Polska
Sugar beet price Cena buraka cukrowego	23.3	22.8	22.1	22.8
A price of sugar beet necessary to level profits on sugar beet and wheat Cena buraka cukrowego zapewniająca taki sam poziom zysków dla buraka cukrowego i pszenicy	26	29	32	28

Table 12

**Influence of scenario IV on the Polish sugar industry with such a price of sugar beet  
as to level profits gained from sugar beet and wheat (EUR)**  
**Wpływ scenariusza IV na polski przemysł cukrowniczy przy cenie buraków cukrowych  
zapewniającej opłacalność uprawy (EUR)**

Formula Formuła	Specification Wyszczególnienie	Value Wartość
1.	Cost of sugar beet purchase for a 1 t of sugar Koszt zakupu buraków cukrowych na 1 t cukru	199.80
2.	Total costs borne by a sugar factory for a 1 t of sugar Koszty 1 t cukru generowane przez cukrownię	423.74
3. = 1.05 × 2.	Income made on a 1 t of sugar when gross profitability 5% Przychód generowany na 1 t cukru przy zysku brutto 5%	444.93
4.	Income made on molasses and beet pulp on 1 t of sugar Przychód generowany na melasie i pulpie cukrowej przypadającej na 1 t cukru	46.25
5. = 3. – 4.	Income from a 1 t of sugar Przychód na 1 t cukru	398.68

factory would have to sell a ton of sugar for EUR 398.68 in order to gain 5% profitability. However, as it has been previously shown, cultivation of sugar beet at a price of EUR 28 for a ton is, for planters, as profitable as wheat cultivation, on the level of income. If a price of sugar beet was lower than EUR 28 for a ton, sugar beet cultivation would be replaced with wheat cultivation. If a price of sugar beet was higher than EUR 28 for a ton, it would be more profitable for farmers to cultivate sugar beet than wheat.



### **Minimal price of sugar and sugar beet in scenario IV**

The author of the thesis has calculated how much a price of sugar beet would have to be so that, with an intervention price amounting to EUR 284.36 for a ton, sugar factories could achieve 5% gross profitability. The calculations have been done exclusively for Poland. There were three factors taken into consideration while doing calculations: income on a sale of a ton of sugar, total costs for one ton of sugar, and a cost of sugar beet purchase borne by a sugar company for a ton of sugar. A cost of sugar beet purchase, which in Poland amounts to EUR 153.08 for a ton of sugar, has been calculated basing on an assumption that a sugar factory pays EUR 21.45 for a ton of sugar beets. It can be concluded from the calculations that, when an intervention price amounts to EUR 284.36 for a ton and a sugar beet price amounts to EUR 21.45 for a ton, as assumed in the scenario IV, a sugar company will suffer loss of EUR 46.40 for a ton of sugar. If a sugar factory was to achieve 5% gross profitability, with a sugar price amounting to EUR 284.36 for a ton, it would have to pay planters EUR 12.63 for a ton of sugar beet.

In consequence, it would be necessary to lower sugar beet price from EUR 21.45 for a ton to EUR 12.63 for a ton, which could bring about a complete change in sugar beet cultivation profitability. Assuming that a minimal price of sugar beet amounted to EUR 12.63 for a ton, sugar beet planters would suffer loss of both gross margin and profit. Thus, sugar beet cultivation would become completely unprofitable, comparing to alternative crops.

Moreover, it has been calculated that, with a price of sugar beet amounting to EUR 21.45 for a ton, as assumed in scenario IV, a sugar company would have to sell sugar for EUR 349.61 for a ton in order to achieve 5% gross profitability. Nevertheless, as it has been previously described, cultivation of sugar beet at a price of EUR 21.45 is unprofitable for farmers and it would be replaced with wheat.

### **Conclusions**

1. For many years, Poland has been experiencing a surplus of sugar production over the demand for it.

2. The demand for sugar in Poland does not raise; there is a downward trend of sugar consumption in households and upward trend in industry. Sugar production belongs to the most regulated industries in Polish and European economies. Polish regulations are becoming more and more similar to the ones binding in the European Union. However, it is since 2004 that Poland will be able to take advantage of better prices guaranteed in the EU.

3. Extent of concentration of sugar production in Poland differs drastically from the standards adopted in Europe. Polish sugar factories are much smaller and technologically older than their rivals in the EU. In consequence, productivity of resources involved is much lower than in Europe.

4. Polish sugar industry has at its disposal a surplus of production capacity estimated as 35-40%.

5. Bigger European concerns, as well as those of a similar size, are well prepared to take advantage of possibilities created by the European Union regulations. Thus, currently, they are rivals on the Polish market. The concerns have already made use of higher prices in their countries and of a competitive advantage they have on the Polish market, which is a result of their greater financial possibilities and more profound reorganization changes introduced in their production base.

In the case of the Polish sugar industry, the only effective way of reorganization is to apply economic mechanisms (a choice of an appropriate scenario from the ones given above) and support them with foreign capital influx. Effectiveness of the changes has been proved by economic practice and illustrated in this thesis with economic results of a sugar factory which is currently undergoing a process of reorganization.

## PERSPEKTYWY POLSKIEGO RYNKU CUKRU – WYBRANE ZAGADNIENIA

### S t r e s z c z e n i e

Celem artykułu jest zaprezentowanie możliwych scenariuszy rozwoju polskiego przemysłu cukrowniczego, który wymaga niezbędnej reorganizacji. Jedynym racjonalnym rozwiązaniem tego problemu jest zastosowanie mechanizmów ekonomicznych oraz wsparcie reorganizacji branży przez napływ kapitału zagranicznego. Autor artykułu proponuje zastosowanie jednego z opracowanych przez siebie scenariuszy.