

[DOI: 10.20472/IAC.2017.034.021](https://doi.org/10.20472/IAC.2017.034.021)

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POLISH SUGAR SECTOR AFTER ABOLISHING SUGAR PRODUCTION QUOTAS

Abstract:

The sugar market was one of the most regulated markets in the agri-food sector in the EU, The basis of said regulation was an administrative restriction of supply (production quotas), protectionist foreign trade policies, a minimum procurement price for sugar beet and the reference price of sugar. The sugar sector in Poland has a long tradition and is of great economic social and environmental significance, as well as an important element of the food security policy. Sugar beets are characterized by the greatest productivity per area unit, and by-products are used as fodder or for energy production purposes. The sugar industry is a strategic part of the food economy. Sugar remains the main sweetener, despite the development of the starch syrup and low-calorific sweetener markets. The social importance of the sector results from the fact that sugar beet production remains the source of income for planters, and the sugar industry and numerous service providers create both national income and jobs. Sugar beet cultivations are a crucial element of the sustainable development of agriculture as they increase biodiversity and maintain agricultural land in good condition.

Abolishing production quotas will result in big changes in the sugar sector, which in turn will have multiple economic, social and environmental effects. Accounting for international conditions, including competition from cane sugar and obligations resulting from trade contracts, it is assessed that the sugar balance may undergo significant changes. Under the changing external conditions, the foreign trade policies and international economic relations will have a very significant impact on the situation of the domestic sugar sector. Situational development in the sugar sector should include two basic elements: changes in the EU market after the market regulations reform and changes in the economic situation on the international market, and foreign trade conditions. The significant economic social and environmental importance indicates that future policy with regards to the sector should include solutions which will allow to maintain sugar beet cultivation and sugar production at least in the most effective and competitive regions of the country.

Keywords:

sugar beets, sugar, sugar sector, market, market regulations, competition

JEL Classification: D20, D40, C10

1 Economic and Environmental Importance of the Sugar Sector

The sugar industry in the EU has long traditions and great economic significance, as it is a strategic part of the agri-food sector in Poland. The first sugar refinery converting sugar beet in Europe was launched by F.C. Achard in 1801 in Konary in Lower Silesia [Łuczak 1981]. Sugar remains the main sweetener in households and the food industry. In 2016, sugar consumption in Poland increased up to 1.75 million tonnes, despite the developing market for other sweetening substances. The consumption of isoglucose, which is the main substitute for sugar, is ca. 0.12 million tonnes [Szajner, Hryszko 2017].

Sugar beet production and processing create jobs and play an important role in regional development. In Poland, the number of planters is ca. 35,000 and the number of jobs in the sugar industry is 3,500. Planters and the sugar industry make use of the services of other companies (e.g. transport, mechanization, seeding, crop protection, fertilizers and trade). Sugar refineries are located in smaller towns and their business operations have a positive effect on the development of the regions.

The sugar industry creates by-products: molasses, pulp, energy (power, biogas) and lime, which constitute ca. 10% of the value added [Řezbová, Belová, Škubna 2013]. By-products are used as: fodder, energy raw materials, and lime is a mineral fertilizer. Cooperation between the sugar industry and agricultural holdings enables effective use of by-products with economic advantage, but is also beneficial for the natural environment. Such cooperation is an example of practices within the scope of sustainable development principles. The growing negative impact of human activities on the natural environment gave rise to the need for sustainable development, which assumes the shaping of relations between economic growth and care for the natural environment. With regards to using renewable energy, it imposed an obligation to meet the criteria of sustainable production on all entities manufacturing biofuels [Renouf, Wegener, Nielsen 2008]. Policy in the scope of biofuels in the EU creates new possibilities for sugar beet. Bioethanol and biogas may be manufactured from entire plants, leaves (alternative for their use as fertilizer), beet pulp and molasses [De Wit, Faaij 2010], [Serra, Zilberman 2013].

Food security encompasses the following aspects: its availability, its use and supply stability. Food should meet health safety standards (food safety). As a result of the 2006-2009 reform, the EU became a net importer and further production decrease will result in a greater dependence on import. The large share of import in the market resulted in the supply-demand situation on the internal EU and Polish markets depending on the situation on the global market. The result may be a growth in price variability, and by extension, of the risk of conducting business operations. In accordance with the Hecksher-Ohlin theorem, the EU and Poland have sufficient resources of means to produce sugar and there is no reason to make the market dependent on import [Hecksher, Ohlin B 1933].

Food quality is determined by the health, flavour and aesthetic qualities, which remain the subject of interest of consumers and producers. Health safety of food depends on multiple stages: production in agriculture and food industry, as well as storage and distribution. Production of "healthy food" in agriculture requires improvement and introducing technologies, including those broadened with elements of environmental protection. A key element of sugar production are sugar beet cultivations, which determine the quality and quantity of the raw materials in the sugar industry. It is in the interest of the planter and producer to observe the cultivation standards, which enable production adjustment to the soil-climate conditions and optimal use of holding potential, and do not disturb the environmental balance. The document laying down the manner of agricultural production in the EU is the Code of Good Agricultural Practices, which includes agrotechnical recommendations and legal standards for agricultural production and environmental protection.

The basis for a balanced agricultural production is crop rotation and fertilizing plants adequately to the type of soil. Plant production should be based on crop rotation, which will ensure soil fertility and protect it against erosion, enable a good yield of crops and will reduce weeding and pathogen development. In connection therewith, results in plant production are less dependent on the use of chemical production means.

The progress of mechanisation, increase in consumption of yield-forming chemical agents and market conditions made many agricultural holdings resign from the classic forms of crop rotation, often reaching to monocultures. Simplified crop rotation, leads to disturbances of the ecological balance in result of intensified occurrence of pathogens, a decrease in soil fertility and weed propagation. An important element of counteracting these practices, are agri-environmental programmes, as along with cross-compliance rules [Uthes, Matzdorf 2013]. The sowing structure determines the diversity of agricultural cultivations. The number of groups of plants cultivated on arable lands provides information on the correctness of plant production organisation. According to the code of good agricultural practice, rational crop rotation should include 3-4 plant species on less dense soils and 4-5 species on denser soils. The sowing structure of field cultivations indicates a high possibility of crop rotation in the scope of considering at least several percent of the share of sugar beet sowings [Wrzaszcz 2014].

In Europe sugar beet is an important element of correct crop rotation, as it favourably affects the environment by increasing the diversity of production, as well as maintaining soil in good condition. It is characterised by the greatest unit production of biomass from an area unit (> 100 t/ha) [Ostrowska, Artyszak 2005]. In cultivation, it is recommended to use organic fertilizers. In this context, the reduction of the sugar beet cultivation area will have an unfavourable impact not only on the market situation, but also on the sustainable development of agriculture. The area of sugar beet cultivation in the world and in the EU has decreased. This tendency, at minimum, requires to be stopped for economic and

environmental reasons. Between 2000 and 2014 the share of sugar beets in the sowing structure in the EU has decreased from 2.1 to 1.2% [CEFS 2014]. In accordance to recommendations, sugar beets should not be cultivated on the same field more often than every 4-5 years. Sugar beets should have a few percent share in the structure of sowings in the EU and Poland, as the sowing structure differs from optimum values.

2 Changes in the market regulations system

Regulations of the EU sugar market were introduced in 1968, and the goals of the market policy were: a guarantee of self-sufficiency, as an element of food safety and a stabilization of prices ensuring the profitability of sugar beet cultivations and the profitability of sugar production¹. Until 2006, the general principles of market regulations did not undergo major changes because of the MacSharry reform [1992] and the Agenda 2000 did not introduce significant changes². Certain changes pertained to foreign trade regulations, as they were a result of the accession of new Member States and the liberalization of global trade in agricultural products on the WTO forum.

Market regulations in the EU were criticized for high prices on the internal market and low international competitiveness, they also failed to encourage planters and producers to reduce costs and improve effectiveness. Subsidised export increased the supply on the global market and prices were low, which negatively affected the economic situation of developing states. In 2005, the WTO questioned EU export subsidies³. The European Commission, taking account of the need to improve sector competitiveness, the position of the WTO and the interests of food market participants, in 2006-2010 introduced a market regulations reform⁴ [Agrosynergie 2011]:

- Production quotas A and B have been combined, which in 2016 was ca. 13.5 million tonnes as compared to 17.4 million in 2005.
- The minimum procurement price for sugar beet has been reduced by 40% to EUR 26.29/t. A decrease in planters' income was compensated by direct payments unrelated to production. Between 2007 and 2014, for this form of support, the EU has been allocating EUR 1542 million annually. Since 2015, the form of support has changed and in some Member States, planters receive payments connected

¹ Council Regulation No 1009/67/EEC of 18 December 1967 on the common organization of the market in sugar.

² Council Regulation (EC) No 1260/2001 of 19 June 2001 on the common organisation of the markets in the sugar sector (L 187/1 30.06.2001).

³ European Communities – Export Subsidies On Sugar, AB-2005-2, WTO, 28 April 2005.

⁴ Council Regulation (EC) No 318/2006 of 20 February 2006 on the common organisation of the markets in the sugar sector. Council Regulation (EC) No 319/2006 of 20 February 2006 amending Regulation (EC) No 1782/2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers. Council Regulation (EC) No 320/2006 of 20 February 2006 establishing a temporary scheme for the restructuring of the sugar industry in the Community and amending Regulation (EC) No 1290/2005 on the financing of the common agricultural policy (L 58/1 28.02.2006).

with production. The intervention price of sugar was replaced with the reference price (EUR 404.4/t.).

- The purpose of the reform was also to restructure the sector. Sugar beet cultivation and sugar production were concentrated in regions with favourable climatic and soil conditions. In order to encourage decreasing production by non-competitive producers, a system of restructuring was introduced, which consisted of renouncing production quotas in exchange for financial assistance. The restructuring fund was supplied by producers by way of restructuring fees. Subsequently, the raised funds were paid to producers in order to alleviate the economic and social effects of stopping production. Under such restructuring assistance, 10% of funds was reserved for planters and entities providing services therefor.
- The reform introduced small changes in foreign trade. The EU market is protected by high customs duties, however, preferential quotas are used, including those granted to economically developing states (ACP, LDC), the Balkan states, and CXL quotas. Export refunds could have been paid as part of the WTO quota, but in 2008 they have been suspended.
- Instruments supporting the maintenance of market balance were not changed. Intervention purchases may be no more than 600,000 tonnes of sugar. The intervention price will be 80% of the reference price. Furthermore, the following actions remained in force: transferring produced surpluses to the following season and support of private storage.

In 2017, the EU introduces another reform of the market regulations, main elements of which will be a liquidation of production quotas and minimum procurement prices for sugar beet, and the production fee⁵. Instruments of foreign trade regulation will undergo minute changes. The EU market will remain protected by high customs duties, but import will be possible in preferential quotas. The WTO allows the EU to export sugar with subsidies, but like in recent years it will not be implemented.

⁵ Regulation (EU) No 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organisation of the markets in agricultural products and repealing Council Regulations (EEC) No 922/72, (EEC) No 234/79, (EC) No 1037/2001 and (EC) No 1234/2007 (L 347/672 20.12.2013).

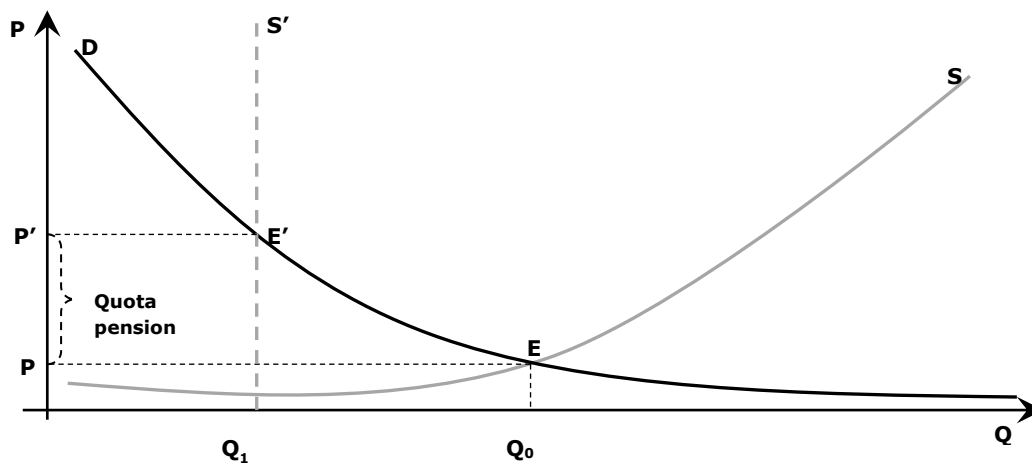
Table 1. Selected Elements of Sugar Regulation

Market Regulations	Current	Proposed
Production Quotas	YES	NO
Managing out-of-quota sugar	YES	NO
Reference Sugar Price	EUR 404.4/t.	NO
Minimum Sugar Beet Procurement Price	26.29 EUR/t.	NO
Production Fee	12.00 EUR/t.	NO
Sugar Price Monitoring	YES	YES
Import	Prohibitive Customs Duties. Preferential Quotas: LDC, ACP, CXL, Balkan States.	Prohibitive Customs Duties. Preferential Quotas: LDC, ACP, CXL, Balkan States.
Export	YES	YES
Permits for Sugar Export and Import	YES	NO/YES (for import within quotas)
Subsidies to Private Storage	YES	YES
Subsidies to Sugar Beet Cultivation Connected with Production	YES	YES

Source: prepared by the author based on data of the European Commission.

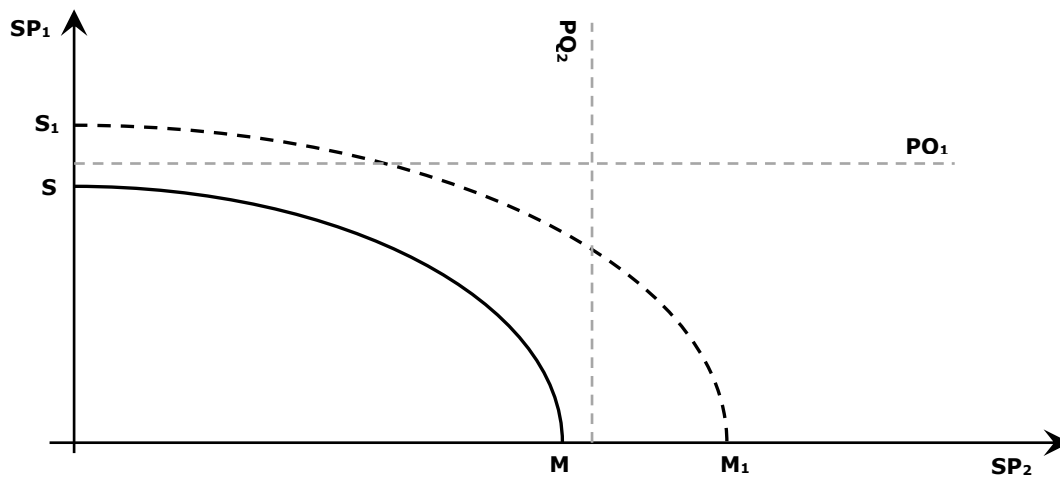
3 Market Regulations Impact on the Sugar Sector

EU market policy in sugar industry constitutes an interference with market laws. The principle of administrative restriction of supply may be illustrated by using the law of supply and demand. Supply curve S and demand curve D determine market balance E. If the balance price P is low and does not guarantee profitability of production, and if the supply $(Q)_0$ is high and problems occur with management thereof, the administration may introduce supply limits. The production quota is "a rigid curve of supply" S. Introducing smaller production limits under conditions of stable demand D sets the new market balance E' and an increase in prices P' ("quota pension"). Economic experiences in the EU showed that introducing production quotas did not guarantee market stabilisation, as both the milk and sugar markets required other market regulation mechanisms (e.g. customs protection, support for export, support for demand on the internal market, managing out-of-quota sugar). Furthermore, the experiences of recent years, including those on the sugar market, show that production quotas did not guarantee price stabilisation. The production quota was less than the production potential of the sugar industry and problems occurred with out-of-quota sugar management. The EU market is connected with the global market, as import has a large share in supply, and out-of-quota sugar was largely exported [Bert, de Bont, 2011], [Nolte, Buysse, Van Hulenbroeck 2012].

Figure 1. Production quota impact on market functioning

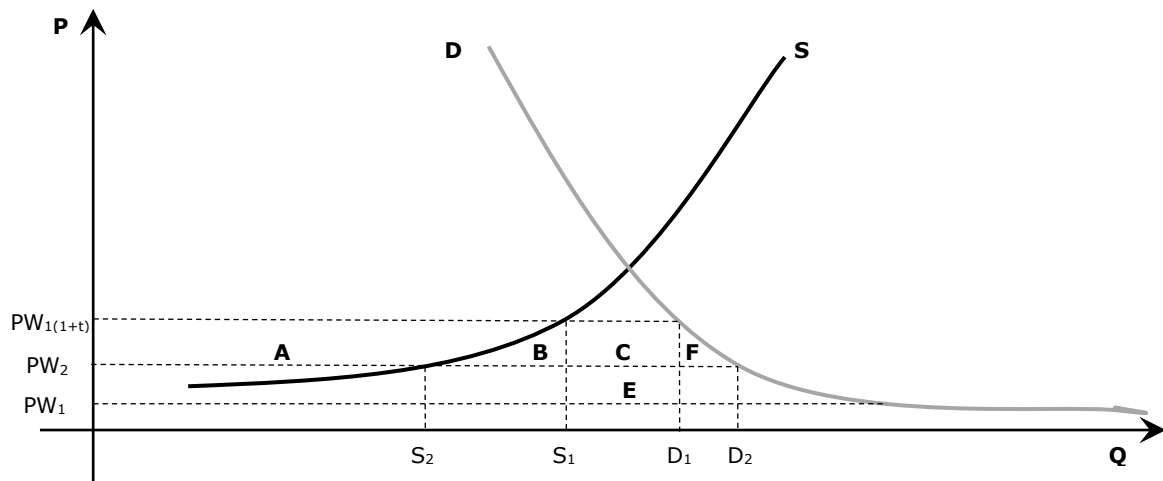
Source: Prepared by IERiGŻ-PIB.

Production quotas will have the meaning in the context of efficiency of management, which is the condition necessary for building competitive advantages. Efficiency will be understood as a maximisation of production resulting from a proper allocation of resources of labour and capital. Efficient allocation is depicted by the limit of production capacity, i.e. maximum production with the resources available. The industry will be effective, if increasing the production of good S requires a reduction in the production of good M. The increase in the production of good S requires larger expenditures and less resources remain that could be spent on the production of good M. Technological progress and restructuring allow to move the production capacity limit from SM to S₁ M₁. Then, it is possible to increase production thanks to managing the resources, which were previously utilized inefficiently. This process may be limited by way of administrative setting of supply limits PQ₁ and PQ₂, which are less than the production capacity limit (sector potential). Business entities need to adjust to such market conditions, by way of restructuring. This may result in distorting the functioning of market mechanisms, and under such conditions, imperfect competition intensifies, which is not a desired phenomenon.

Figure 2. The impact of production quotas on the production–possibility frontier

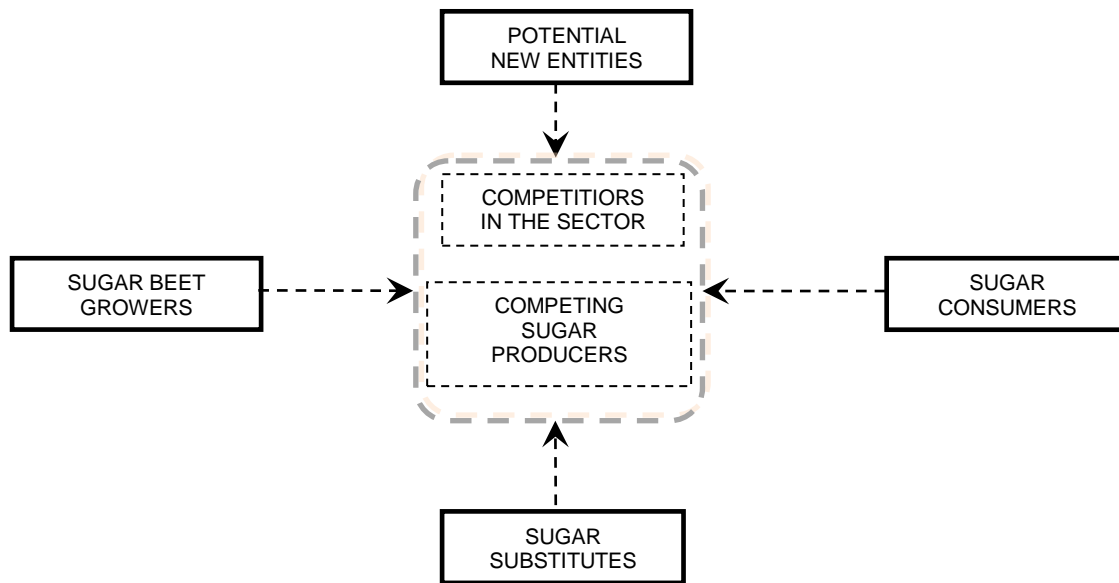
Source: Prepared by IERiGŻ-PIB.

A significant impact on the supply-demand situation on the internal market is had by the situation on the international market [Areté 2011]. If global prices are lower than prices on the internal market, then introducing production quotas is economically sensible only in the case of high customs duties being maintained. Thus, the effectiveness of production quotation depends on other market regulation instruments. The protectionist policy in the sugar industry guarantees maintaining production, however, it has a negative impact on the global market situation. Customs protection is a key element of the regulation. Prices on the internal market PD_1 are a result of the relation between demand D_1 and supply S_1 , and market balance is guaranteed by import $D_1 - S_1$. Prices on the internal market are higher than global prices PW_1 , which is determined by customs duties t and transportation costs. Simplified, the domestic prices correspond to global prices increased by customs duties $PD_1 = PW_{1+t}$. Customs duties reduction causes reactions on the side of supply and demand, as the effect is a decrease in domestic prices PD_2 . Lower prices cause a reduction in supply S_2 , as ineffective producers will not generate profits. The decrease in prices will contribute to an increase in demand D_2 and import $D_2 - S_2$. If the increase of import would be high, it may create an increase in global prices to ED_2 . Reducing the surplus of sugar producers is depicted graphically by area A. At the same time, the consumer surplus increase is depicted by the sum of areas $A+B+C+F$. The decrease in revenues from customs duties $C+F$ negatively affects the budget situation. Effects for the entire economy are reflected by the sum of areas $C+E$, which constitute consumer benefits less producer losses and lower budget revenues [OECD, 2007]. The effects of customs duties reduction in the sugar sector by 70% in connection with the end of the WTO Doha Round and abolishing production quotas, were the subject of analysis, the results of which indicated that the prices of sugar would drop, that further structural changes will be necessary, however, an increase in sugar production is possible [Smit, Helming 2012].

Figure 3. Impact of customs tariffs liquidation on the market situation

Source: Prepared by IERiGŻ-PIB.

Market competition will be a result of the impact of five forces, which may be identified in the sugar sector: competition between sugar producers, the supplier (planters) bargaining power, consumer bargaining power, threat from substitute sweeteners and the threat of new producers entering the market [Porter 2008]. Market regulations have reduced the impact of competition forces. Production quotas were reducing the competition between companies within the industry and excluded new companies from entering the market. The threat from import was effectively limited by a protectionist trade policy. The sugar market in Poland is a classic oligopoly, as four producers manufacture a homogeneous product. Production quotas caused that producers had little room to compete against one another in the scope of production volume (Stackelberg and Cournot models). The competition strategy was based on cost reduction and concentration on the group of recipients (e.g. food industry plants). The position of the sugar oligopoly was strong in relations with planters, despite entering into cultivation contracts, as well as the minimum procurement prices for sugar beet. The demand for sugar in Poland is non-flexible, which is favourable for producers. Other sweeteners have a small share in the market and furthermore, isoglucose production was restricted by the production quota system [Dillen, Dries, Tollens 2006].

Figure 4. Impact of customs tariffs liquidation on the market situation

Source: Prepared by IERiGŻ-PIB.

Liquidation of production quotas fundamentally changes the competition conditions in the domestic sugar industry. Producers are able to compete against one another in the scope of production volume to a greater extent. It should be remembered that the sugar market in the EU and in Poland is dominated by several large producers who possess plants in different Member States. In Poland, four producers are present, with ca. 60% of the market occupied by three German sugar companies. Abolishing production quotas and a possible decrease in production profitability may result in a growth of the concentration of production in the most effective and competitive regions in the EU-15, at the expense of other regions (e.g. in EU-13 states). Concentration of production in certain regions may be favourable in the context of effectiveness, however, at the same time, it creates a threat of the growth of monopolistic practices. Liquidation of production in certain regions will have unfavourable economic, social and agri-environmental results. Restructuring and modernisation transformations of the sugar industry will be necessary, but exclusions from production should only pertain to regions characterised by the least competitiveness.

Change in market regulations does not provide for financial support of restructuring processes. This proposal is correct, as support for restructuring processes could constitute an incentive, to exclude plants and plantation areas from production, which could function in the future. Another issue are the financial means for supporting such a programme. In the 2006-2010 reform, restructuring support was granted with the share of the restructuring fund, which was supplied by premiums paid by sugar producers. The

mechanism proved ineffective, because in certain states, producers paid more premiums than the amount of support they received (e.g. Poland).

Liquidation of production quotas will have a large impact on the functioning of the market in the context of balance. In Poland, the production quota was 1405.6 thousand tonnes and was smaller than the demand (1750 thousand tonnes) and the production potential of the sector (2300 thousand tonnes). Previously, market demand was covered by domestic production only to a small degree, as out-of-quota-sugar was exported, or included in quota production for the next season. An important role in market supply was played by import (200-250 thousand tonnes). Quota liquidation will result in production covering the internal demand. The situation in the EU, including Poland will be complicated by trade contracts concerning preferential import, which will probably remain at a stable level. A part of the plants in the period between campaigns will refine raw sugar, so as to make more effective use of factor resources. In such a situation, the market will have a surplus of supply, which will have to be exported. Under conditions of low prices on the global market, export will result in financial losses for producers and it will be necessary to reduce production.

Changes of market regulations also envisage abolishing production quotas for isoglucose, which is currently the main substitute for sugar [Zimmer 2013]. This is a significant change in the context of competition on the sweetener market. The production quota for isoglucose in Poland is 42 thousand tonnes of dry substance and is less than the domestic demand, making import a necessity. Liquidation of production quotas will result in a growth of production, as producers have large potential at their disposal. Demand may be a possible barrier for production growth, as isoglucose can be used only in certain branches of the food industry (e.g. in production of sweetened beverages) [Gocht, ..., 2012], and it is not used in households. Replacing sugar with isoglucose in beverage production will undoubtedly be an impulse for the growth of its production and may cause a decrease of demand for sugar. The sweetener market will witness an increase in the intensity of the forces from substitute products.

Apart from the liquidation of production quotas, another important change in the regulation will be abolishing the minimum procurement price for sugar beet. In Member States which apply the SPS direct payment system, "sugar payments" have been incorporated into payments for holdings, which hindered the evaluation of their impact on production profitability. In the SAPS system, "sugar payments" have been distinguished as separate support and it was possible to evaluate their impact on cultivation profitability. A comparative analysis of direct payments and sugar payments in France, Germany and Poland has shown that in Poland, support for sugar beet planters was 5-10% of the value of total direct payments, whereas in France it was (2-3%) and in Germany (3-5%). Between 2009 and 2013 in Poland, sugar payments were on average ca. EUR 840/ha of sugar beet cultivation, and in Germany (EUR 760/ha) and in France (EUR 705/t). The

comparison shows the differences in the level of support of sugar beet cultivation and the role this support played in production profitability.

4 Polish Sugar Sector After Accession to the EU

Poland witnessed a process of deep restructuring and modernisation in the sugar industry and in sugar beet cultivation. An important role was played by the accession to the EU, which coincided with the reform of regulations and investments into global sugar companies. The result of restructuring was a reduction in the number of sugar refineries, and thus multiple plantation regions were excluded from production.

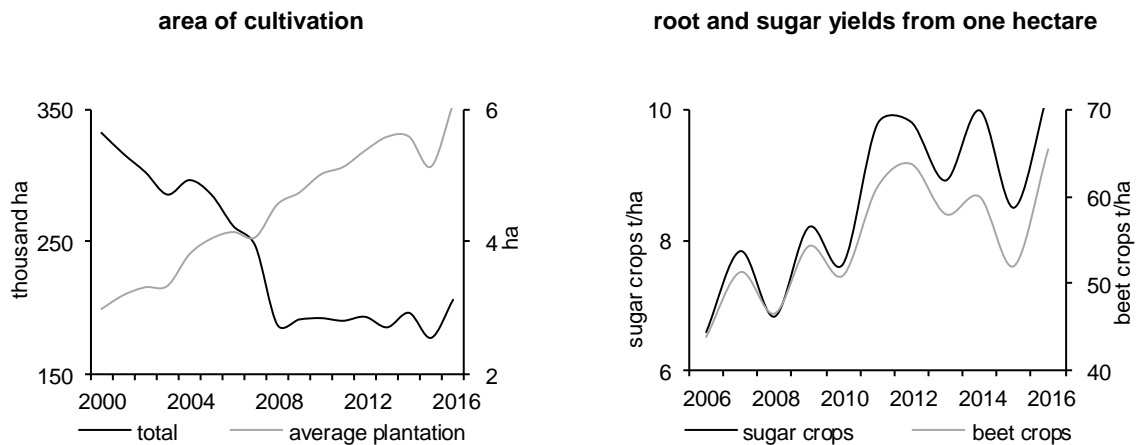
Between 2006 and 2016, the area of sugar beet cultivation was reduced from 265 thousand ha to ca. 180 thousand ha. In 2016 the area of cultivation was increased again to 203 thousand ha in result of small production in the season 2015/2016. Sugar companies are preparing for changing market regulations in 2017 and have been contracting much raw material, so that after abolishing production quotas, out-of-quota sugar could be sold on the EU market.

Sugar beets are cultivated, in regions with favourable soil-climatic conditions [Szajner, Hryszko 2013]. The share of sugar beet in the domestic sowing area has decreased from 3% to 1.7%. For comparison, the share of canola in the sowing structure has increased to 9%, and the share of cereals is ca. 72%.

Structural changes illustrate a significant decrease in the number of sugar beet planters and a growth in production concentration. The number of planters has decreased from ca. 111 thousand to 34 thousand. The area of an average plantation has doubled to 6.1 ha. The plantation structure is still fragmented as compared to the major competitors in the EU-15. In the United Kingdom, the area of the average plantation is 24 ha, in France, 14.5 ha, in Germany, 11 ha, and in the Netherlands, 7 ha.

Concentrating production on good soils and in large holdings had a favourable impact on effectiveness. The technological sugar yield has increased to 10 t./ha. Yields were variable, which was determined by weather conditions. Yields increase partially compensated the decrease of the cultivation area and harvests were 10-12 million t.

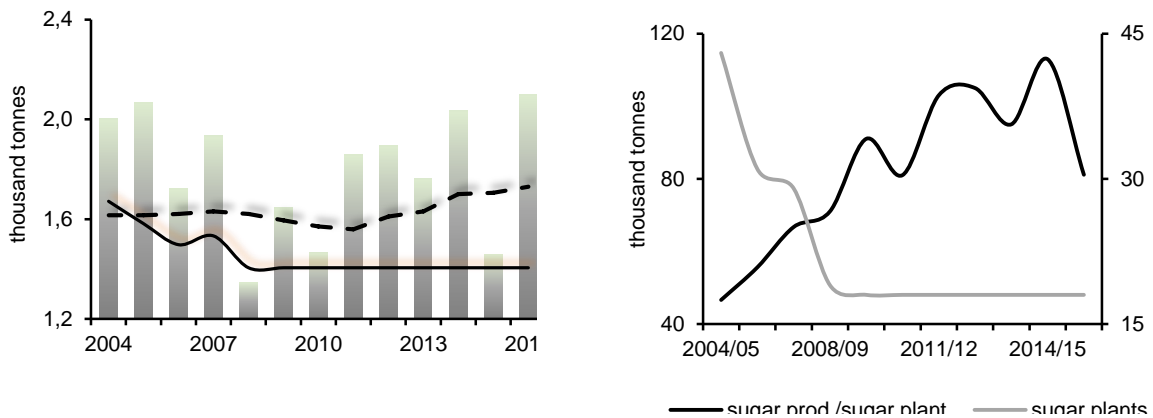
Figure 5. Area of Cultivation and Crops of Sugar Beet and Sugar in Poland



Source: IERiGŻ-PIB study, data: "Rynek cukru. Stan i Perspektywy", no. 35-43, IERiGŻ-PIB, ARR, MRiRW, Warszawa.

Between 2000 and 2009, the number of sugar refineries in Poland was reduced from 76 to 18, which operate within the structure of four sugar companies. The process of concentration and modernization of the plants is showcased by the triple production increase per sugar refinery to ca. 120 thousand tonnes. The production capacity of the sugar industry is ca. 2.3 million tonnes and is larger than production quotas (1.4 million tonnes).

Figure 6. Sugar Industry in Poland



Source: IERiGŻ-PIB study, data: "Rynek cukru. Stan i perspektywy", no. 35-43, of IERiGŻ-PIB, ARR, MRiRW, Warszawa.

Modernization processes in the sugar industry reflect large investment outlays, which between 2000 and 2016 were nominally ca. PLN 4 billion. Modernisation of facilities

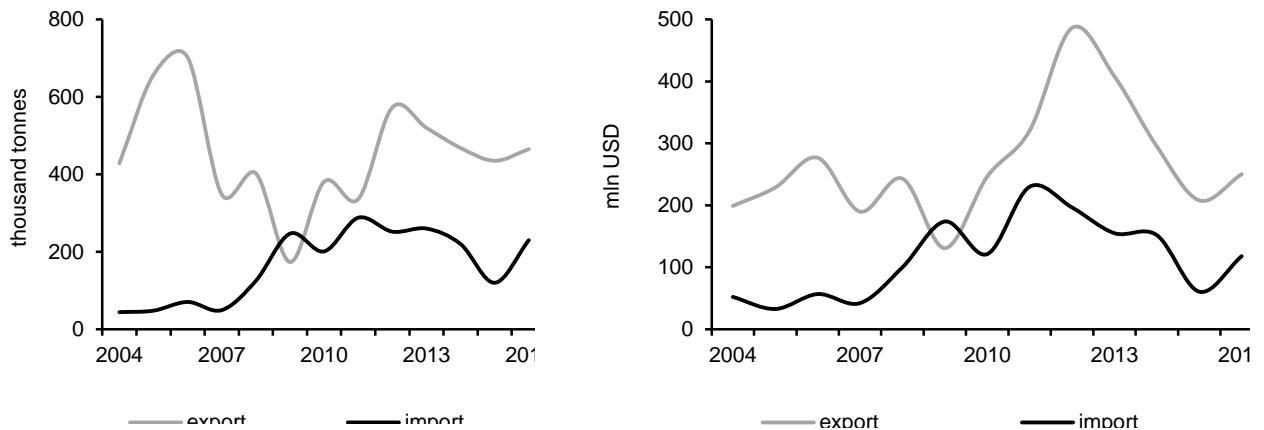
resulted in a growth of productivity of the capital and management efficiency. The reduction of employment was accompanied by a growth in work efficiency.

The sugar industry is characterised by variability of financial results, which mainly depend on the market situation. Restructuring processes made the sugar industry one of the most effective in the food sector. Under the high prices, the sugar industry achieved very high profits and demonstrated high profitability (ca. 20% of net revenues). Between 2014 and 2015, low sugar prices caused a reduction of revenue, profits and profitability, which was still higher than the average in the food industry. In 2016, in connection with increased sugar prices the financial situation of the sugar industry has improved [Szajner, Hryszko 2017].

Sugar consumption in Poland shows an increasing trend and large structural changes. Systematic growth of consumption can be observed in the food industry (1100 thousand tonnes) and in other areas of the economy (pharmaceutical industry, feeding of bees). In households, consumption of unprocessed sugar is decreasing (550 thousand tonnes). Simultaneously, the consumption and export of sweetened products is increasing. Balance sugar consumption is 40-44 kg per capita and possibilities of growth are minute. However, possibilities exist, to increase consumption in the food industry, which increases export.

The Polish sugar sector is a net exporter. Foreign trade is characterised by great variability due to production fluctuations. The negative balance of foreign trade occurred only twice (1995, 2009). In Poland, the production quota was less than production and domestic consumption. As a result, 400-500 thousand tonnes of sugar were exported annually and at the same time, 200-250 thousand tonnes were imported annually. In result of the reform, 2006-2010 saw an increase in the share of import in market supply to ca. 15%. The share of export in production was characterised by great variability (12-40). A new phenomenon is the import of sugar for refining. This import is ca. 130 thousand tonnes annually and is carried out in the summer, which enables refineries to make better use of resources of labour and capital and improve management efficiency.

The main trading partners in export are EU states including Germany due to direct investments of German sugar companies. Major sales markets are the CIS states (Russia and Kazakhstan) and Middle Eastern countries (Israel, Syria). Import is dominated by sugar for refinement from ACP/LDC states (e.g. Mauritius, Zimbabwe, Suzi, Sudan) and white sugar from Germany.

Figure 7. Foreign Trade in Sugar

Source: IERiGŻ-PIB study, data: "Rynek cukru. Stan i perspektywy", nr 35-43, IERiGŻ-PIB, ARR, MRiRW, Warszawa.

Sugar beet procurement prices were determined by: the minimum procurement price, sugar content, industry agreements and the Euro exchange rate, in accordance with which, the minimum price was converted into domestic currency, and the economic situation [Szajner, Hamulczuk 2015]. Integration with the EU caused a significant increase of the procurement prices of sugar beets in the season 2004/2005, to PLN 187/t. As a result of the 2006-2010 reform, the minimum procurement price was lowered and consequently, the procurement prices dropped to |PLN 103.7-115.7/t. Industry agreements and improvement in the economic situation caused the procurement prices to increase in 2011-2013 to PLN 137-148/t. Between 2014 and 2015 the economic situation deteriorated and the procurement prices dropped to ca. PLN 120/t. The drop of the procurement prices and the income of agricultural holdings were compensated by "sugar payments" not related with production. Between 2006 and 2014 the value of these payments was growing from PLN 33/t. to PLN 54/t. Payments were also determined by variations of the currency exchange rate. Only between 2011 and 2014, sugar payment compensated the drop in the procurement prices, as the average price plus the sugar payment was higher or comparable to the prices in 2004.

In 2015, the form of support for planter income changed. Payments not connected with production were replaced by payments related to the production of sugar beets, which are paid per area unit. The main purpose of this support is to create incentives to maintain production at a defined level. Between 2015 and 2020, Poland may allocate ca. EUR 80 million annually for that purpose. In 2015 the support was PLN 2138.26/ha, i.e. ca. PLN 41/t.

Prices on the sugar market were characterized by significant variability with relatively minute changes of the inflation rate. Annual fluctuations of procurement prices of sugar

beet and selling prices of sugar, were $\pm 20-40\%$. The sugar beet procurement and sugar sales prices indicators were characterised by analogous directions of changes. An increase or decrease of sugar sales prices translated to an increase or a decrease in the prices paid to planters. An exception was observed only in 2006, when a deep decrease of the procurement prices (by 27%) was accompanied by a stabilisation of selling prices. Sugar prices in the country are dependent on the prices on the international market, including the EU [Areté 2012]. Foreign trade, including mainly out-of-quota sugar export, plays a significant role in the national sugar balance. Directions of changes of the selling prices correspond to the variability of the global prices of white sugar.

Price variability is illustrated by cumulated price indicators. Between 2005 and 2016 the accumulated sugar beet procurement price index was 64.4%, and that of the prices plus sugar payments, ca. 87%. In the same period, the inflation rate was 123.1%, and that of food prices, 130.7%. In the analysed period, the accumulated wheat procurement price index was 204%, and that of canola, 208.6%, which was determined by a good economic situation on the cereal and oilseed market, being the result of factors including biofuel policy. Cumulated selling and retail sales prices of sugar were 98.8% and 126.4% accordingly. Actual increase of sugar prices as compared with sugar beet prices, as well as positive effects of facility restructuring, contributed to the increase of the sugar industry profitability.

Table 2. Accumulated price indexes in the national sugar sector and the food market

Years	Prices of Goods and Services		Procurement prices			Sugar Prices	
	CPI	Food	Sugar beets	Wheat	Canola	Sales	Retail
2005	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2006	101.0	100.6	73.5	121.0	89.4	102.9	99.6
2007	103.5	105.6	61.8	189.1	91.5	95.8	96.1
2008	107.9	112.2	59.2	171.9	121.3	85.5	86.5
2009	111.6	116.8	66.1	129.1	103.6	99.0	99.7
2010	114.4	120.0	64.6	160.1	122.2	87.2	87.0
2011	119.4	126.8	82.3	219.3	176.0	133.8	129.8
2012	123.8	130.2	78.4	239.1	300.5	132.6	126.4
2013	124.9	133.1	82.2	215.2	231.4	114.0	107.5
2014	124.9	131.9	69.6	192.8	198.5	74.1	100.5
2015	123.8	129.7	66.1	219.8	194.2	75.4	99.6
2016	123.1	130.7	64.4	204.0	208.6	98.8	126.4

Source: Study by IERiGŽ-PIB, GUS data.

Figure 8. Polish and Global Raw Sugar Prices

Źródło: Opracowanie IERiGŻ-PIB, niepublikowane dane GUS, ERS USDA.

5 Sugar Sector Development Scenarios

Projections of the European Commission and the OCED-FAO assume that the EU sugar market will in the long-term be characterised by an evolutionary development [European Commission 2015], [OECD-FAO 2016]. This is a relatively optimistic scenario, as experiences of recent years clearly indicate that the economic cycle in the global sugar industry lasted for ca. 5 years [Isermeyer, Kleinhanß 2005], and has been shortened in recent years to 2-3 years [Szajner, Hamulczuk 2015]. Changes of the economic situation on the global and EU markets in recent years, and the proposition of market regulations constituted the basis for preparing possible scenarios for the development of the Polish sugar sector. The liquidation of production quotas and the minimum procurement prices of sugar beet, and maintaining binding regulations in the scope of foreign trade will cause the domestic market to be under a greater impact of the global economic situation, including fuel prices [Chen, Saghaian 2015]. It has been assumed that the WTO Doha negotiations will not be concluded [Smit, Helming 2012]. In connection with the above, three possible scenarios have been assumed for the development of the market situation, which differ in the level of global prices:

- scenario 1: assumes that the global prices of white sugar will be maintained at the level of 2015 of ca. EUR 350/t., as will the low prices of energy resources,
- scenario 2: assumes a large supply of sugar on the global market, which will be expressed by the increase of the final stock and relatively low prices of energy resources, resulting in a decrease of global white sugar prices to ca. EUR 250/t,
- scenario 3: assumes an increase of the global white sugar prices to EUR 500/t., with the underlying reason being a decrease of sugar supply, an increasing demand and high prices of energy resources.

Scenario 1 assumes that in the long term, global prices will remain at the level from 2014-2015. Under such external conditions, sugar prices in the EU will oscillate within the reference price boundaries (ca. EUR 400/t.). Sugar production in Poland will be possible only in effective sugar refineries. It should be expected that German sugar companies will exclude ineffective sugar refineries from production. There are 11 sugar refineries operating in the structure of German sugar companies. Under the presented market conditions, it may be assumed that exclusion from production may encompass 3-6 sugar refineries. Plantation regions of these facilities will be partially taken over by effective sugar refineries. Other sugar refineries will aim to increase the area of sugar beet cultivation. It is anticipated that the area of sugar beet cultivation would be ca. 190 thousand ha, and sugar production ca. 1800 thousand t. In the context of market balance, this is the *status quo* scenario. Export will be 300-400 thousand tonnes and import will remain at the level of ca. 250 thousand tonnes. Due to relatively low prices both in the sugar industry and agricultural holdings, restructuring transformations will be necessary, which should aim at reducing costs.

In the scenario of a poor economic situation and low global prices, the prices on the EU market will decrease to ca. EUR 340/t. Low EU sugar prices will result in low prices on the domestic market and consequently, the sugar industry will pay low prices for sugar beets. It can be expected that the procurement prices will be lower than the minimum price. Under such conditions, the profitability of the sugar industry will significantly worsen, and German sugar companies will exclude refineries from production. Sugar beet cultivation profitability decrease will make the planters search for other, more profitable plant production directions. This is a very unfavourable scenario for the sugar industry and the entire food sector in Poland. In result of the prevailing slump, deep restructuring changes will take place. 6-8 sugar refineries may be excluded from production. As a result, the sugar beet cultivation area in Poland may be reduced to 140 thousand ha, and sugar production, to 1350 thousand tonnes. Under conditions of internal demand of ca. 1750 thousand tonnes, unfavourable changes will take place in market balance. Export will be reduced to ca. 100 thousand tonnes, and significant import will be necessary (ca. 500 thousand tonnes). The reduction of the sugar beet cultivation area and excluding certain plants from production will have adverse social and environmental effects. Agricultural policy towards the sector should provide a so-called safety net, to limit the risk of unfavourable changes to the maximum possible extent.

Scenario 3 is the optimistic market development variant. After the 2006-2010 reform, the prices on the global market increased to USD 800/t. and between 2011 and 2013 the national sugar industry generated large profits. Under conditions of a favourable economic situation, it is possible to develop the Polish sugar industry, the production potential of which is ca. 2.3 thousand tonnes of sugar. The area of sugar beet cultivation may increase to 220 thousand ha. Poland will be a large sugar exporter (ca. 500 thousand tonnes annually). At the same time, import will remain at the level of ca. 200

thousand tonnes, in result of bilateral commercial agreements and the increasing level of refining. The sugar industry will be a large net exporter. Under such market conditions, entities of the sugar sector should continue modernisation processes and diversify business operations (e.g. secondary sugar processing, biogas, biofuels). Strengthening and improving the competitive position of the industry is only possible by way of improving effectiveness.

Table 3. Polish Sugar Market Situation in 2025 Forecast

Specification	2016	Scenario 1		Scenario 2		Scenario 3	
			2016=100		2016=100		2016=100
Global White Sugar Price [EUR/t]	400	350		250		500	
Cultivation Area [thousand ha]	200	190	95.0	140	70.0	220	110.0
Crops [t/ha]	61	63	103.3	63	103.3	63	103.3
Harvests [thousand t]	12300	12000	97.6	8850	72.0	13850	112.6
Sugar Production [thousand t]	1900	1800	94.7	1350	71.1	2050	107.9
Sugar Consumption [thousand t]	1710	1750	102.3	1750	102.3	1750	102.3
Export	400	300	75.0	100	25.0	500	125.0
Import	200	250	125.0	500	250.0	200	100.0
Self-Sufficiency [%]	111.1	102.9	-	77.1	-	117.1	-
Import Share in Supply [%]	11.8	14.3	-	28.6	-	11.4	-
Export Share in Production [%]	21.1	16.7	-	7.4	-	24.4	-

Source: Prepared by the author.

6 Summary

The sugar industry in Poland is a strategic area of the food sector. Sugar is the basic sweetener and maintaining production is an important element of food safety. The sugar industry is of great economic, environmental and social significance.

The sugar market is one of the most regulated food markets, and market regulations comprise significant interference with market laws. The basis for the system were production quotas, official prices and foreign trade regulations. Liquidation of production quotas for sugar and isoglucose and abolishing the minimum procurement price of sugar beets will cause a significant change in market conditions. This applies to sugar production and distribution, and will have a significant impact on the market balance. Limiting supply has determined the impact of competition forces and its liquidation will significantly change the competition conditions. Liquidation of production quotas will strengthen the competition between sugar producers, the threat from substitute products will increase, the possibilities for new entities to enter the market will increase, and the

bargaining power of planters (position in the delivery chain) will be weakened, mainly as a result of abolishing the minimum procurement price. Foreign trade regulations will not change. In result of commercial agreements, developing states will export sugar to the EU on preferential terms. The liquidation of production quotas will increase the role of foreign trade in the market balance. Furthermore, the liberalisation of production will cause the market in Poland to be more strongly associated with the global market. The impact of the global economic situation on domestic prices will strengthen.

Global sugar prices are characterised by high variability and the economic cycle has been shortened to ca. 3 years. The prices are determined by the supply-demand situation (e.g. the closing stocks level) and are correlated with energy prices. Such tendencies will be maintained in the future, and consequently, forecasts concerning the development of the situation on the global market and in Poland should take account of cyclical economic fluctuations. Monitoring these tendencies, interpreting and applying this information should be an important element of market regulations.

Three possible scenarios have been showcased, of the development of the supply-demand situation in Poland depending on the economic situation and the price level on the global sugar market.

- The first scenario assumes that global prices of white sugar in the long-term will remain at the level of EUR 350/t. Under the conditions, it will be necessary to conduct restructuring transformations of the sugar industry, and production will only be possible in effective plants. In foreign trade, no significant changes will occur.
- The second scenario assumes a long-term decrease of global prices to EUR 250/t., which will exert pressure on the prices in Poland. Under such conditions, a deep restructuring of the sector will take place. Many sugar refineries and plantation regions will be excluded from production, and the sector will become a net importer.
- The third scenario envisages that global sugar prices will increase to EUR 500/t. in result of a decrease of supply or improvement of the general economic situation and an increase of fuel prices. Global prices will be higher than the reference price in the EU and a possibility exists of increasing sugar production. It is anticipated that production in Poland may increase to ca. 2 million t. and will exceed internal demand. Import will be reduced to duty-free quotas, and supply surplus will be directed for export (ca. 500 thousand t.).

The liberalisation of the sugar market will result in a stronger integration with the global market, and the result will be a higher variability of conditions and an increase of the risk of business operations. In connection therewith, market policy should include a broad set of instruments and regulations (so-called safety net):

- a risk management system in the scope of sugar production and agricultural income. Such a system is indispensable in the face of the instability of agricultural markets and price variability. It should enable the national administration to directly respond to changes of the market situation;
- maintaining subsidies to private storage and active trade and promotional policy. The market should be protected by customs duties and non-tariff instruments, and import should be carried out only within quotas, which should not be increased. Sugar should be classified to the group of sensitive products. In the event of high supply on the internal market, the possibility of direct support of export should be considered. Promotional activities should concern acquiring new sales markets, informing about the values of sugar production in Poland (e.g. environmental protection standards);
- instruments which indirectly stabilize the income of agricultural holdings. They include direct payments closely connected with the area of sugar beet cultivation. Not all EU states where sugar beets are cultivated use this form of support. It should be noted that accepting them will entail a reduction of the overall pool of payments available for farmers conducting other production;
- instruments directly limiting variability in farmers' incomes. Instruments which may be used for this purpose include: counter-cyclical payments, income insurance, or a combination of these instruments;
- connection of sugar beet cultivation with environmental objectives (crop rotation, multidirectional animal production, etc.) The policy towards the sugar sector should take account of the possibility of supporting planters by means of environmental payments;
- support of investments in agricultural holdings and connecting them with activities intended for a local, multi-purpose and sustainable development of rural areas;
- activities designed to strengthen the farmers' position in the marketing chain. For this purpose, a crucial role is played by written contracts between planters and sugar manufacturers, maintaining the possibility of support for creating industry organisations and producers' groups, and any and all activities aiming at integration (capital) of planters and the sugar industry;
- the condition for an effective market policy is access to information and the possibility of predicting changes in order to take effective actions at an appropriate time. A modern and effective monitoring market system is necessary, which will provide companies and the administration with access to market information;

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