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EVOLUTION OF SUGAR BEET AND SUGAR PRODUCTION IN ROMANIA AFTER ITS ACCESSION INTO THE E.U.

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Abstract

The paper presents an analysis of the evolution for sugar beet production and sugar beet extraction after Romania accesion in European Union. The analysis is based on the evolutions of areas, total and average yields per unit of area. The last period (2007- 2013) is compared to the previous period (2001-2006), utilised at reference. Also, it is performed in the four sugar factories respectively (SC AGRANA Romania SA, Sugar Factory Bod, SC sugar Oradea SA, sugar Ludus SA) and it was made for the 2007-2013 period, after the application of EU's rules for sugar market. The study presents the evolution of the biological sugar content and white sugar content between the years 2007 and 2013 and it evaluates the variability of the way of achieving production quotas. The main conclusion imposed after the analysis is that the systems of sugar production from sugar beet are stabilized. Statistically multi-annual average deviation from the assigned quota is approx .2%. Annual variations of sugar production are set between (-) 15 % - (+) 43%, compared with the Romanian quota (104.688 tons white sugar).

Key words: *biological sugar, content, correlations, quotas, stability, sugar beet system, sugar factory, sugar content, sugar production, sugar yield, variability, white sugar*

INTRODUCTION

Until 1990, Romania produced approx. 500,000 tons of white sugar, from sugar beet, on a surface area of approx. 200,000-250,000 ha and an average yield of 2.2-2.5 tonsof white sugar per hectare. The annual consumption of sugar was about 20-22 kg sugar/capita/year, including sugar products [1].

Since 1991, some of the 35 sugar factories have ceased production gradually so that in 2007, from the EU accession, four factories were operational, extracting sugar from sugar beet, making annually approx. 100,000 tons of white sugar [1].

Romania's EU accession meant for the sugar beet chain the introduction of annual production quotas, calculated based on historical reference (average production of the last five years preceding accession (01/01/2007).

Following the accession negotiations, Romania had allocated a quota of 109.164 tonsof white sugar from sugar beet, a quantity of 329.636 tons of white sugar from imported raw sugar (known as the traditional supply of raw cane sugar) and isoglucose quota of 9,981 tons.

In accession moment 10 sugar factories functioned from which three factories (S.C. Agrana S.A.-Roman Branch, S.C. Fabrica de Zahăr Bod S.A., S.C. Zahărul Oradea S.A.) processed white sugar from sugar beet and refined raw sugar cane, one factory for sugar beet only, (S.C. Zahărul Luduş S.A.), six factories (S.C. Zahărul Lieşti S.A., S.C. Lemarco Cristal Urziceni SRL, S.C. Zaharul Corabia S.A., S.C. Agrana Buzău SRL, S.C. Agrana Ţăndărei SRL, S.C. Zahărul Călăraşi S.A) for processed raw sugar cane.

The paper analyses the evolution of the sugar beet and white sugar from beet production in Romania, fromthe EU accession in 2007 to 2013, trying to capture the changes that occurred in the system of white sugar from sugar beet production.

The main restrictions on the Community market system regarding the production of sugar from beet and /or cane sugar is the quotas. Production quotas in each Member State (MS) are the result of a pre-negotiation

phase.The MS quota level is determined by a conventional instrument called "historical reference of production" and that holds the average sugar production achieved in the last three years, elected from the last five calendar's years preceding the year of accession. Negotiated quotas are managed by administrative authorities of Member States.

In our country, the quota distribution was made in accordance with Article 7 of the Regulation (EC) No. 318/2006 on the common organization of the markets in the sugar sector. The criteria underlying the allocation of sugar quotas were established by the Accrediting Commission of the Ministry of Agriculture and Rural Development, in compliance with the Order no. 815/2006 on the accreditation economic operators performing the manufacture of sugar from beet and/or refining raw sugar from cane or isoglucose production, as well as those that use sugar and /or isoglucoseas raw material, along with the representatives of sugar factories.

As a result of the temporary restructuring of the EU sugar regime, in compliance with art. 11 of Regulation (EC) No. 320/2006, in marketing year 2008, Romania's quota was 104,168.8 tons. For the marketing years 2009/10 and 2010/11 Romania's sugar quota was established in accordance with Regulation (EC) No. 183/2009, and Regulation (EC) No. 513/2010 amending by the Annex VI of the Council Regulation (EC) No. 1234/2007 regarding the adjustment of sugar quota.

Besides the production quota system one of the main restrictions imposed by the European market regime is the payment of raw material in relation to sugar content. Prior to the EU accession, thenational system was administered through quantitative receptionin which the only quantitative parameter introduced was the permitted foreign bodies content (including root top fraction incorrectly removed in the harvesting process and the roots smaller than 150 grams that were removed in the sort process ofthe sugar factory).

In the reception and payment after beet quality there are two operating criteria such as biological sugar content and white sugar content.Biologicallysugar is the sugar existing in the root cellular juice, whereas white sugar is the crystallized sugar obtained after transformation of roots in sugar factories, the commercial product known as granulated sugar or sugar "in the bag".

It follows that after the transformation of sugar beet results a quantity of white sugar (the commodity production) and some sugar, bio-synthesized in the field, but lost in the process of manufacturing.In other words, in the transformation of sugar beet the content of white sugar is an indicator of the manufacturing efficiency.

In this context we cannot considerbiological sugar extraction efficiency because part of it, although extracted it is not found "in the bag" being found in molasses (which has a sugar content that can sometimes exceed 50%) [9]. Also a small amount of biological sugar remains in the noodles, the diffusion process used to extract sugar does not allow full extraction of the sugar stored in the reserve root cells [9].

Another restriction/significant feature of the CAP sugar market regime are the payment of the potentially extractable amountof sugar content in beet roots received by the factory. [6]

This payment method is made by introducing a threshold level (16^{o}S) of biological sugar content to which the purchase amount is recalculated depending on the effective content of sugar in the roots through a system of bonuses that proportionally rewards a high potential extraction output or decreases the shortagesof the value of roots [2,3,4].

This system is claimed by another quality characteristic of sugar beet namely cell juice purity (ratio between the sugar extracted from noodles in the process of diffusion and the biological sugar content in the cell juice).

Because purity analysis is laborious and time-consuming, the chain partners have agreed to affect the biological sugar content with bonuses and decreasesand in these conditions the determination of roots value had become significantly easier.

Note that for reasons of business confidentiality we could not analyze the evolution of the purchase price of beet and sugar production from sugar beet, so that we could not conclude on the economic impact of the accession on national chain of sugar.

MATERIALS AND METHODS

The statistical data used in this analysis came from the archive of Sugar Beet Producers Association of Romania and is restricted to sugar produced from beet. The period between 2001 and 2006 was used as a reference for evaluating system changes produced between 2007 and 2013.

As production estimators of the production system for sugar from beet there were used: acreage, production of received roots (net of payment), the production of extracted white sugar, the biological sugar content in the roots and white sugar content (extractable), average root production respectively white sugar per area unit and the number of contracts signed annually by sugar factories to ensure sugar quotas [1,9].

The average values of the production of roots and white sugar were calculated by averaging the total net production of roots received by the factories and the effectively collected beet area.

Surfaces grown on-farm were derived by averaging the acreage at the factory, based on the number of actual contracts.

Concerning the CAP conditionality for sugar beet regime, the only compliance that was analyzed was the way sugar quotas were realized at factory level.

The following sugar factories were analyzed: S.C. Agrana S.A. - Sucursala Roman (Agrana, in the text and tables), S.C. Fabrica de zahăr Bod S.A. (Bod), S.C. Zaharul Oradea S.A. (Oradea) and S.C. Zahărul Luduş S.A (Luduş).

The data was processed using statistical analysis of variation for the small string [7, 10] using the statistical estimators: the arithmetic mean, the variability of the mean (as a ratio between the average and standard deviation of the range of variation).

Variability was used in the interpretation of statistical analysis as an estimator of the constancy annual values recorded by the estimators of beet production system [2, 3, 5].

To determine the significance of mutations occurring in beet production system we used the method of establishing the significance for a 95% probability (LSD 5%).

To determine the influence of sugar production concentration through the contract imposed by the manufacturing plants we used the regression coefficient between the variable **x** (number of contracts) and **y** (biological sugar content, white sugar content and white sugar production perarea unit). The reason of this analysis stems from the fact that a smaller number of contracts allows technical apparatus of sugar factories better monitoring of the culture and, consequently, an increase in raw material quality indicators, namely the white sugar content (extracted [7,10]).

Abbreviations: **Σ**-total, **ū** - mean value, **s** - deviation, **s%** - variability, **Δ** - difference: DL5% - difference limit for a 95% probability; **Sign.** – Significant difference; *****– positive significant difference for a probability of 95%; **^{o}**– negative significant difference, for a probability of 95%.

RESULTS AND DISCUTIONS

I.The impact of EU accession upon the system of sugar beet production

The occupied area of sugar beet in Romania declined progressively from 2000 to present (Table 1). The decrease was approx. 35%, from an average of approx. 36.000 ha period prior to accession, to approx. 23.000 in post-accession. The decline was significant for each of the analyzed plants (Table 1).

Table 1. Evolution of sugar beet cultivated areas (ha)

SOC	2000	2001	2002	2003	2004	2005	2006
Agrana	21.949	17.097	19.348	15.876	6.330	8.081	14.746
Bod	8.617	7.080	8.130	15.539	4.668	4.939	7.332
Oradea	10.142	7.190	7.300	4.974	3.905	5.935	10.264
Luduş	7.273	7.268	5.938	4.364	5.721	6.007	6.802
Σ	47.981	38.635	40.716	40.753	20.624	24.962	39.144
	2007	2008	2009	2010	2011	2012	2013
Agrana	11.154	7.463	7.319	7.977	6.918	11.509	11.370
Bod	4.998	4.624	4.682	6.193	3.740	5.250	5.788
Oradea	5.925	5.381	5.062	4.706	2.234	4.340	5.137
Luduş	6.425	2.760	3.990	5.158	3.834	4.543	4.414
Σ	28.502	20.228	21.053	24.034	16.726	25.642	26.709

The variability of the occupied area, as an estimator of the culture system constancy (Table 2) experienced a decrease of contracted areas in each factory. Reducing of the occupied areas variability in pre-accession phase is due to management policy of agricultural departments of sugar factories, faced with the necessity to create a minimal area to cover the sugar quotas expected to be obtained after accession.

Table 2.The compliance influence with CAP sugar market conditionality on acreage cultivated with sugar beet

Factory	Period 2001-2006			Period 2007-2013		
	ū	*s*	*s%*	ū	*s*	*s%*
Agrana	**14.775**	5.702,5	***38,6***	**9.101**	2.123,2	***23,3***
Bod	**8.044**	3.628,3	***45,1***	**5.039**	808,9	***16,1***
Oradea	**7.101**	2.428,9	***34,2***	**4.684**	1.189,9	***25,4***
Luduş	**6.196**	1.029,6	***16,6***	**4.446**	1.144,5	***25,7***
Σ	**36.116**			**23.271**		
Differences Analysis 2007/2013 vs 2001-2006						
Soc	Δ	DL 5%	Sign			
Agrana	**-5.674**	***4.830***	*			
Bod	**-3.004**	***2.951***	*			
Oradea	**-2.418**	***2.147***	*			
Luduş	**-1.750**	***1.222***	*			

The most significant mutations in terms of occupied area were recorded from Oradea to the decrease in the surface occupied by approx. 3.000 ha associated with a 16% annual average variability.

At Luduş, the multiannual variability increased from 16% to 25%.In conclusion, after accession, sugar beet production branch has seen a significant reduction concerning the occupied areas, without their multiannual variability to be significantly affected.

In terms of roots production, the effort made by factories is evident as in the pre-accession period (especially in 2005 and 2006) to increase production, in order to maximize the sugar quota which would be returned after accession (Tab . 3).

Table 3. Evolution of the total net roots production - tons

SOC	2000	2001	2002	2003	2004	2005	2006
Agrana	319.839	309.623	392.972	277.637	148.722	175.808	394.418
Bod	111.051	132.503	172.594	186.651	145.953	124.204	218.982
Oradea	123.865	203.375	195.642	137.808	189.450	229.018	322.529
Luduş	105.373	222.606	175.416	133.279	179.224	193.706	202.978
Σ	**660.128**	**868.107**	**936.624**	**735.375**	**663.349**	**722.736**	**1.138.907**
SOC	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Agrana	226.928	221.752	225.567	259.131	241.070	310.294	428.924
Bod	127.879	154.552	194.588	134.029	109.871	128.422	225.365
Oradea	176.943	226.788	227.382	204.492	106.394	132.229	196.696
Luduş	210.685	96.545	160.836	187.289	151.242	132.687	185.024
Σ	**742.435**	**699.637**	**808.373**	**784.941**	**608.577**	**703.632**	**1.036.009**

The factories managerial decision concerning stabilization of the roots production before accession proved feasible, so basically, with the introduction of the Community's system of quotas beginning at 2006/2007, the recorded reduction has not suffered significant mutations. (Table 4).

Table 4.The compliance influence with CAP sugar market conditionality on total sugar beet

Soc	Period 2001-2006			Period 2007-2013		
	ū	*S*	*s%*	ū	*s*	*s%*
Agrana	**288.431**	96537,3	***33,5***	**273.381**	75180,7	***27,5***
Bod	**155.991**	38440,5	***24,6***	**153.529**	41677,0	***27,1***
Oradea	**200.241**	65397,6	***32,7***	**181.561**	46556,4	***25,6***
Luduş	**173.226**	40791,3	***23,5***	**160.615**	38269,1	***23,8***
Σ	**817.889**		***28,6***	**769.086**		***26,0***
Differences Analysis s 2007/2013 vs 2001-2006						
Soc	Δ	DL 5%	**Sign.**			
Agrana	-15.050	*97.119*	**NS**			
Bod	-2.462	*45.003*	**NS**			
Oradea	-18.680	*63.718*	**NS**			
Luduş	-12.611	*44.395*	**NS**			

The conclusion is reinforced by the fact that the multiannual variability of the system does not support significant mutations (28.6% 2001-2006 vs. 26.0%/2007-2013), which confirms that the total production of sugar beet roots has been managed in the pre-accession so that any eventual mutations imposed by the quotas does not significantly disturb the agricultural system of each sugar factory taken in part.

Roots yield per surface unit is the most expressive impact estimator of the accession, because it associates the managerial decision of sugar factories with the technological decision of farmers in terms of maximizing the profit for both partners.

This harmonization of management decisions is evident from the pre-accession period, the average yield had a progressive increase from 13.6 t/ha in 2001, to 29.5 t/ha in 2006, and to 39.2 t/ha in 2013 (Table 5).

It should be noted that the efforts of the partners to increase the production efficiency is evident at each of the four accredited factories.

Table 5. The evolution of net yield of roots per hectare (t / ha)

SOC	2000	2001	2002	2003	2004	2005	2006
Agrana	14,57	18,11	20,31	17,49	23,49	21,76	26,75
Bod	12,89	18,72	21,23	12,01	31,27	25,15	29,87
Oradea	12,21	28,29	26,80	27,71	48,51	38,59	31,42
Luduş	14,49	30,63	29,54	30,54	31,33	32,25	29,84
ū	***13,54***	***23,93***	***24,47***	***21,94***	***33,65***	***29,43***	***29,47***
s	*1,18*	*6,45*	*4,43*	*8,67*	*10,57*	*7,51*	*1,96*
s %	*8,7*	*27,0*	*18,1*	*39,5*	*31,4*	*25,5*	*6,7*
SOC	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Agrana	20,34	29,71	30,82	32,48	34,85	26,96	37,72
Bod	25,59	33,42	41,56	21,64	29,38	24,46	38,94
Oradea	29,86	42,15	44,92	43,45	47,62	30,47	38,29
Luduş	32,79	34,98	40,31	36,31	39,45	29,21	41,92
ū	***27,15***	***35,07***	***39,40***	***33,47***	***37,82***	***27,77***	***39,22***
S	*5,41*	*5,21*	*6,04*	*9,10*	*7,72*	*2,64*	*1,87*
s %	*19,9*	*14,9*	*15,3*	*27,2*	*20,4*	*9,5*	*4,8*

Therefore, the variability of yields between the two periods of analysis is medium to large (19.8%) in 2001-2006, and low (13%) in 2007-2013 (Table 6).

Table 6.The compliance influence with CAP sugar market conditionality on yield (t/ha)

Soc.	Perioada 2001-2006				Perioada 2007-2013			
	ū	$ū_d$	*s*	%	ū	ūd	s	%
Agrana	**20,4**	20,3	4,1	20,0	**30,4**	30,8	5,6	18,6
Bod	**21,6**	21,2	7,6	35,4	**30,7**	29,4	7,6	24,6
Oradea	**30,5**	28,3	11,2	36,7	**39,5**	42,1	7,0	17,7
Luduş	**28,4**	30,5	6,2	21,8	**36,4**	36,3	4,5	12,4
$ū_{Multian.}$	***25,21***	***25,0***	***7,27***	***28,4***	***34,27***	***34,6***	***6,18***	***18,31***
s	*4,99*	*5,09*	*3,00*	*8,79*	*4,47*	*5,81*	*1,37*	*5,00*
s %	***19,8***	*20,3*	*41,2*	*30,9*	***13,0***	*16,8*	*22,2*	*27,3*
Differences Analysis 2007/2013 vs 2001-2006								
	Δ	**DL5%**	**Sign.**					
Agrana	**(+)10,06**	***5,53***	*					
Bod	**(+)9,12**	***8,53***	*					
Oradea	(+)9,03	*10,48*	NS					
Luduş	**(+)8,05**	***6,08***	*					
$ū_{Multiyear.}$	**(+)9,07**	***7,57***	*					
s	0,52	*2,62*	NS					
e-s %*	**(-)6,76**	***37,14***	*					

e-s% * - used as the estimator of the stability of multiyearrecorded yields per surface unit

The average differences analysis performed in each factory shows that there were significant increases after accession for three of four factories; the highest growth was recorded in the S.C. AgranaS.A.

In S.C. Zahărul Oradea S.A. factory, the increase is insignificant probably because in this area of culture the resources of soil and climate are harmonized in relation to the requirements of sugar beet culture. In this area were recorded the highest average yields, in the both periods (2001-2006 respectively 2007-2013).

Average annual yield stability analysis through annual mean variability suggests that, except S.C. ZahărulLuduş S.A. at all other factories there is an average stability, even if at a national level there were recorded significant increases in stability due to reduced variability (Table 6).

The conclusion that emerges is that Romania's EU accession to the sugar market system, specific to the agricultural policies for the sugar market had the first major consequence: the significant increase of average yield based on a significant increase of its stability.

II.The impact of EU accession on the quality of sugar beet production

Production quality analysis was conducted for the period 2007-2013, during which the quality reception regime had came into effect in the national production of sugar beet.

It is noted that during the same analyzed period there is a progressive increase in the biological sugar content from 14,984^{o}S/2007 (first campaign in which the quality reception regime was officially applied) at 16.913ºS, with annual variations that in the very favorable years (2009, 2011) have reached 17.8 - 17.9 º S (Tab.7).

Average annual calculation of the discrepancies does not reveal as significant increases or decreases, the differences exceeding the limit of 1.8. It should be noted, however, that at the level of this quality parameter, variability is extremely low, being below 10% which imposes the conclusion that despite regional peculiarities the sugar beet farmers lead the technological process in such a way that they do not reflect in a very large extent on the quality of raw materials, notorious phenomenon known in the scientific literature [2, 3, 4].

Table 7. Evolution of biological sugar content (° S)

	2007	2008	2009	2010	2011	2012	2013	ū
Agrana	14,945	17,160	17,842	15,705	17,760	17,767	17,265	16,921
Bod	16,056	16,730	16,253	15,396	17,330	16,704	16,505	16,425
Oradea	14,625	14,193	19,160	16,485	16,593	16,750	16,530	16,334
Luduş	14,310	16,350	17,943	16,030	19,210	17,122	17,350	16,902
Ū	**14,984**	**16,108**	**17,800**	**15,904**	**17,723**	**17,086**	**16,913**	**16,645**
s.	0,760	1,319	1,192	0,466	1,102	0,491	0,458	0,310
s%.	5,0	8,1	6,7	2,9	6,2	2,9	2,7	1,8
Δ vs. ante		**1,124**	**1,691**	**-1,896**	**1,819**	**-0,637**	**-0,173**	
DL5%		*1,60*	*1,87*	***1,34***	***1,26***	*1,27*	*0,70*	
Sign		**NS**	**NS**	*	*	**NS**	**NS**	

The evolution analysis of the white sugar content shows a similar pattern to that of biological sugar content, with values which lie at around 14% (Tab.8).

Table 8. The evolution of white sugar content (%)

	2007	2008	2009	2010	2011	2012	2013	ū.
Agrana	12,500	14,400	15,280	13,260	15,000	15,205	14,820	**14,352**
Bod	13,160	14,400	13,250	12,500	15,000	13,701	13,609	**13,660**
Oradea	12,400	12,780	16,000	14,260	15,180	13,590	14,305	**14,074**
Luduş	11,880	13,740	15,000	13,600	16,600	14,179	14,920	**14,274**
ū.	**12,485**	**13,830**	**14,883**	**13,405**	**15,445**	**14,169**	**14,414**	**14,090**
s.	0,526	0,766	1,167	0,732	0,775	0,737	0,600	0,310
s%.	4,2	5,5	7,8	5,4	5,0	5,1	4,1	2,2
Δ vs. ante		**1,345**	1,053	**-1,478**	**2,040**	**-1,276**	0,245	
DL5%		***0,98***	*1,47*	***1,45***	***1,12***	***1,12***	*1,00*	
Sign		*	NS	*	*	*	NS	

The annual difference limit is about 1.1, so that it allows us to conclude that the system of payment by quality enhanced the expression of technological interventions forfarmers in terms of maximizing the effects of those technological links that contribute to maximizing the extraction performance, and indirectly of the revenues obtained per product unit delivered to the sugar factories.

The multiannual variation indicates a higher annual average value with approx. 22% variability, in absolute values, to the biological sugar (1.8% vs. 2.2%), which suggests that the existing extracting facilities in sugar factories are very different in terms of extraction efficiency.

The extraction performance analysis (Table 9) highlights the fact that the best performing systems are found in the factory in Oradea conducting the performance considered ideal by professionals in the field of quality extraction of sugar beet produced in Romania.

Table 9. The evolution of the extraction efficiency (%)

	2007	2008	2009	2010	2011	2012	2013	ū
Agrana	83,640	83,916	85,641	84,432	84,459	85,580	85,838	**84,787**
Bod	81,963	86,073	81,523	81,190	86,555	82,022	82,454	**83,112**
Oradea	84,786	90,044	83,507	86,503	91,484	81,134	86,540	**86,286**
Luduş	83,019	84,037	83,598	84,841	86,413	82,812	85,994	**84,388**
ū.	**83,352**	**86,018**	**83,567**	**84,241**	**87,228**	**82,887**	**85,207**	**84,643**
s.	1,180	2,861	1,681	2,223	2,994	1,922	1,860	1,308
s%.	1,4	3,3	2,0	2,6	3,4	2,3	2,2	1,5
Δ vs. ante		**2,665**	**-2,450**	**0,674**	**2,987**	**-4,341**	**2,319**	
DL5%		*3,25*	*3,48*	*2,93*	*3,92*	***3,74***	*2,81*	
Sign		NS	NS	NS	NS	°	NS	

The annual differences analysis shows that, except for 2012, when the excessive drought of the late growing range affected the sugar beet crop, national average extraction performance variation is not significant.

This fact requires the conclusion that the technical sugar extraction system in Romania has not undergone major changes in terms of the capacity to increase extraction performance.

The conclusion is supported by the fact that in the years 2010 and 2011, although there were significant differences in terms of biological sugar content (see Tab.7) and white sugar content (Table 8), the extraction has not seen significant differences, as expected.

Evolution of the system from the point of view of white sugar production per unit area (Table 10) as estimator of merged sugar factories management and technological management of farmers indicates a change deeper than the biological sugar content respectively white sugar content.

With a multiannual variability of 13%, with variations from 7.4%/2013 to 32%/2010 it is obvious that at the level of this efficiency indicator of the system there is still a potential growth of mean values both landing technical management of agricultural departments and manufacturing of sugar factories and from the point of view of technological farmers' interventions.

Table 10.The evolution of the production of white sugar per hectare (t / ha)

	2007	2008	2009	2010	2011	2012	2013	ū.
Agrana	2,543	4,279	4,709	4,307	5,227	4,099	5,591	**4,394**
Bod	3,367	4,813	5,507	2,705	4,407	3,351	5,299	**4,207**
Oradea	3,703	5,386	7,187	6,196	7,229	4,141	5,477	**5,617**
Luduş	3,896	4,806	6,046	4,938	6,548	4,141	6,254	**5,233**
ū.	**3,377**	**4,821**	**5,862**	**4,537**	**5,853**	**3,933**	**5,655**	**4,863**
s.	0,597	0,452	1,040	1,452	1,273	0,388	0,417	0,672
s%	17,7	9,4	17,7	32,0	21,8	9,9	7,4	13,8
Δ vs. ante		**1,444**	**1,041**	**-1,326**	**1,316**	**-1,920**	**1,722**	
DL5%		*0,79*	*1,19*	*1,88*	*2,03*	*1,40*	*0,60*	
Sign		*	NS	NS	NS	°	*	

The analysis suggests that there are sufficient resources so that the white sugar per area unit production maximization should be possible in terms of an integrated approach of the branch system for both partners.

III.The accession impact over the production of sugar beet system structure

The sugar quota introduced in 2007 (Table 11), in the seven years analyzed was not achieved in any of the years analyzed, with the exception of 2013 when it was surpassed by approx. 43,000 tons of white sugar (Table 12).

However, except the year 2007 (the first year of quota system application and whose implementation was made effective in 2006), the failure of quota rate was below the limit allowed by EU regulations (10%).

The exceeding of the quota made in 2013is a management decision of the sugar factories to create a new supply space to enable them to overcome the predicted shock of quota regime abrogation coming into effect from 2015.

The most obvious indicator of the changes occurring in the system of sugar beet production in Romania is the number of contractors/ farmers who participated in achieving the quotas.

Table 11. Sugar quotas (tons)

	2007	2008	2009	2010	2011	2012	2013
Agrana	20.967,6	24.240,0	24.240,0	24.240,0	24.240,0	24.240,0	36.575,0
Bod	15.921,2	18.406,0	18.406,0	18.406,0	18.406,0	18.406,0	22.750,0
Oradea	28.651,4	28.651,4	28.651,4	28.651,4	28.651,4	28.651,4	19.355,8
Luduş	28.886,4	33.391,4	33.391,4	33.391,4	33.391,4	33.391,4	26.008,0
RO	**94.426,6**	**104.688,8**	**104.688,8**	**104.688,8**	**104.688,8**	**104.688,8**	**104.688,8**

The number of contracts can give information on the average size of cultivated sugar beet areas.

Table 12. The evolution of the implementation of sugar beet quotas (tones)

	2007	2008	2009	2010	2011	2012	2013
Agrana	20.618,7	28.612,4	26.340,0	35.054,0	36.169,0	47.180,2	63.567,0
Bod	16.748,0	19.406,2	21.546,2	15.840,0	16.967,1	16.753,1	29.001,0
Oradea	22.095,3	31.069,1	28.809,3	25.377,6	25.018,2	17.969,0	28.137,6
Luduş	20.672,9	14.673,0	20.243,9	24.152,0	16.153,6	19.687,5	27.600,0
Σ	**80.134,9**	**93.760,7**	**96.939,4**	**100.423,6**	**94.307,8**	**101.589,8**	**148.305,6**
Differences regarding RO quotas							
t	**-14.291,7**	**-10.928**	**-7.749,4**	**-4.265,20**	**-10.380,9**	**-3.099,01**	**43.616,82**
%	-11,95	-6,04	-3,27	-2,11	-5,73	1,83	+ 38,19

It is well known that increasing the size of the area occupied induces better management of maintenance and harvesting.

The introduction of a quota system had resulted in a drastic reduction in the number of contracts from the first campaign (Table 13).

Table 13.Theproduction concentration of sugar beet

	Contr	Δ vs ante	Σ sup	ū	°S	% z.a	z.a. t/ha
2007	5341	-	28502	5,34	14,98	12,49	3,38
2008	1555	-3786	20228	13,01	16,11	13,83	4,82
2009	1483	-72	21053	14,20	17,80	14,88	5,86
2010	1276	-207	24034	18,84	15,90	13,41	4,54
2011	1117	-159	16726	14,97	17,72	15,45	5,85
2012	1543	426	25642	16,62	17,09	14,17	3,93
2013	1608	65	26709	16,61	16,91	14,41	5,66
ū	**1493**		**23533,2**	**15,85**	**16,92**	**14,36**	**5,11**
s	129,19		2822,20	2,29			
s%	8,65		11,99	14,42			
Correlations(r*for a P 95%= 0,63)					**-0,72**	**-0,75**	**-0,68**
Determination %					**52,0**	**56,2**	**46,6**

Thus in 2007 (the first year of application of the quota system implemented on cultivated surfaces from autumn 2006) the number of farmers decreased by cca.70% (1555/2008 vs. 5341/2007).

The average area increased from 5.34 contracted ha to 13.01 ha, stabilizing in the coming years around an average area about 16 ha with annual variations of 2 to 3 ha.

There is an inversely proportionate ratio in determining the number of contracts and qualitative parameters of sugar beet root achieved. Therefore, the increase in the number of contracts induces a decrease in expression of quality parameters at a significant rate for a statistical probability of 95%.

The determination coefficient calculation as a share estimator for the independent variable influence (annual number of contracts) on the dependent variables (qualitative) of sugar beet roots indicates that probably ca. 50% of the quality variation is due to farmer fluctuation and consequently the average contracted surfaces per farmer, in order to achieve production quotas imposed by the CAP.

It is obvious that this analysis is not exhaustive and does not retain other factors that influence the intrinsic quality of the raw material but we point out that it provides information that confirms that the management and mismanagement of the system of sugar beet production are significant factors of achieving the

communitarian output restrictions for the sugar market, managed by CAP instruments.

CONCLUSIONS

The main conclusion from this analysis is that imposing CAP restrictions on the market for the sugar obtained from sugar beet (the quota regime and minimum quality of raw materials) significantly influenced the production system in Romania by:

-The reduction of sugar beet cultivated areas,

-The significant increase of roots and sugar yields per unit area;

-The significant increasein the value of quality indicators for raw material;

-The increasing stability of multiannual beet production;

-Creating a critical mass of specialized sugar beet farmers interested in maximizing the incomes through technological management of the raw material quality.

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