EU Sugar beet production – Perspectives for a no-quota situation

The quota system and, hence, the minimum prices for sugar beets will expire in September 2017. In his PhD thesis, Raphael Albrecht[1] analyzed the competitiveness of sugar beet production of farms in five key European regions. This paper summarizes some of the key findings from this thesis.

Future challenges

The expiration of the quota system in sugar beet production is a done deal. Thus, the minimum price for sugar beet expires, too. At the same time, for quite a while, prices for alternative crops have been at a relatively high level, which in turn would increase the pressure on European sugar beet cultivation. The question arises, "Which locations and farms will be able to grow sugar beet competitively?" For this reason, the study, using typical farms and intensive focus group discussions, analyzes the crop's competitiveness in different European regions with strong sugar beet production.

The regions included are the Cologne-Aachen Bay and East Westphalia in North Rhine-Westphalia, Lower Franconia in Bavaria, Zeeland in the Southwest of the Netherlands, and East Anglia in Great Britain. The regions were selected with particular attention to different natural and operational framework conditions.

To be able to analyze the competitiveness of crops at the farm level, information regarding the respective production costs and revenues is required. For this purpose, farm enterprise data from 2006 to 2010 of various farms from the chosen regions were used. These data are being collected by farmer groups for internal management and benchmarking purposes. As the cost and revenues included were not sufficiently detailed for a comprehensive evaluation of the competitiveness of sugar beets, additional data were gathered during so-called focus group discussions that included farmers, advisors and the scientist.

In a first step, in view of expected lower sugar beet prices, focus groups were asked to decide which crops compete for the land that is currently under sugar beets. Among other factors, this decision is dependent on rotational constrains; in many regions the next best alternative was rapeseed.

The other issue to solve was the question of whether there are any rotational non-monetary effects associated with sugar beets and/or the alternative crop. These non-monetary effects have an economic impact on subsequent crops but do not show up in a crop profitability analysis. One example is the need to plow before planting the subsequent crop when sugar beets have been harvested late under wet conditions. These non-monetary effects were converted into monetary values – positive or negative – and were included in the calculations. Only by doing so, it was possible to draw a

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[1] Raphael Albrecht's PhD thesis, which is in German, can be downloaded here: https://www.ti.bund.de/media/publikationen/thuenen-report/Thuenen-Report_24.pdf

realistic picture of the economics of sugar beets and alternative crop production. The calculated additional benefits or costs vary considerably among the different regions.

Example: non-monetary effects in the Cologne-Aachen Bay

Alternative crops for sugar beets in the Cologne-Aachen Bay are winter rapeseed, silage corn and summer barley. Winter wheat cultivated after rapeseed achieves yields 0.7 t/ha higher than after sugar beets or corn silage. In the case of wheat after wheat, yield drops by 0.5 t/ha in comparison with wheat following beets. Summer barley as the preceding crop increases the following wheat yield by 0.2 t/ha compared with wheat after beets. From a farmer's point of view, plant protection and fertilization will cause differences, but those would be offset. On the other hand, tillage after sugar beets usually are more intense and hence more expensive than after alternative crops.

Compared with sugar beets, winter rapeseed in the Cologne-Aachen Bay is usually grown on lower-yielding soils. Should rapeseed be grown on land currently in beets, rapeseed yield will be higher than on the formerly used fields. Farmers in the Cologne-Aachen Bay region talk of a 0.75 t/ha increase in rapeseed yield for this case.

When adding all effects, there will be a beneficial effect for rapeseed of 414 €/ha compared with sugar beets; for barley a benefit of 62 €/ha; for wheat, a negative effect (disadvantage) of -68 €/ha and for corn, a negative effect of -9 €/ha. The table below shows the additional effects of the alternative crops in the regions analyzed.

Table 1: Non-monetary effects in sugar beets and alternative crops in the different regions

Region	**Cologne-Aachen Bay**	**East Westphalia**	**Lower Franconia**	**Zeeland**	**East Anglia**
Alternative crops	Winter Rapeseed Maize silage Winter Wheat Summer Barley	Winter Rapeseed	Winter Rapeseed	Winter Wheat	Winter Rapeseed Winter Wheat Summer Barley
Yield advantage / disadvantage of wheat following alternative crop vs. wheat after sugar beets (in t/ha)	Following… Rapeseed: + 0,7 Maize: 0 Wheat: - 0,5 Barley: + 0,2	Following… Rapeseed: + 0,6	Following… Rapeseed: + 0,5	Following… Wheat: + 0,5	Following… Rapeseed: + 2,0 Wheat: - 0,3 Barley: - 0,3
Cost savings or cost increase in plant protection, fertilization and tillage in wheat following alternative crop vs. wheat following sugar beets	21 €/ha savings after rapeseed an grains. 9 €/ha cost savings after maize.	30 €/ha savings after rapeseed	40 €/ha higher herbicide cost following rapeseed and 30 €/ha cost savings in tillage after rapeseed.		61 €/ha savings after Rapeseed; 17 €/ha savings after wheat 22 €/ha savings after barley
Labor and machinery workload	Peaks in labor and machinery requirement can be either covered by underutilized in-house capacity or by contractors				52 €/ha cost increase due to the use of high performing machinery
Yield advantage from rapeseed moving onto previous sugar beet acreage	max. 0,75 t/ha => + 270 €/ha	up to 0,5 t/ha => + 180 €/ha	max. 1 t/ha => + 360 €/ha	No yield effect because wheat data already stems from beet acreage.	No difference between beet land and alternative crop land.
Willingness to accept foregone profits in order to maintain beet production on the farm.	Initially growers were putting a high value on this but after realizing the no-quota situation they came to the conclusion that straight economic performance matters.		200 €/ha	- 219 €/ha	See Cologne-Aachen Bay and East Westphalia
Total added value (at wheat prices of 180 €/t; in €/ha)	Rapeseed: 414 Maize: 9 Wheat: -68 Barley: 62	Rapeseed: 325	Rapeseed: 231	Wheat: 300	Rapeseed: 372 Wheat: -126 Barley: -87

Source: ALBRECHT (2015), based on focus group discussions in the regions of Cologne-Aachen Bay, East Westphalia, Lower Franconia, Zeeland and East Anglia.

These findings regarding non-monetary effects were combined with the respective farms' enterprise evaluations to generate a comprehensive economic analysis of the overall profitability of sugar beets and alternative crops by calculating so-called on-farm equilibrium prices.

Calculation of on-farm equilibrium prices

To determine the on-farm competitiveness of sugar beet production, individual farms' equilibrium prices for sugar beets were calculated. They indicate the beet price at which the cultivation of beets is as profitable for the farm as the cultivation of the alternative crop defined before. When the market price for sugar beets is above the equilibrium price, the cultivation of sugar beets is profitable. If it is below the equilibrium price, alternative crops are more profitable.

In a scenario of structural change in the EU sugar beet production because of declining sugar and sugar beet prices, a second question arises: "Which region might expand its beet production if it shrinks in other regions?" Therefore, the theoretically maximum acreage of sugar beets in the region was calculated. The starting point for this analysis was the assumption of a maximum share of beets in the area. Because sugar beets are susceptible to significant yield penalties when the density of beets is too high, focus groups decided to go for an upper limit of 25% in the rotation in the long run.

Heterogeneity in the regions

The most competitive sugar beet producers can be found in the Cologne- Aachen Bay and in Eastern Westphalia. In these regions, sugar beet prices of 27 €/t are enough for beets to be competitive against alternative crops. In Lower Franconia and East Anglia, the most competitive farms need a price of 29 €/t for sugar beets to cultivate them competitively. The least competitive farms - in East Westphalia and Lower Franconia - need beet prices of about 39 €/t and in East Anglia, approximately 46 €/t. From the single farm's point of view, farms in East Westphalia have the best possibilities to expand cultivation of sugar beets. As this region is small, their contribution to the planted area of sugar beets in the five analyzed regions is small, too. Against this background, Lower Franconia, the Cologne-Aachen Bay and East Anglia are of much more importance. These regions represent larger areas of sugar beet cultivation, whereas their farms cannot expand their sugar beet acreage that much because of already rather high shares of beets in their rotations.

Comparison of the regions – which will stay in business?

Graph 1 shows the possible modifications of the beet acreage in the regions at different prices for sugar beets. These equilibrium prices have been calculated by assuming wheat prices to be about 180 €/t and rapeseed, 360 €/t. This price scenario must to be kept in mind while reading the subsequent analysis.

Graph 1: Changes in sugar beet acreage with varying sugar beet prices, assuming wheat price of 180 €/t.

	Cultivation in 2010 in %	calculated changes in production compared to 2010 in % and sugar beet prices of ... €/t				
		45	40	35	30	25
Region						
Cologne-Aachen Bay	100	+ 23	+ 23	+ 23	- 47	no cultivation
East Westphalia	100	+ 132	+ 132	+ 103	+ 52	no cultivation
Lower Franconia	100	+ 80	+ 80	+ 25	- 41	no cultivation
Zeeland	100	+ 49	+ 49	+ 19	- 64	no cultivation
East Anglia	100	+ 23	+ 23	- 24	- 72	no cultivation

Sources: ALBRECHT (2015) based on enterprise data for Cologne-Aachen Bay, Eastern Westphalia and data from Farm Business Survey, DEFRA and Welsh Assembly Government, 2004/05 to 2010/11, UK Data Archive. Microeconomic data from 2006 - 2010 of the Dutch FADN system from LEI Wageningen UR. Results shown are and remain entirely the responsibility of the author; they neither represent LEI/CEI views nor constitute official statistics. Also, yield data from Pfeifer & Langen GmbH & Co. KG and FDZ, Landwirtschaftszählung (agricultural census) 2010 have been used.

Should sugar beet prices be above 45 €/t, it is to be expected that all farmers in the analyzed regions would expand their beet acreage, increasing the supply everywhere. However, in the regions of Cologne-Aachen Bay, Zeeland and East Anglia, the shares of sugar beet in the crop rotation already are high, so the possible expansion of plantings there is limited. On the other hand, Lower Franconia and East Westphalia could increase sugar beet cultivation remarkably. With beet prices of 35 €/t, the cultivation of sugar beet would be competitive for many fewer farms. The German regions and Zeeland also would increase cultivation with these prices, but in East Anglia they would see a decrease of area. In the case of beet prices as low as 30 €/t, only East Westphalia would be able to expand plantings; in all other regions, sugar beet area would shrink considerably.

According to the calculations, beet prices of 34 €/t would be sufficient for output similar to 2010. This would require that all farms that can produce beet competitively at these prices would actually produce it and expand the area up to the threshold as defined earlier (25%). However, this would relocate the production to the European mainland, as beet cultivation in East Anglia would decrease while production on the mainland would increase.

With reference to the relocation of European beet acreage, it should be noted there are farms in each region that can produce sugar beets competitively even with prices below 30 €/t. But these farms cannot produce enough beets to maintain current sugar production; hence, EU sugar production would drop. With prices of more than 40 €/t, an increasing supply of sugar beet is to be expected.

These conclusions are made on very restrictive assumptions and therefore merely indicate tendencies. In reality, sugar processors pay different prices. Should this continue after the expiration of the quota system, the competitiveness of sugar beets would change. Furthermore, the question arises regarding how to handle transportation costs. Long distance transports that would have to be paid by the farmers would increase the competitiveness of alternative crops. On-site conditions around sugar plants are another

important factor. If the processing period could be lengthened, processing costs could fall, making higher beet prices possible.

Conclusions

When analyzing the likely future for sugar beet production, understanding the economically most attractive alternatives is important. A number of costs and benefits, that, at least in some cases, are fairly significant - must be taken into account. Rapeseed, in particular, shows significant non-monetary effects when compared with sugar beet. Just looking at crop enterprise data is by far not sufficient to access the competiveness of sugar beets.

Furthermore, the competitiveness of sugar beet production varies considerably within the analyzed regions. This in turn implies that in a scenario with bearish beet prices, a strong relocation within the regions can be expected. Whether or not growers will indeed adhere to the assumed restrictive threshold of beets in their rotations remains to be seen.

Finally, it appears that beet production in East Anglia is not that competitive, primarily because of low sugar beet yields and yields losses in subsequent wheat tend to be rather high compared with those following rapeseed. At the other end of the spectrum, sugar beets appear quite competitive in East Westphalia.

When considering equilibrium prices in this paper, it has to be highlighted that they are valid only when - and as long as - competing crops wheat and rapeseed trade at 180 and 360 €/t respectively. Since recently agricultural commodity prices have been much lower than that respective equilibrium prices for sugar beets are much lower as well. This in turn leads to the conclusion that even at much lower sugar beet prices than those in the past it is very likely that growers will stick to sugar beets.