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Which factors influence the willingness of German farmers to grow sugar beet for biogas production?

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Sugar beets – What we need to think about...

- The EU is the world's biggest producer of beet sugar
 - within the EU Germany belongs to one of the most competitive sugar beet growing areas
- Talking about sugar beet production in the EU means talking about a crop that is regulated by production quotas and a minimum price.

Source: European Commission 2014, http://ec.europa.eu/agriculture/sugar/index_en.htm



Sugar beets – What we need to think about...

- With the help of a sugar market reform in 2006 the EU achieved transparency, simplification and more market orientation of their sugar policy.

Consequences:

- Reduction of the sugar quota by 5.8 mio. tons
- Decline of the minimum beet price by 39.7 %
- Germany: Decrease of sugar beet production area by 17.7 %
- Sugar production quota expires in 2017

How did / do farmers deal with the reform?

Source: European Commission 2014, http://ec.europa.eu/agriculture/sugar/index_en.htm



Background of the experiment

What do farmers want?

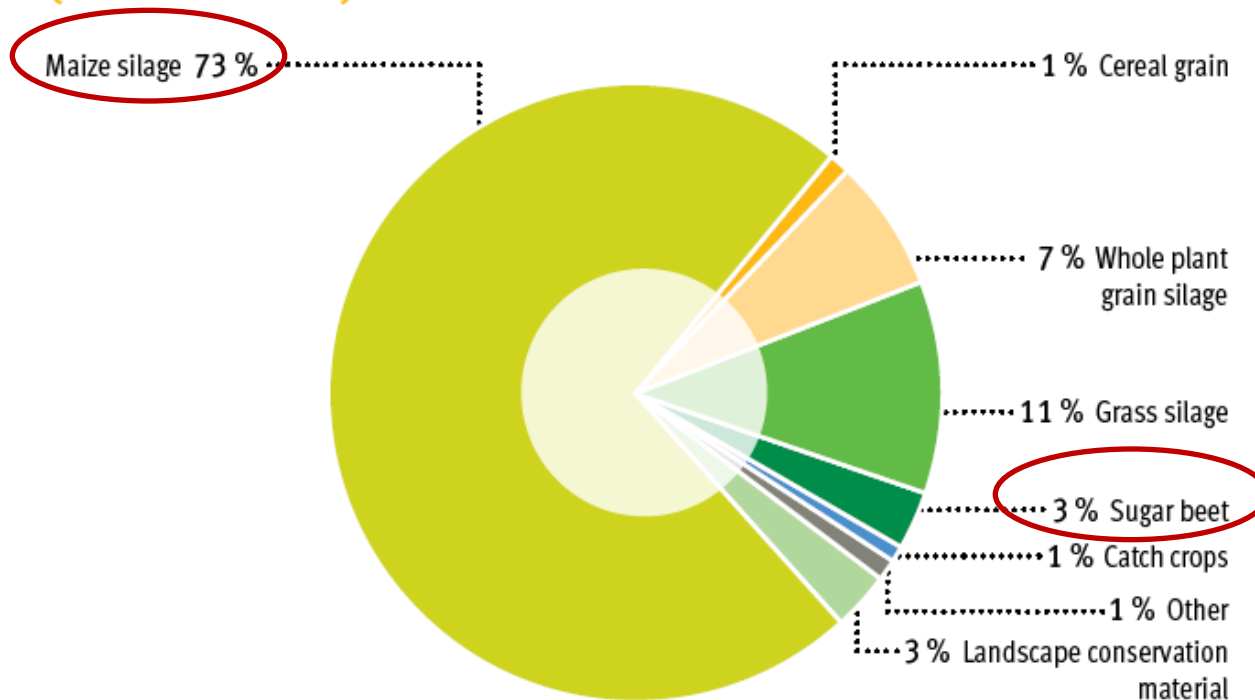
- More planning certainty for their planting decisions
- Convert their planting decisions into money (e.g. high gross margins)
- Minimize risks
 - which can result from unexpected changes or derive from unpredictable events

How to answer those expectations?

- Bring the field of renewable energies into focus!
 - Sugar beets for biogas plants?

Status quo of substrate input in German biogas plants

Substrate input of energy crops in biogas plants 2012 (mass related)



Latest amendment of the Renewable Energy Sources Act (EEG) introduced an upper level (restriction) of silage maize and grain kernels by 60 %

→ New biogas plants need an alternative to the main input substrate maize!

Source: FNR (2013) from DBFZ Betreiberumfrage (2013)

Why sugar beets for biogas?

- Cultivation of *sugar beets* for biogas plants *under delivery contracts with fixed prices* could be one way to be less exposed to price uncertainties.
- Sugar beets have promising properties for the production of biogas:
 - compared with silage maize higher yields per hectare
 - sugar beets have a so called “boost effect“ (8 to 10 % higher gas yield per hectare as compared to silage maize)
 - sugar beets have a positive effect on the fermentation of silage maize
- + sugar beets are a profitable alternative in terms of crop rotation diseases (Fusarium), new pests (European maize borer, western corn rootworm) and public discussion



Objectives

- I. We analyzed if there is a link between
 - I. risk attitude,
 - II. the self-assessment of the farmers' economic ability
 - III. and socio-demographic parameters on the one hand
and the willingness to grow sugar beets for methane production on the other hand

- II. We examined whether there are **other factors** that have an influence on the endorsement or rejection of sugar beet supply contracts

Data basis I

- Online-survey among German farmers
- between July and October 2013
- 142 respondents participated

Main focus:

- Gather information about the farmers' perspective on the cultivation of sugar beets for biogas
- 2 groups of farmers:
- with sugar beets
 - to date no sugar beets (but they can imagine to grow sugar beets as the option biogas arises)



Data basis II

Aim of the study:

- Make predictions,
 - whether sugar beets are in demand as an extension of the substrate range
 - and at which points obstacles arise that exclude this type of use

Methods:

- Mann-Whitney-**U-Test** (to measure differences within 2 groups)
- Kruskal-Wallis-**H-Test** (2+ groups)

Descriptive statistics I

	N	Min.	Max.	Mean	SD
Characteristics of participants:					
Age (years)	142	19	93	40,4	14,4
Male participants (%)	142	-	-	93,0	-
Participants with agricultural qualification (%)	142	-	-	85,2	-
Participants with university degree (%)	142	-	-	54,9	-
Agricultural manager (%)	142	-	-	65,5	-
Full-time farmers (commercial farms) (%)	142	-	-	86,6	-
Arable farms (%)	142	-	-	64,1	-
Farms with sugar beet cultivation (%)	142	-	-	65,5	-
Farms with bioenergy crops (%)	142	-	-	63,4	-
Farms with biogas beets (%)	142	-	-	12,7	-

Descriptive statistics II

	N	Min.	Max.	Mean	SD
Key data:					
Extent of arable land (ha)	142	5	4010	353,8	620,7
Average annual precipitation (mm)	142	480	950	679,3	109,3
Average soil class	142	22	96	57,4	18,9
Yield levels:					
Sugar beet yield in 3-year average (dt ha ⁻¹)	93	400	1000	705,5	97,7
Silage maize yield in 3-year average (dt ha ⁻¹)	93	200	720	510,9	90,0
Expected yield potential for sugar beet (dt ha ⁻¹)	49	100	850	573,1	176,7

H-/U-test for equal means I

Item	Mean	Groups	H-/U-Test P-Value
In general, what is your opinion on biogas production?	2,38	Age	0,002**
		Education	0,582
	neutral	Farmsize	0,027*
	slightly	Risk	0,975
	positive	Eco-Ability	0,951
		Energy crops	0,001***
Biogas from sugar beets...			
...may become an important alternative after the production-quota expiration in 2017	2,38	Age	0,129
		Education	0,007**
	neutral	Farmsize	0,249
	slightly	Risk	0,592
	positive	Eco-Ability	0,801
		Energy crops	0,019*

***, ** and * describe a significance level of 99,9%, 99% and 95%

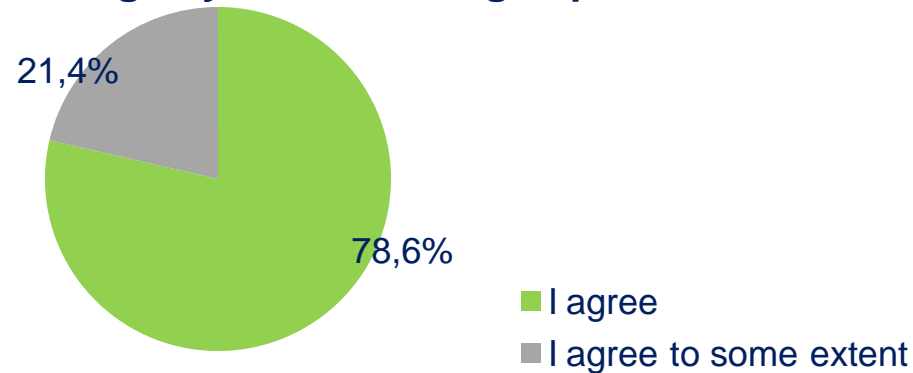
H-/U-test for equal means II

Item	Mean	Groups	H-/U-Test P-Value
Biogas from sugar beets...			
...is a sustainable alternative to silage maize	2,39 neutral slightly positive	Age	0,362
		Education	0,078
		Farmsize	0,459
		Risk	0,638
		Eco-Ability	0,800
		Energy crops	0,808
...is more reasonable than sugar beet cultivation for ethanol production	3,28 neutral slightly negative	Age	0,020*
		Education	0,525
		Farmsize	0,512
		Risk	0,721
		Eco-Ability	0,221
		Energy crops	0,202

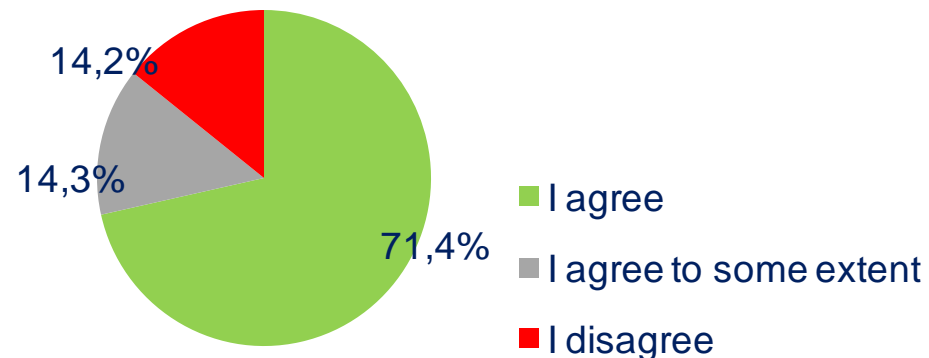
***, ** and * describe a significance level of 99,9%, 99% and 95%

Motives to grow sugar beets for biogas:

...with sugar beets I increase the gas yields in a biogas plant



...sugar beet cultivation for biogas production is an important extension of my business



Conclusions

Key question:

Are German farmers willing to grow sugar beets for biogas production?

- Opinion on biogas in general and from sugar beets is predominantly positive across all tested groups.
- We can confirm a participants' acceptance for sugar beets as an addition to established substrates.
- It has not turned out that biogas production from beets is rated better than bioethanol production from beets.
- It could not be shown that larger than average farms or risk averse farmers tend to earlier accept contracts that protect them against risk.



Critical reflection

- We collected data from farmers across Germany
 - partially suitable to our survey
 - better: address farmers in regions where sugar beet cultivation is possible but not very common
 - Biogas beets in spotlight, not sugar beets for sugar
- We analyzed data from 142 respondents
 - more data collection is necessary
- Every farmer could participate
 - It is important that the participants have knowledge of sugar beet cultivation (and biogas production)



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Thank you for your attention!

Any questions?