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Bioenergy from winter beet – a joint project in the value chain -

Resource efficiency of winter beet

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Introduction

The resource efficiency of sugar beet sown in autumn and harvested in late summer or autumn of the next year (= **winter beet**) might differ from the resource efficiency of beet sown in spring and harvested in autumn (= **spring beet**). The two crops are grown during different seasons and for a different period. This has consequences for the crop rotation (Fig. 1) and the cultivation system (Tab. 1). The question is to which extent the additional efforts connected to growing winter beet, in particular in terms of plant protection, affect the resource efficiency of the cultivation system.

Crop rotation & cultivation system

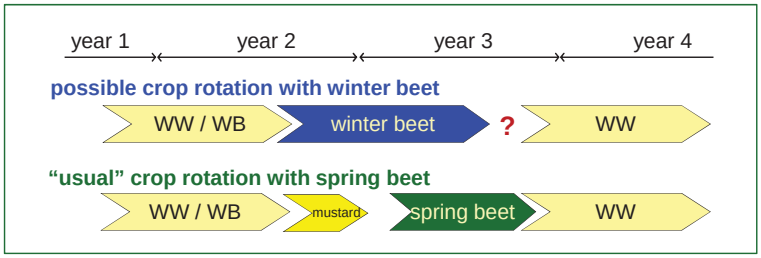

Fig. 1: Possible crop rotations (WW = winter wheat; WB = winter barley; **?** depending on time of harvest in late summer or autumn)

Tab. 1: Proposed cultivation systems

measures		intensity: winter beet	intensity: spring beet
soil tillage	2 x stubble cultivation seedbed preparation	5 cm + 15 cm working depth 3 cm working depth	5 cm + 15 cm working depth 3 cm working depth
fertilising	P_2O_5 and K_2O N	according to plant uptake 40 kg N ha^{-1} in autumn + 70 kg N ha^{-1} in spring	according to plant uptake 90 kg N ha^{-1} in spring
catch crop	sowing mustard N application mulching	– – –	in August: 20 kg ha^{-1} seeds 20 kg N ha^{-1} in October/November
sowing	drilling to stand	in August, distance 15 cm	in April, distance 20 cm
pesticides	herbicides	3 x dicotyledons 2 x monocotyledons	3 x dicotyledons
	fungicides	1-2 x leaf spot diseases, fungal infection of leaves	1 x leaf spot diseases
	insecticides	1 x aphids	–
harvest	6-row harvester	starting end of August	starting mid September

Results

Pros

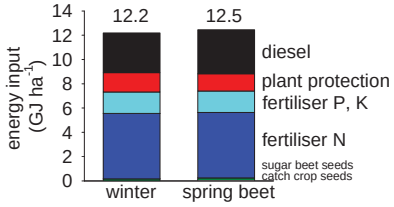

Fig. 2: Energy input

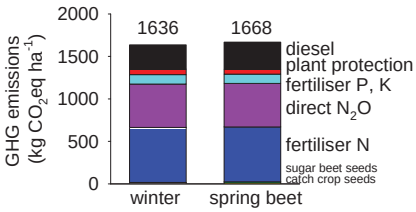

Fig. 3: Greenhouse gas (GHG) emissions
(only N_2O directly linked to N fertilising was taken into account)

Tab. 2: Estimated root yield for spring beet and bolting-resistant winter beet at sites differing in yield potential (model calculations, Stephan et al. 2014)

	spring beet	winter beet	
site	root yield	additional yield (%), harvest at the end of	
(geogr. loc.)	(t ha^{-1})	August	October
1 (Central)	54.4	-2	+24
2 (East)	55.6	+2	+34
3 (North)	63.3	+6	+33
4 (West)	64.8	+9	+33
5 (South)	71.8	+1	+26

Cons

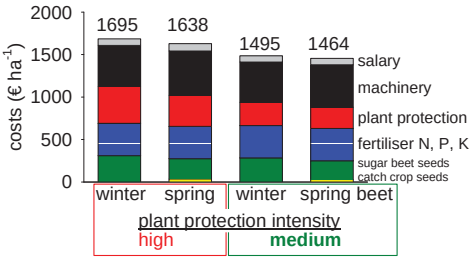

Fig. 4: Influence of plant protection intensity on direct costs and operating costs

Indifferent

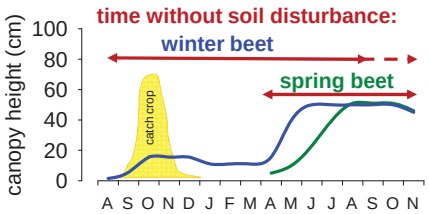

Fig. 5: Factors effecting biodiversity like canopy development and soil disturbance

Conclusions

Environmental effects demonstrate some advantages and some undecided differences. Costs are higher for **winter beet** (plant protection), which emphasizes the importance of the attainable yield. Therefore, differences in resource efficiency between **winter** and **spring beet** strongly depend on the additional yield of **winter beet**.

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