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# Does sugar beet need close row spacing for maximum yield?



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## **Background & Objectives**

- In Europe and many other areas of the world, sugar beet is grown in row spacings of 45 or 50 cm
- Wider spacings offer benefits such as: decreased need for in-row hoeing to control weeds, less diesel consumption and soil tare at harvest
- Such benefits of wide rows might be counteracted by substantial yield decreases
- The aims of our study were:
  - To quantify the **yield effect** of row spacings in the range of 30 90 cm
  - To clarify, if differences in light interception can explain yield differences

#### **Results & Discussion**



**Fig. 1:** Row spacing effect on **relative sugar yield** (45 cm=100 %). Mean ± coeff. of variation, 95 % conf. interval. Mean absolute sugar yield varied among sites from 9 to 20 Mg ha<sup>-1</sup>.  No yield difference between 30 and 45 cm row spacing, but yield loss with wider spacing (Fig 1.)

→ 2.5, 5 and 10 %
 loss with 60, 75 and 90
 cm row spacing,
 respectively

 Similar LAI but lower canopy ground cover in July with increased row distance (Fig. 2)







PAR transmission measurement at 90 cm row spacing

Fig. 4: Row spacing effect on PAR transmission in July/August. Dashed lines show means. Row direction was east-west. Harste 2021.

- Closer correlation
  between CGC and
  sugar yield than
  LAI (Fig. 3)
- 10 % higher PAR transmission with
   90 versus 45 cm
   wide rows (Fig. 4)

**Fig. 2:** Row spacing effect on **LAI** (top) and **canopy ground cover** (bottom). Mean ± standard deviation. Harste 2021.



**Fig. 3:** Pearson coefficients of correlation between **canopy properties** and **sugar yield**. N=16, LAI = leaf area index, CGC = canopy ground cover. Harste 2021.



Fig. 5: Canopy ground cover was acquired from subplots of 0.9 m x 7.0 m. It was calculated from VARI-Index and by using Otsu threshold method, 6<sup>th</sup> of July 2021, Harste.

- Yield decrease at 60 90 cm wide rows was lower than expected
- Effect size corresponds for yield and PAR transmission
- Canopy ground cover appears better suitable to explain sugar yield than LAI
  - → Source limitation likely explains yield decrease in wide-row sugar beet stands

### Outlook

Conclusions

Can integration of plant canopy height estimation improve sugar yield prediction?

#### **Materials & Methods**

- Field trials conducted at 14 sites in Central Germany 2018-2021, with row distances from 30 to 90 cm (4 field replicates each, 85,000 95,000 plants ha<sup>-1</sup>)
- RGB arial photographs (DJI Zenmuse X7) acquired at 4 dates in 2021 to calculate canopy ground cover (CGC) using VARI-Index and Otsu threshold method. Leaf area index (LAI) was measured with LI-COR LAI 2200C. LI-COR LI-191R was used for PAR measurement below the canopy. Incoming PAR was calculated as solar radiation divided by 2
- Sugar yield determined according to standard procedures