



PLANTING DEPTH STUDY IN SUGAR BEETS

STUDY CONTACT:

Nils Zehner - Agronomy and Farm Solutions
nils.zehner@agcocorp.com

OBJECTIVE:

The objective of this study was to evaluate yield in sugar beets at different planting depths using a Precision Planting test planter with a DeltaForce™ down force control and SmartDepth™ planting depth control system.

STUDY DESIGN:

The study was carried out on the Swiss Future Farm in Switzerland in 2022 as a side-by-side strip trial with the following planting depths:

- Uniform planting depth 2.5 cm (standard)
- Variable planting depth based on soil moisture (SM) measurements of Precision Planting SmartFirmer soil sensors and Precision Planting SmartDepth control with 3 increments: 2.5 cm - 3.8 cm - 5.5 cm planting depth:
 - SM >40% = 2.5 cm
 - SM 40%-30% = 3.8 cm
 - SM <30% = 5.5 cm
- Uniform planting depth 3.8 cm (slightly deeper)

To ensure consistent planting depth, all treatments were planted with DeltaForce automatic down force control set to a target down force of 45 kg with a plant population of 100,000 seeds per hectare (hybrid: KWS Smart Manja). Planting date for the study was on 24th March.

RESULTS:

The trials plot was harvested in October 2022 (210 days after planting).

Highest sugar beet yield in the comparison was obtained from the trial strips with standard planting depth (2.5 cm), whereas variable (2.5-5.5 cm) and slightly deeper planting depth (3.8 cm) provided lower yields (Figure 1). The beet yield difference resulted to 1.5% and 4.1% when planting at variable depth of 2.5-5.5 cm and 3.8 cm respectively instead of 2.5 cm planting depth.

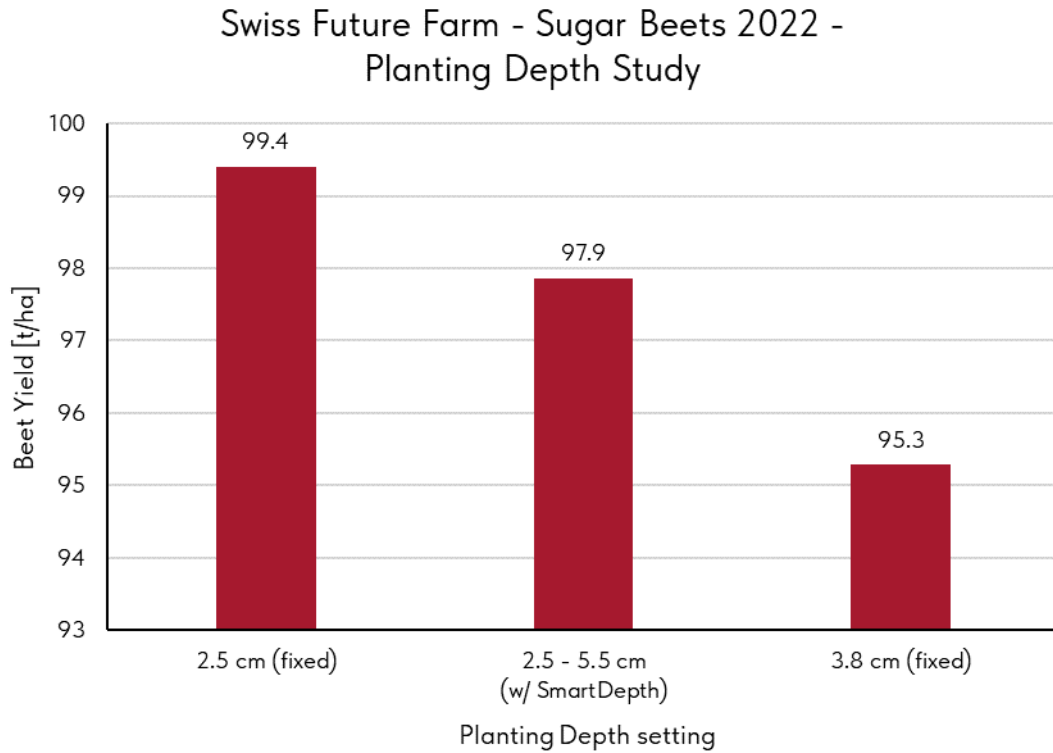


Figure 1. Beet yield results of the Swiss Future Farm 2022 Planting Depth Study in sugar beets.

Highest sugar content was obtained from sugar beets planted at standard planting depth of 2.5 cm (16.92%), whereas variable and slightly deeper planting depth had lower sugar content of 16.39% and 16.25%, respectively (Figure 2). This may be due to lower impurities such as amino acids, potassium and sodium in sugar beets planted at 2.5 cm planting depth, as these impurities reduce the extractable sugar.

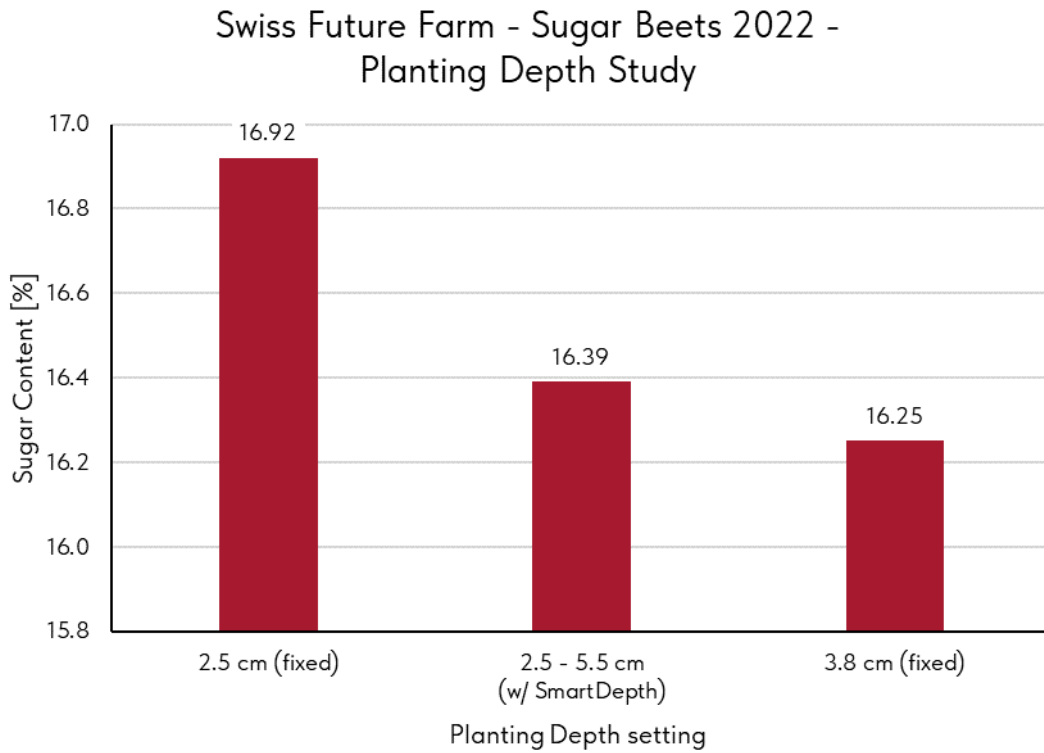


Figure 2. Sugar content results of the Swiss Future Farm 2022 Planting Depth Study in sugar beets.

Highest sugar yield was obtained from the trial strips with 2.5 cm standard planting depth, whereas less sugar yield for variable and slightly deeper planting depth was found (Figure 3).

In our study, the increase in sugar yield that was generated by planting at 2.5 cm instead of 2.5-5.5 cm and 3.8 cm planting depth amounted to 6.0% and 8.7%.

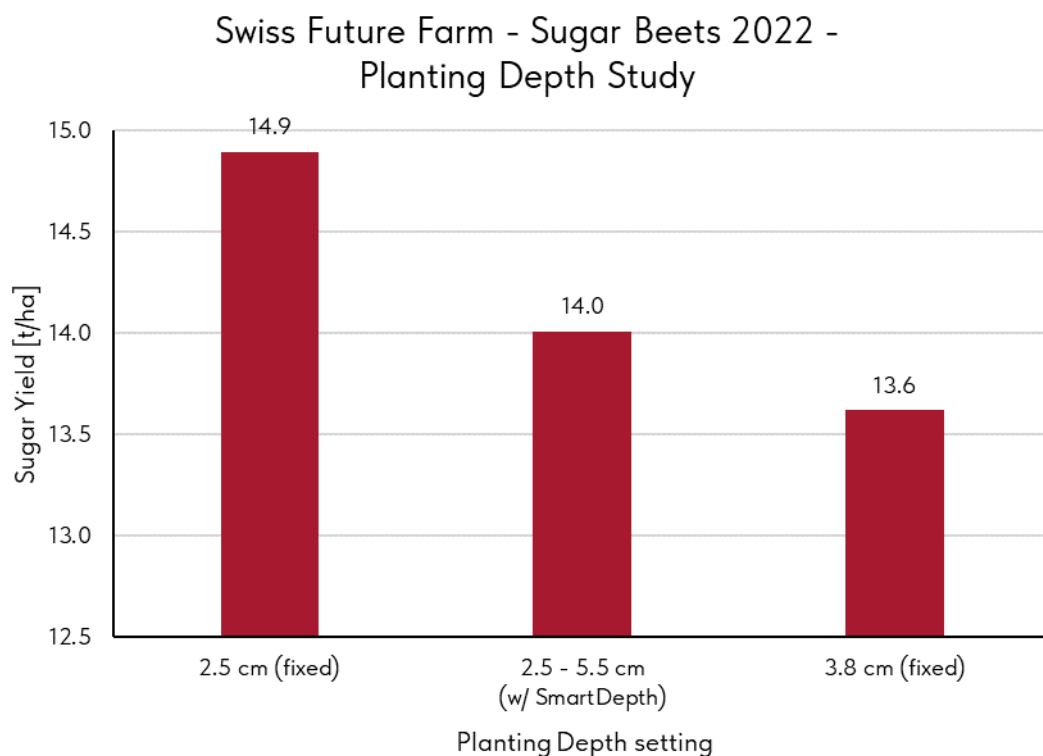
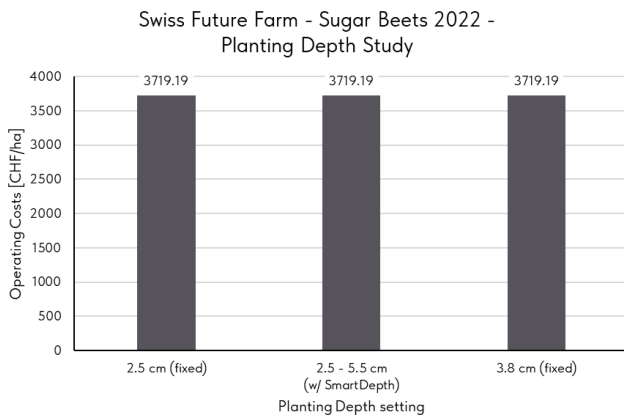
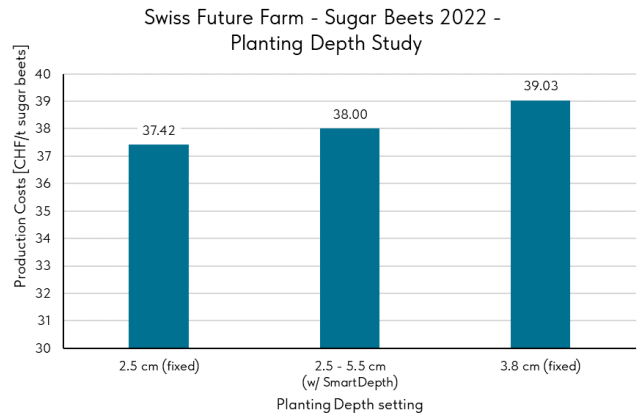
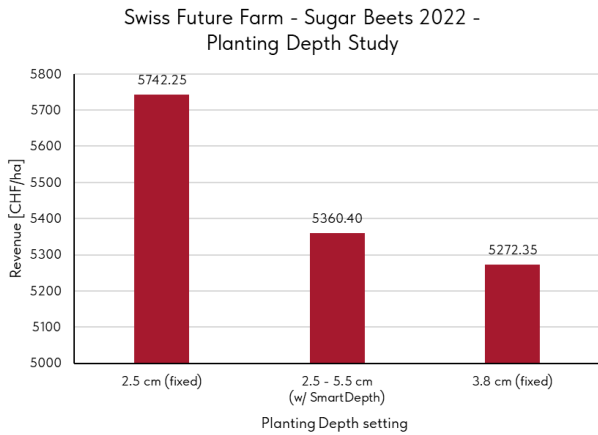


Figure 3. Sugar yield results of the Swiss Future Farm 2022 Planting Depth Study in sugar beets.

Figure 4 shows a graphical comparison for revenue, operating costs, and production costs per ton of sugar beets resulting from this study. Operating costs comprise machinery, input, and labor costs for all field operations along the crop cycle from seedbed preparation for the preceding cover crop (Phacelia) to sugar beet harvest. All field operations were conducted uniformly across all trial strips and the planting depth settings represented the only variable altered between the different treatments.



FINANCIAL:

For sugar beets planted at 2.5 cm fixed planting depth, an additional contribution margin of 381.85 CHF/ha and 469.90 CHF/ha could be achieved compared to 2.5-5.5 cm variable planting depth and 3.8 cm fixed planting depth, respectively (Figure 7).

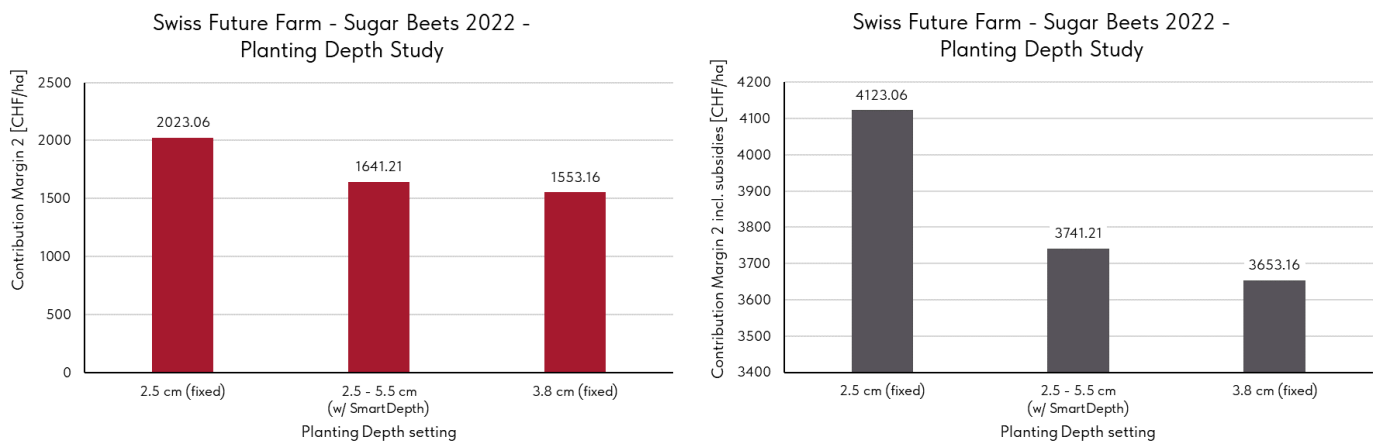


Figure 7. Contribution margin 2 obtained from the SFF 2022 Planting Depth Study in sugar beets.

The assumptions on payback are based on the conditions in the Swiss Sugar Beet Growing and Delivery Agreement 2022 between Schweizer Zucker AG and the Swiss Sugar Beet Growers Association.

Sugar beet basic price: 50.00 CHF/ton

CONCLUSIONS:

- Precision Planting SmartFirmer™ soil sensors measure soil moisture, soil temperature and organic matter in real time during planting and provide meaningful information on soil properties and field zones.
- Precision Planting SmartDepth™ automatically adjusts planting depth between a minimum and maximum depth while maintaining the soil moisture target based on SmartFirmer soil sensor measurements.
- vSet™ seed meters and vDrive™ electric drives provide highest accuracy for singulation of row crops and enable real time adjustment of planting rates.
- Automatic down force control with Precision Planting DeltaForce™ ensures consistent planting depth also under heterogeneous soil conditions.
- Fendt VarioGuide with RTK ensures planter passes with maximum accuracy and operator comfort.
- Fendt Contour Assistant enables optimum wayline adaption to the contours of the field during planting.

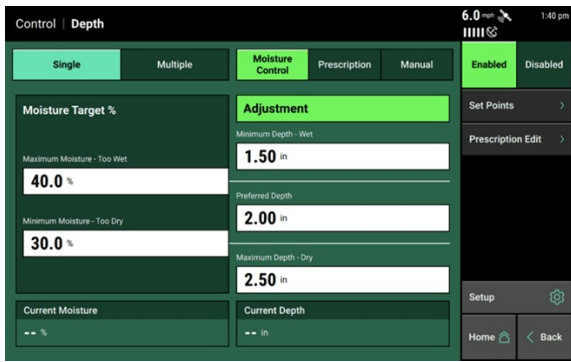


Figure 6. Variable Depth Moisture Control mode in the Precision Planting 20/20 Gen3 monitor (left), Precision Planting SmartDepth gearbox for real-time adaption of planting depth according to soil moisture (top right), and Precision Planting SmartFirmer for measurement of soil moisture in the furrow (bottom right).

Table 1 shows summarized results on revenue, operating costs, production costs per ton, and contribution margin 2 for sugar beets planted with different planting depth using the Precision Planting SmartDepth system.

	Planting Depth 2.5 cm (fixed)	Planting Depth 2.5 - 5.5 cm (w/ SmartDepth)	Planting Depth 3.8 cm (fixed)
Sugar Beet Yield (t/ha)	99.4	97.9	95.3
Sugar Content (%)	16.92	16.39	16.25
Sugar Yield (t/ha)	14.9	14.0	13.6
Deliverables (CHF/ha)			
Crop Value / Revenue	5742.25	5360.40	5272.35
Costs (CHF/ha)			
Tillage	443.41	443.41	443.41
Seeding & Planting	788.81	788.81	788.81
Fertilization	763.15	763.15	763.15
Herbicide Application	186.18	186.18	186.18
Insecticide Application	136.33	136.33	136.33
Fungicide Application	403.45	403.45	403.45
Harvest	720.00	720.00	720.00
Labor	277.86	277.86	277.86
Outcomes			
Operating Costs (CHF/ha) incl. machine, labor, inputs costs	3719.19	3719.19	3719.19
Production Costs (CHF/t sugar)	37.42	38.00	39.03
Contribution margin 2 (CHF/ha)	2023.06	1641.21	1553.16
Contribution margin 2 (CHF/ha) incl. machine, labor, inputs costs and sugar beet subsidies	4123.06	3741.21	3653.16

Table 1. Cost accounting results of the SFF 2022 Planting Depth in sugar beets.