

Field testing Agrobot Robotti 2019

In sugar beet cultivation

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Abstract

In spring 2019, the autonomous tool carrier Agrobot Robotti was field tested for applications in sugar beet cultivation. A two hectares patch in a larger beet field was seeded, herbicide treated three times, and row cultivated twice by the tool carrier using implements specifically adapted to the tool carrier. The field was monitored throughout the growth season and developed similar to the adjacent field. Weed control was at a satisfactory level and comparable to levels in the rest of the field, although patches of thistles did develop slower in the Robotti treated area.

Introduction

Band spraying can be a path to increase the efficacy in herbicide and insecticide applications in sugar beet production and to reduce the environmental impacts by the applications. The technique can also reduce the amount of active ingredients used, thus leading to potential economic savings. A lack of precision in seeding and spraying can limit the full exploration of the technique when using a very narrow band.

The expected high precision of the autonomous tool carrier could be a means to fully exploit the potential savings by band spraying combined with row cultivation. It is therefore of interest to test this concept and its durability and accuracy.

In spring 2019 Agricenter Denmark at Nordic Sugar carried out a field test of the concept in collaboration with the research station Nordic Beet Research, the retailer FMR Maskiner and the developing company Agrobot. **The field test**

A two hectare area was selected for the test. The area is part of a large, uniform and rectangular-shaped field located on the island Falster near the city Nørre Alslev. The uniform and rectangular shape eased the drive path of the autonomous tool carrier. A mechanical sugar beet drill was fitted to the tool carrier. Because of limitations in width, the number of rows was reduced to five. The two hectares were seeded the 10 April 2019 under good conditions, but about a week later than the rest of the field.

An existing simple field sprayer developed for the tool carrier was adapted to band spraying. A band of approximately 15 cm was applied over the beet row, using an ISO 01 Teejet Even spray nozzle spraying at 1.3 bar and moving at a 5 km/h speed. The field was treated three times with a standard mix of herbicides (metamitron, phenmedipham, desmedipham and ethofumesat). Treatments were carried out on April 30th, May 8th, and May 23rd when emerging weeds were at the dicotyledonous state. A five row cultivator was fitted to the tool carrier and row cultivations were carried out on May 8th, the same day as the second spray, and again at row closure on June 18th.

The driving path of the tool carrier was prepared by Agrobot, and the tool carrier did not seed or treat the headlands.

The yield was estimated using the weight of beets in the harvester at three places in the test field and in the adjacent field, harvested at a known surface area.



Figure 1. The Agrointelli Robotti seeding the test area.



Figure 2. The Agrointelli Robotti band spraying the test area.



Figure 3. The Agrointelli Robotti row hoeing the test area.



Figure 4. The test area in July, with the adjacent field in the back to the left side.

Monitoring the field and harvest

The Agricenter followed the development in the field throughout the season. Weeds were well controlled with only a few weeds left in the rows, except for some patches of thistles on the area. The general weed control was as good as in the rest of the field, which was sprayed with a conventional sprayer and not row cultivated. The thistle patches did not develop as much in the test area as in the adjacent field, which could be a result of the row cultivations.

The field and the test area was harvested on December 6th with a six row self-propelled harvester. Harvesting the area seeded with a five row seeder did not cause any problems. Yields were high and approximately 116 ton dirty beets per hectare in the test area cultivated with the autonomous tool carrier and approximately 112 ton dirty beets per hectare in the rest of the field.

Discussion

The field test indicates that the autonomous tool carrier are well capable of carrying out seeding, band spraying and row cultivation in a beet field. The tool carrier worked well on the two hectares, although some work still can be done on optimizing the driving paths. There were no indications of negative impacts on yields. The row cultivation might have led to less development of thistles.

The concept has been shown to work on a smaller area, and it will be interesting to scale up the test, which we expect to be able to do in 2020.

If the concept works well on larger areas, and it can be shown to be economically viable for beet growers, it could prove to be one of the paths to follow in future beet growing.