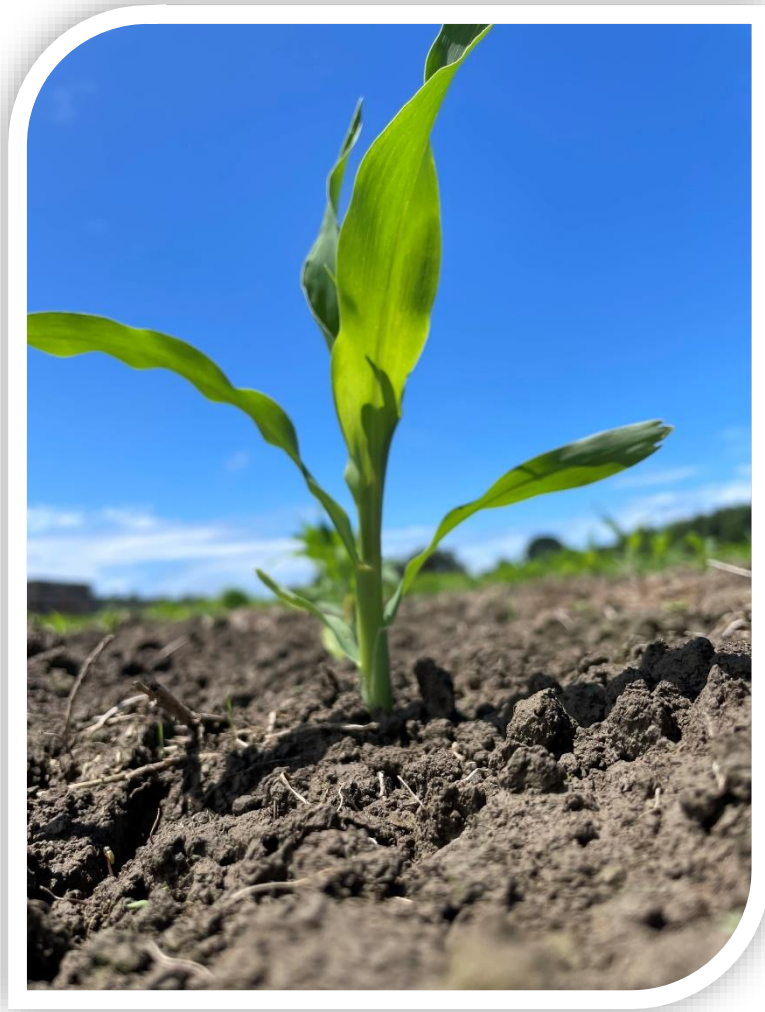


Carbon Positive Project

Milestone Three Report

Due 1 March 2023



Milestone 3: Year 1 Crop Monitoring and Reporting

Date:1 March 23	Milestone 3
Milestone description	Year 1 Progress as per planned milestones
Target Outcome	Scientific knowledge of regenerative agriculture principles and transition.
Activities undertaken	PSG Meeting to review milestone reports, Year 1 summer process crops established, crop monitoring, outreach Field Day. Further activities as per Annual Project Plan and Annual Science Plan.
Deliverables / evidence of completion / achievement of Outcome	PSG and TAG meeting minutes. Deliverables as per milestones within Annual Project Plan and Annual Science Plan.
MPI Funding amount	\$83,303.55
Co-Funding contribution	35,601.52
Total	\$119,005.07

Activity:	Target Completion Date:	Details:	Completion Date:
Year 1 Progress as per planned milestones	1/03/23	Year 1 Progress as per planned milestones	Ongoing
Continue agronomic observations	1/03/23	Weekly crop walks noting weeds, pests, diseases	Ongoing
Irrigation	1/03/23	By linear as required according to monitoring, all treatments same	Ongoing

Activities Completed

In addition to the listed activities, time has been spent researching cover crop species and establishment options. We continue working with our wider advisory team on what might be appropriate in our systems, and have engaged with seed companies that can provide useful advice and the required seed.

On the 13th of February, Cyclone Gabrielle tore its path across Hawke's Bay.

The trial site for this project has come through virtually unscathed, with surface flooding which cleared after about a day. Many others have not been so lucky. Both Heinz-Watties and McCains have experienced severe damage to parts of their operations, with both factories experiencing closures and harvest equipment damaged. The sector will have challenges ahead to harvest and process what remains of their crops.

Agronomic Observations

Weekly crop walks have been completed, checking crop development, as well as the presence of pests, diseases, and weeds.

Crop Development



Figure 1 Sweetcorn before canopy closure

Post emergence herbicide was applied on the 18th January, and side dressing completed 25th January. Pukeko trapping continued through the month of January and into early February, to allow the crop to reach a size where pukeko couldn't pull them out of the ground.

Included in this report are some crop development data collected so far. Below is a reference table showing the treatment, and the colour and plots that relate to each treatment.

Treatment	Plots
Conventional	1, 6, 9, 11
Hybrid	2, 4, 8, 12
Regenerative	3, 5, 7, 10

Before canopy closure Canopeo was used weekly to capture canopy cover in each plot. Weed cover in some plots affected results, implying their canopies were significantly larger than others. However, after the post emerge herbicide was applied, canopy data captured became more uniform.

Canopy data has been analysed per treatment. Using the most recent information collected, there was a statistically significant difference between the conventional treatment and the regenerative treatment, however there is no significant difference between the other treatments.

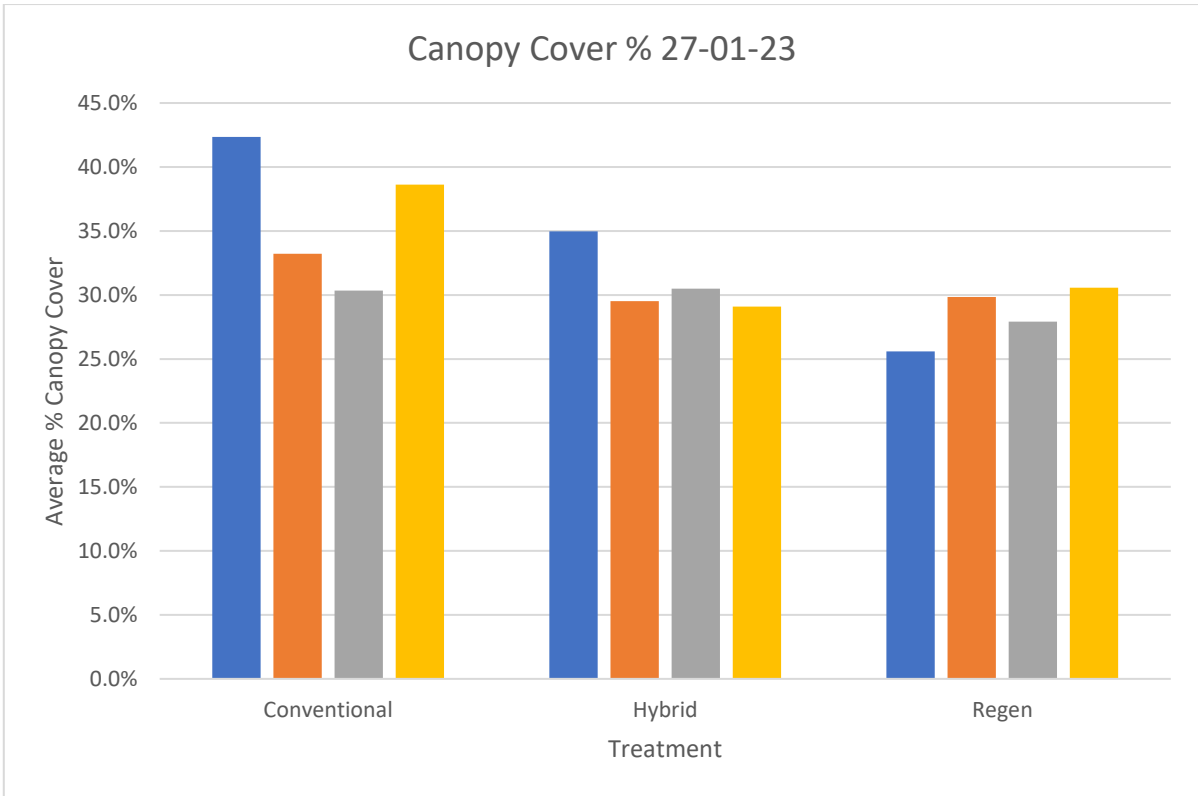


Figure 2 Graph showing % canopy cover at the end of January.

Crop monitoring has included plant population, leaf counts, number of tillers and stem diameter. Two examples: Sweetcorn Population and Average Stem Diameter are presented in Charts below. As the crop matures, silking and tasselling will be monitored.

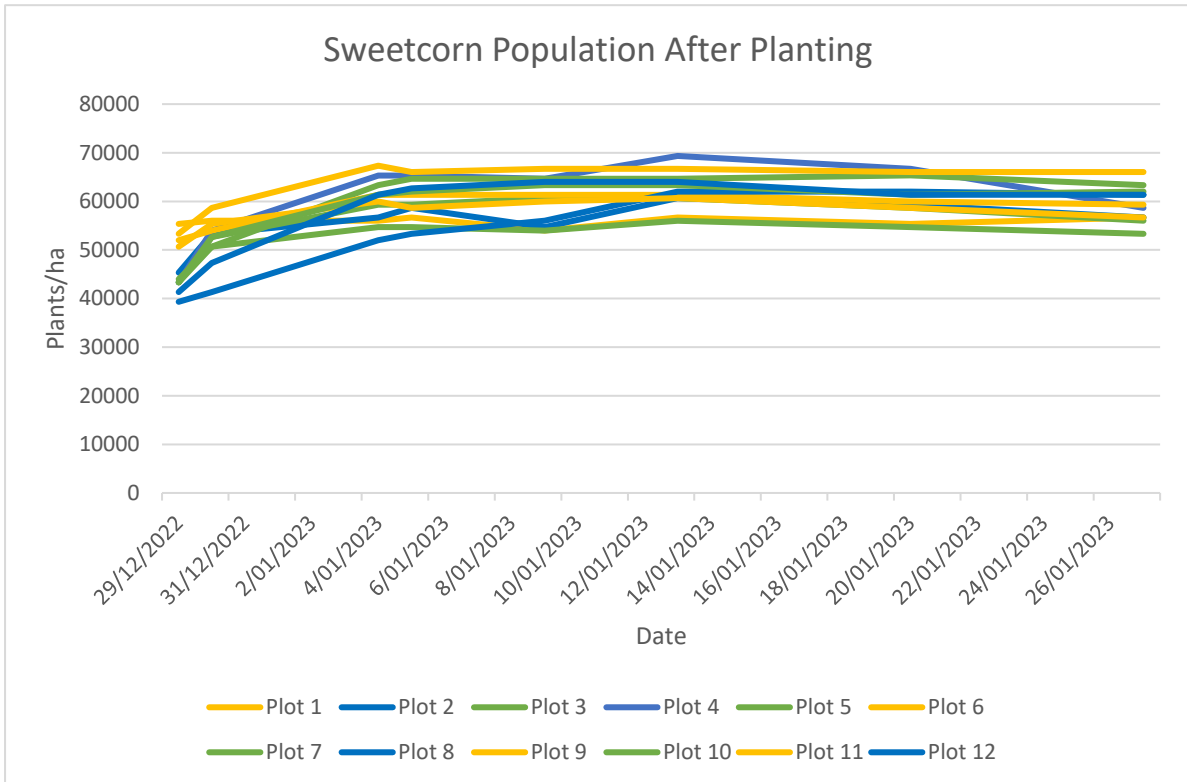


Figure 3 Sweetcorn population from planting

Final plant population is given per treatment below. Statistical analysis shows no significant difference between treatments.

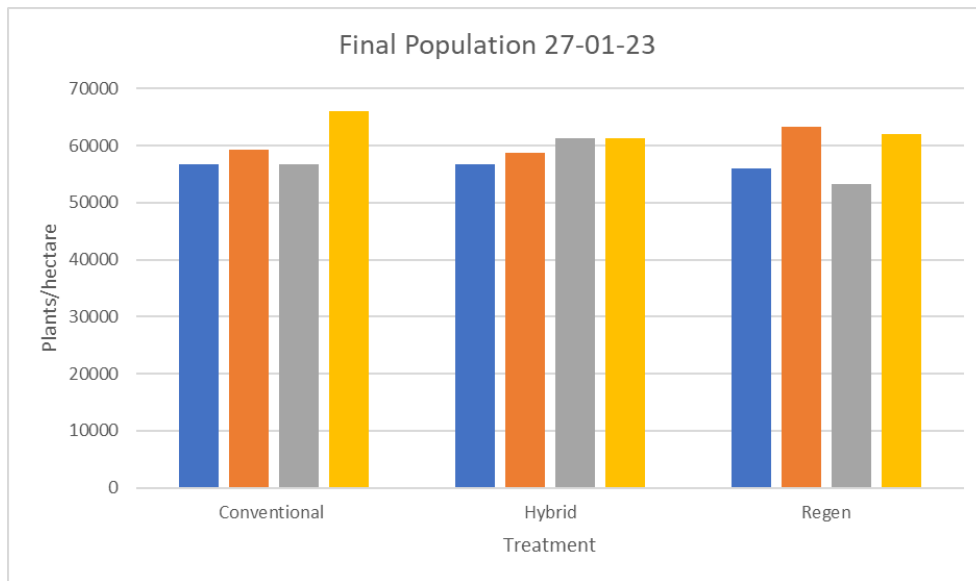


Figure 4 Sweetcorn final population per treatment.

Stem diameter has been used as a crop development measure. There is a statistically significant difference between the conventional treatment and the regenerative treatment. There is no significant difference between the other treatments.

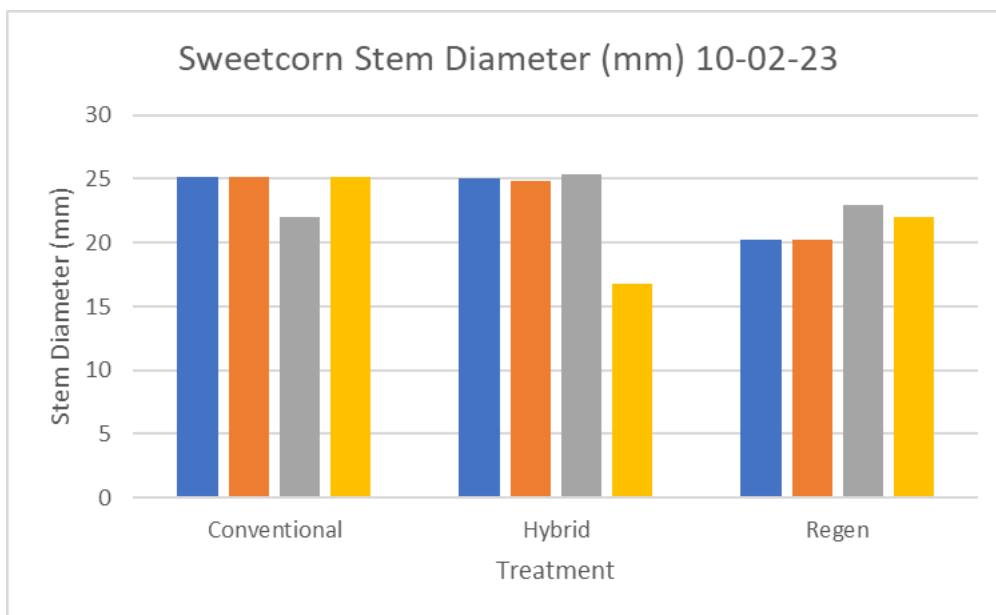


Figure 5 Sweetcorn stem diameter

Pests, Disease and Weeds

The emerging crop was affected by slugs and some cutworm damage. The crop is now healthy, with no disease or insect pressure causing significant damage. We will monitor for Fall Army Worm.

There appears to be differing effectiveness in weed control with the different programs used. The crop has outgrown any significant weeds, however there may be other issues associated with weed pressure after harvest. This will be managed as appropriate.

Irrigation

No irrigation has been applied to the crop. While there have been some small periods of drier weather, the site has received consistent rainfall since planting. The below graph shows recorded rainfall, including the 138mm the site received on the 13th of February during Cyclone Gabrielle.

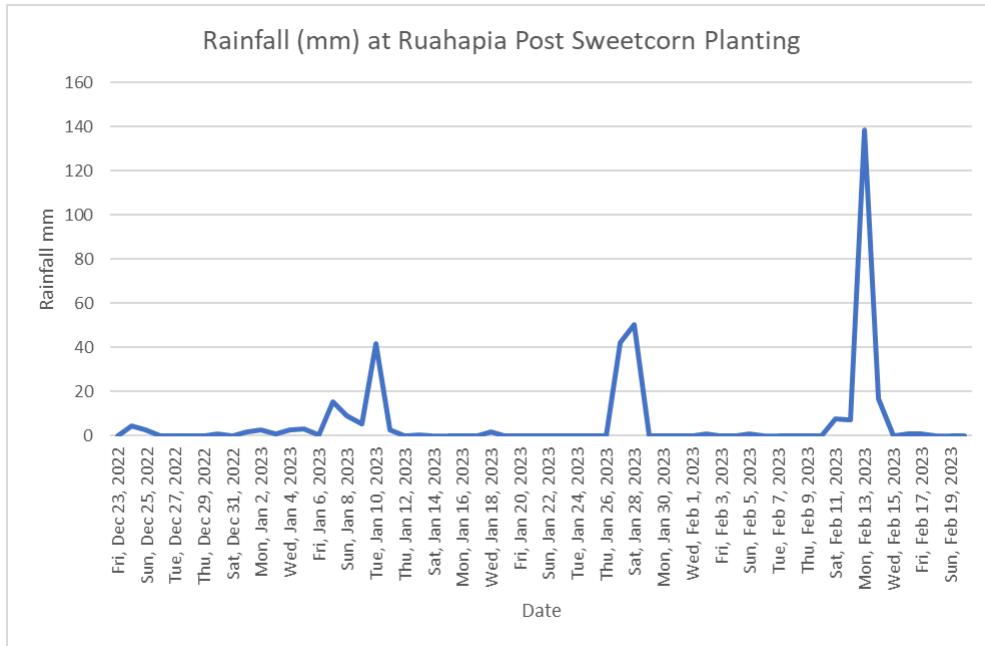


Figure 4 Rainfall data from Ruahapia weather station, retrieved from <https://nzap.metwatch.nz/weather/monthly?station=RUA&year=2023>

While it has been a significantly wetter than average summer, irrigation monitoring is still occurring. Twelve neutron probe irrigation monitoring tubes have been installed by Aqualinc. As there are limited differences between plots at this early stage, the data is reported per quadrant. An example of the data is given below.

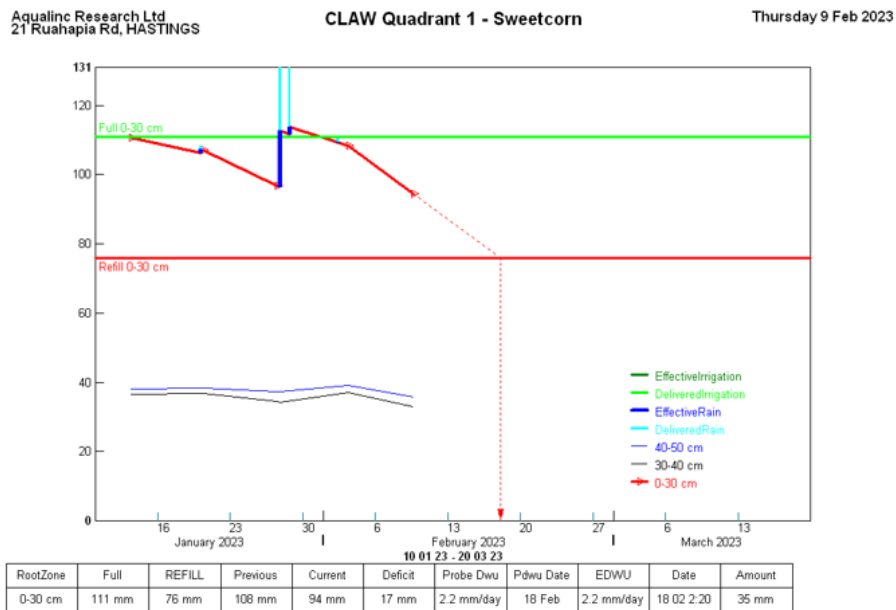


Figure 5 Soil moisture data to date provided by Aqualinc.

Additional Results- Aggregate Stability

As part of Milestone 2, samples were collected for aggregate stability testing and delivered to Manaaki Whenua- Landcare Research for analysis. These results were not available to be presented as part of the Milestone 2 report. A brief summary of results included below.

Manaaki Whenua have advised that the most common way of presenting aggregate stability is using Mean Weight Diameter, allowing for trends to easily be tracked over time.

- MWD <1 very weak soil aggregates
- MWD >2 quite stable aggregates.

Treatment	Mean Weight Diameter
Conventional Treatment	0.60
Hybrid Treatment	0.80
Regenerative Treatment	0.65
Hybrid Treatment	0.61
Regenerative Treatment	0.59
Conventional Treatment	0.46
Regenerative Treatment	0.65
Hybrid Treatment	0.92
Conventional Treatment	0.49
Regenerative Treatment	0.67
Conventional Treatment	0.49

All treatments have a MWD <1, indicating that all plots have very weak soil aggregates. The MWD of the conventional treatment (full cultivation) was significantly lower than both the hybrid and regenerative treatments (P-Value of 0.044 and 0.008 respectively). The MWD of the hybrid and regenerative treatments (both strip tilled) was not significantly different (P-Value 0.323).

Additional to this method of measuring aggregate stability, the review of another method, the Slake Method, has been conducted and progress is being made.

Field Day

Due to the timing of the formal Carbon Positive Project announcement and the region being hit by a cyclone, there has not been an appropriate window for an organised field day to at the Microfarm. Dan, Alex and Phil attended a small, informal field day with the Massey Regenerative Project team to look at their site and will be hosting the Massey team in return in the coming weeks. A wider industry field day will be organised, once recovery has started for Hawke's Bay growers.

Planning Ahead: Milestone 4 - Due 1 June 2023

Date: 1 June 2023	Milestone 4
Milestone description	Year 1 Completed
Target Outcome	Scientific knowledge of regenerative agriculture principles and transition.

Activities undertaken	Operational Advisory Group (OAG) meeting, harvest, crop and soil analyses completed, winter crops established, magazine article, Outreach presentations at 1 conference. Further activities as per Annual Project Plan and Annual Science Plan
Deliverables / evidence of completion / achievement of Outcome	Trial results, copies of all extension material. Photos of events (preferred but not essential) PSG and TAG meeting minutes. Deliverables as per milestones within Annual Project Plan and Annual Science Plan.
MPI Funding amount	\$83,303.55
Co-Funding contribution	35,701.52
Total	\$119,005.07

Key actions for Milestone 4 include:

- Organise meeting with Operational Advisory Group
- Year 1 summer crop harvested and related data collected incl. quality and soil data.
- Appropriated cover crops established.
- Magazine article to be written.