Carbon Positive Milestone 13

Prepared by Olivia Webster and Dan Bloomer

LandWISE Inc.

June 2026

Table of Contents

Table of Figures

Table of Tables

Milestone 13

Date: 1 Jun 2026	**Milestone 13**
Milestone description	Year 4 Completed
Target Outcome	Industry adoption of new best practice and decision-making tools.
Activities undertaken	OAG team meeting, harvest, crop and soil analyses completed, winter crops established, support grower to adopt regen practice, Outreach presentations at 1 conference, magazine article. 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	109,203.55
Co-Funding contribution	46,801.52
Total	$156,005.07

Milestone 13 Activity Plan

Activity	Completion Date	Details
OAG Team meeting	1/06/26	Year 4 Progress as per planned milestones
Agronomic observations/ crop health monitoring	1/06/26	Agronomic observations leading up to harvest
Year 4 summer harvest measurements (Butternuts)	1/04/26	Estimated harvest date early April
Harvestable yield (hand harvest)	1/04/26	4 x 4m2 quadrats per plot
Wattie's harvestable yield	1/04/26	Details to be confirmed with Wattie's
Non harvested yield	1/04/26	Details to be confirmed with Wattie's
Year 4 summer crop analysis (Butternuts)	1/06/26	
Factory quality assessments	1/06/26	Details to be confirmed with Wattie's
Crop tissue N and C	1/06/26	Commercial lab assessment
Residue biomass	1/06/26	Landwise harvest and weighed
Residue N, C and DM%	1/06/26	Commercial lab assessment
Post harvest soil analysis	1/06/26	
Visual soil assessment	1/06/26	4 samples per plot, before crop established
Hot water extractable carbon (intermediate sampling)	1/06/26	0-15cm, 15-30cm, 30-60cm 8 x 40mm cores per plot. Combine and send composite sample for lab testing (East and West end)
Winter cover crops established	1/06/26	
Support grower to adopt regen practice	1/06/26	
Magazine article	1/06/26	
Outreach presentation at 1 conference	1/06/26	FLRC or HBFFT + LandWISE

1 Overview

This milestone report provides an overview of Year 4 progress in the Carbon Positive Trial, focusing on soil infiltration, in-season crop monitoring, summer harvest measurements, crop and residue analysis, winter cover crop establishment, and a gross margin analysis for the butternut crop.

Soil infiltration testing with disc permeameters (at the surface and 10 cm depth) showed no significant differences in steady-state infiltration among the Conventional, Hybrid, and Regenerative treatments across the tensions assessed (-15, -6, and -3 cm).

In-season monitoring of the butternut crop showed largely consistent patterns across treatments. Weekly Hydrosense II readings (0–20 cm) indicated the Conventional treatment was slightly wetter early on, before all treatments converged and tracked similarly for the remainder of the season; after mid-December there was no need to irrigate due to rainfall events. Canopy development followed the same overall trajectory in all treatments, with the Conventional treatment slightly ahead until canopy closure. All three treatments had comparable canopy opening later in the season. Fortnightly soil nitrate quick tests showed short-term differences associated with fertiliser timing and rates (higher soil nitrate in treatments receiving higher granular N inputs), but nitrate levels converged later in the season with no significant difference between treatments.

Nutrient and product strategies reflected each treatment philosophy. The Conventional and Hybrid treatments relied on granular fertilisers (with Hybrid at a reduced rate), while the Regenerative system used substantially lower granular fertiliser inputs supplemented by biological and foliar products. Despite some differences in herbicide use, the spray program was the same across treatments, resulting in very similar field-use Environmental Impact Quotient (EIQ) scores across the treatments.

Summer harvest measurements showed no significant differences in butternut yield between treatments based on the replicated hand-harvest measurements. Mean yields were 52.74 T/ha (Conventional), 52.00 T/ha (Hybrid), and 49.44 T/ha (Regenerative). Heinz-Wattie's did not harvest the crop due to demand constraints; consequently, treatment-level machine-harvest data were not available. A local grower harvested an estimated 34.79 T/ha across the butternut area. This included reduced yields from wheel and irrigator tracks, and patches of poor growth resulting from rabbit and pūkeko damage.

Crop and residue analyses indicated broadly similar composition across treatments. Brix levels averaged 7.0–7.9%. Fruit dry matter (10–12%) and fruit carbon percentage (39.55–40.80%) did not differ significantly. Fruit nitrogen percentage differed between the Conventional and Hybrid treatments, but total fruit nitrogen (kg N/ha) did not differ significantly among treatments. Residue biomass averaged 17.56–20.57 T/ha, with no significant differences between treatments in residue biomass, dry matter (16%), residue nitrogen (1.70–1.95%), or residue carbon (34.20–35.50%).

Gross margin analysis, using typical commercial "real-world" costs, showed the largest cost differences were associated with ground preparation (strip tillage in Hybrid and Regenerative reduced costs relative to full cultivation) and fertiliser/biostimulants (lowest granular fertiliser cost in Regenerative, with additional biostimulant costs in Hybrid and Regenerative). Despite these differences, statistical analysis found no significant differences between treatments in gross profit, gross margin, or return on investment (ROI).

Following harvest, all treatments were disced, and the winter cover crops were direct-drilled. The Conventional and Hybrid treatments were planted in ryegrass, while the Regenerative treatment was planted in a triticale and vetch mix. Early monitoring indicates the Regenerative mix established more rapidly and developed canopy cover faster than the ryegrass treatments.

Outreach during this milestone included weekly Operation Advisory Group field walks, presentations at the FLRC conference and the Vegetables Big Day Out, and the 'A Lighter Touch' biodiversity event. We also hosted some international visitors, including Prof Charlie White from Penn State University and Lauren Diepenbrock from the University of Florida. Carbon Positive will be reported at the LandWISE 2026 Conference – Soil Health for Profit on 27-28 May.

1.1 Seasonal weather

The daily maximum temperature on the MicroFarm since February 1st has ranged from 13°C. to 31.9°C (Figure 1-1). The average temperature was 15.8°C.

There has been 195.3 mm of rain spread across different rainfall events with significant rainfall on the 14-15th of February (41.4 mm), April 12th (36.6 mm), and the 20th-22nd of April (69.3 mm).

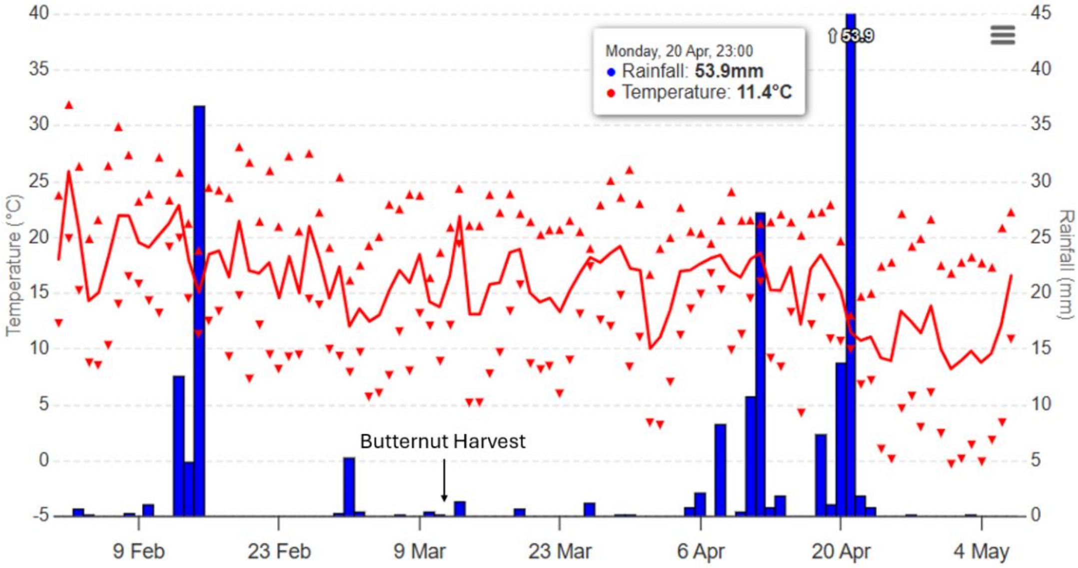


Figure 1-1 Temperature and Rainfall data received from the HortPlus MetWatch Ruahapia Road weather station (1st February - 8th of May).

2 Soil monitoring

2.1 Soil infiltration

Disc permeameters were used to measure soil infiltration. The first set of measurements was taken with the disc permeameter on the soil surface, and the second set was taken 10 cm below the soil surface. Both sets of measurements were taken in the plant line of each subplot (four measurements per plot).

Disc permeameters allow us to understand how water moves through the soil. It does so by applying water to the soil surface at a controlled negative pressure (tension). By changing the water tension, it allows us to measure the unsaturated hydraulic conductivity – flow through only part of the soil pore network – to assess flow through specific pore sizes. Doing so allows us to understand mesopore (0.03-0.075 mm) and macropore (> 0.075 – 0.1 mm) flow, which can give insight into soil porosity, compaction, and drainage capacity.

The permeameter tensions we used were:

-15 cm ~ flow through all pores ≤ 0.2 mm (fine macropores) plus all smaller pores.

-6 cm ~ flow through all pores ≤ 0.5 mm (medium macropores) plus all smaller pores.

-3 cm ~ flow through all pores ≤ 1.0 mm (large macropores) plus all smaller pores.

We worked from the most negative tension (-15 cm) to the least negative tension (-3 cm). The rate of water infiltration into the soil was measured at regular intervals until a constant flow rate was achieved. From these infiltration rates, unsaturated hydraulic conductivity was calculated using the Wooding (1968) equation.

There was no significant difference ($p > 0.05$) in mean steady-state infiltration rate among treatments at the soil surface (Figure 2-1) or at a 10 cm depth (Figure 2-2).

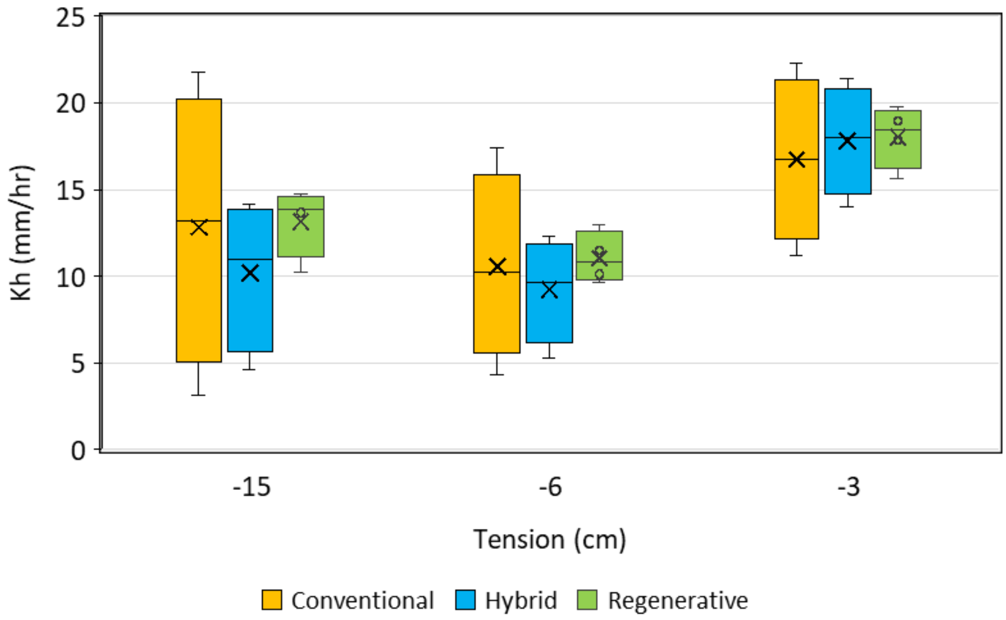


Figure 2-1 Infiltration rate for the soil surface at -15, -6, and -3 tension, by treatment.

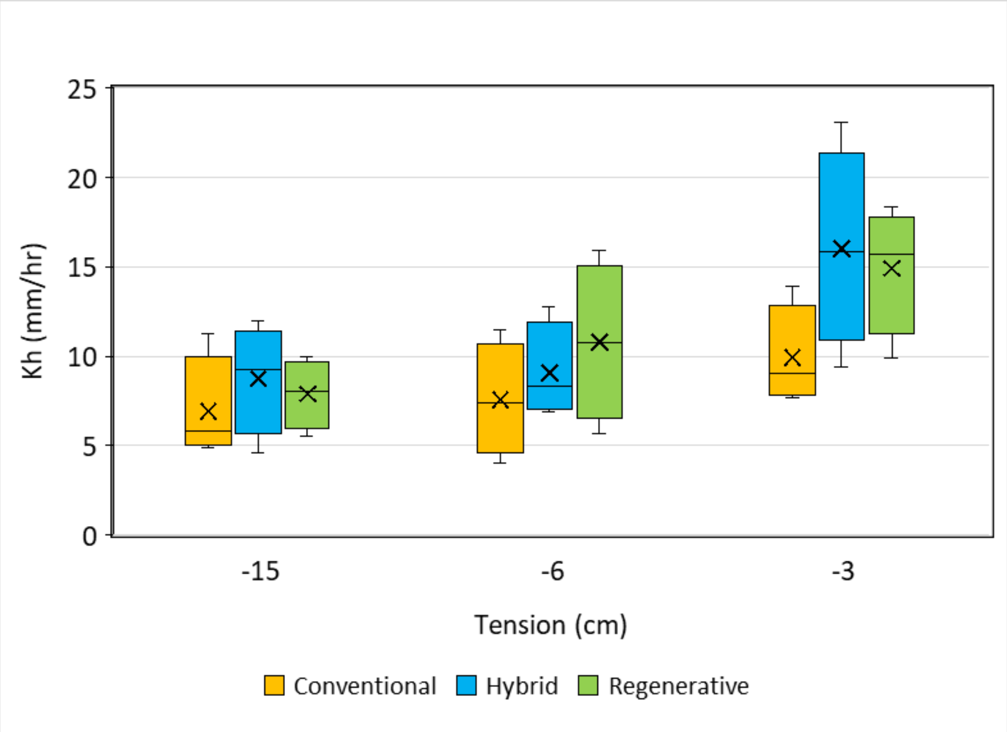


Figure 2-2 Infiltration rate for the subsoil (10 cm depth) at -15, -6, and -3 tension, by treatment.

3 Year 4 crop monitoring

3.1 Soil moisture

3.1.1 Portable readings with Hydrosense II

Soil moisture has been measured weekly down to 20 cm using the Hydrosense II, a highly accurate portable TDR sensor that measures soil moisture content (volumetric %). Two measurements were recorded per subplot (eight per plot).

Initially, the Conventional treatment was slightly wetter than the other two treatments, then all three treatments showed similar soil moisture levels throughout the rest of the butternut crop. After mid-December, no irrigation was applied to the crop due to rainfall events, and because the butternut roots were down in the moisture below 20 cm. The average soil moisture ranged from 14.5 to 30.1% (Figure 3-1).

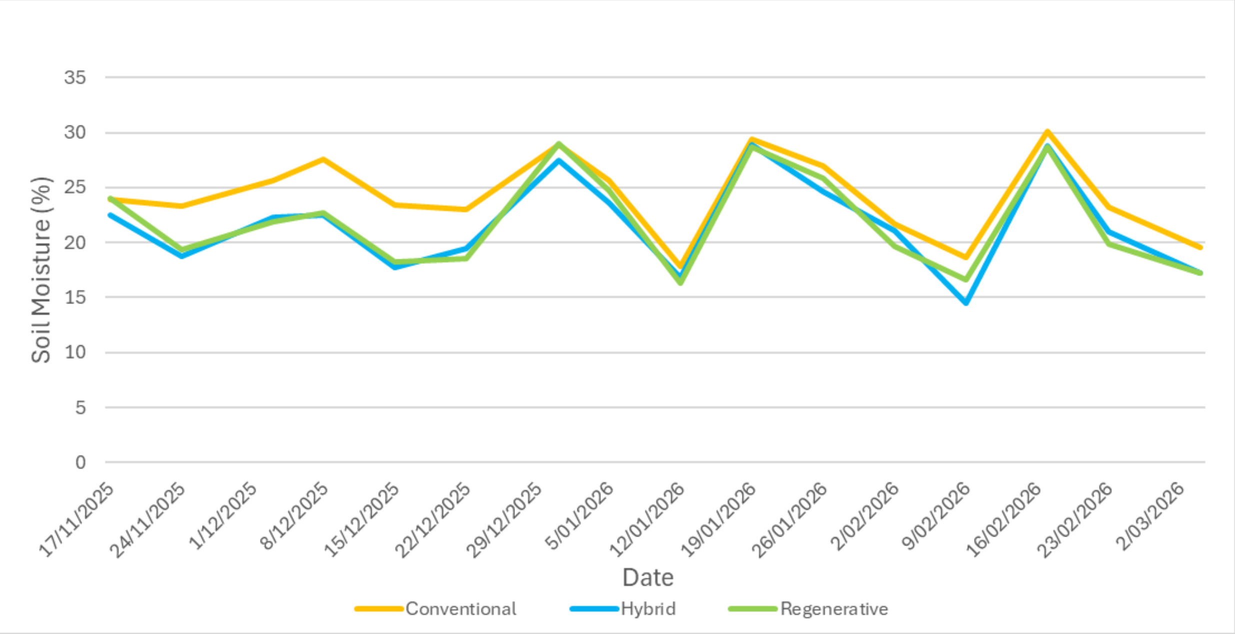


Figure 3-1 Soil moisture percentage to 20 cm (Hydrosense II), by treatment.

3.1.2 Installed GroPoint soil moisture probes

A 90 cm Growpoint probe was inserted into the ground in each plot. The GroPoint electronic soil moisture probes take average volumetric soil moisture measurements in six 15 cm deep segments using TDT, time domain transmission. Our probes are programmed to capture data every 5 minutes using custom data boxes connected to a Croptide gateway.

These probes have produced variable results (Figure 3-2) as two were damaged by the contractor's machinery at the start of the season. Three other sectors were also damaged throughout the season. Next growing season, these probes will not be used. Tipu Services will do soil moisture monitoring for us.

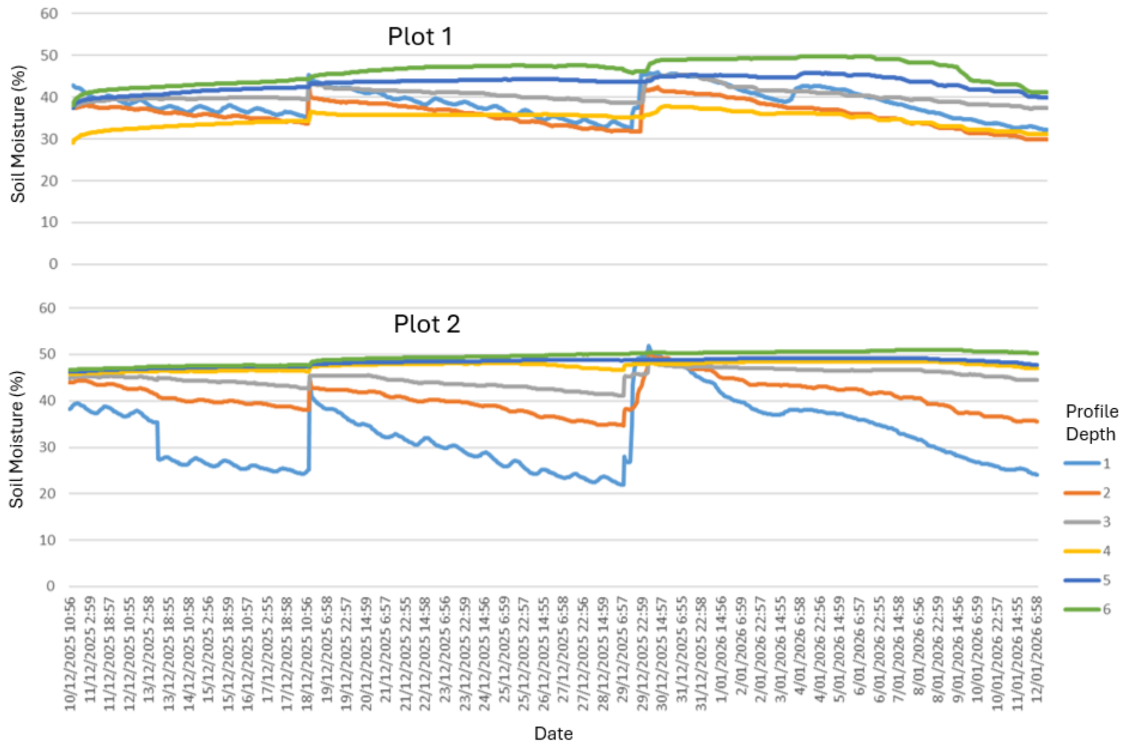


Figure 3-2 Example of variable results from the GroPoint sensors, by soil depth over time.

3.2 Canopy development

The Canopeo app was used weekly to measure the canopy cover development. The app measures the fractional green canopy cover reported as a percentage.

All three treatments showed the same trend, although the Conventional treatment had a slightly higher canopy cover until full canopy closure (Figure 3-3). All treatments then showed a similar decrease in canopy cover as the canopy began to open up, which is desirable in a butternut crop at that stage of the season.

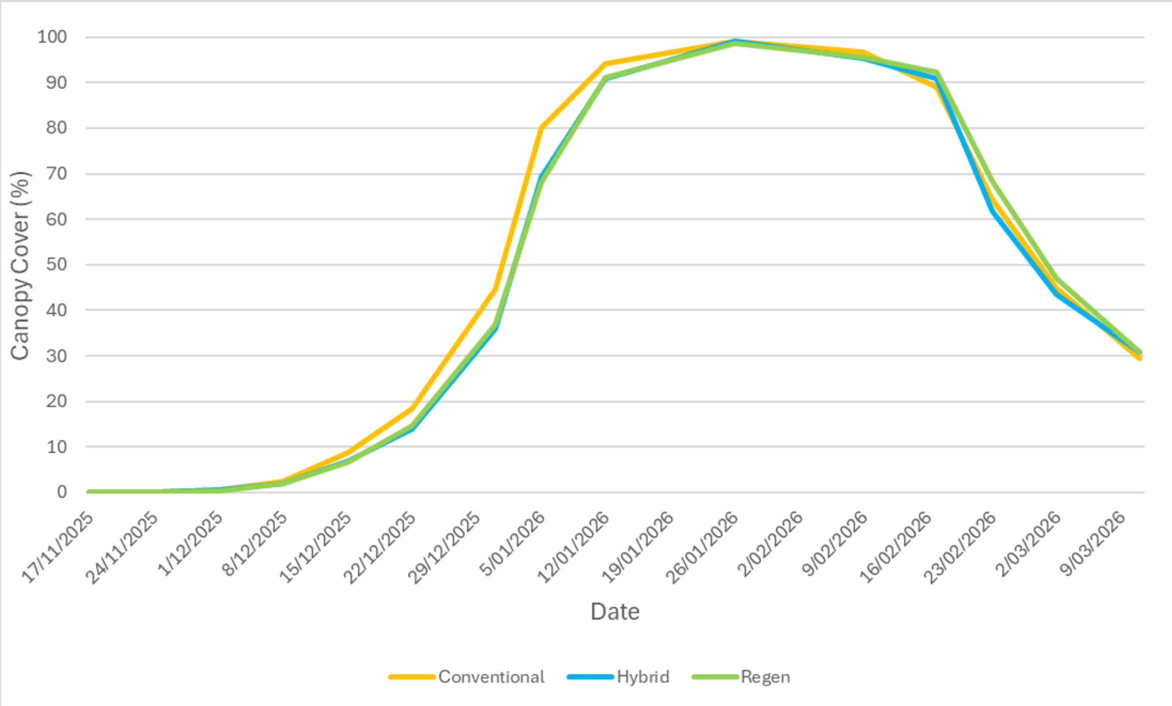


Figure 3-3 Butternut canopy cover percentage measured with the Canopeo app, by treatment.

3.3 Soil Nitrate (Quick Test)

As part of our long-term nitrate monitoring, fortnightly Soil Nitrate Quick Tests were conducted before, during, and after the butternut crop (Figure 3.2). Soil nitrate was measured to a depth of 30 cm, split into two increments (0–15 cm and 15–30 cm), with eight cores collected per plot along the existing sampling transect.

All three treatments followed a similar overall trend throughout the growing period, although differences in soil nitrate levels were evident at key stages. Prior to planting, soil nitrate levels were highest in the Regenerative treatment, followed by the Hybrid and then the Conventional treatment. After fertiliser was applied at planting, the Conventional treatment had the highest soil nitrate levels, despite the Hybrid treatment receiving the same nitrogen rate (36 kg N/ha). The Regenerative treatment, which received a lower rate (18 kg N/ha), maintained comparatively lower soil nitrate levels.

At side dressing, the Regenerative treatment did not receive any granular fertiliser and therefore remained lower than the other treatments. In contrast, the Conventional and Hybrid treatments received further nitrogen inputs (40.5 kg N/ha and 30.5 kg N/ha, respectively), resulting in higher soil nitrate levels. However, within a few weeks, soil nitrate levels across all treatments converged, with no significant differences observed thereafter.

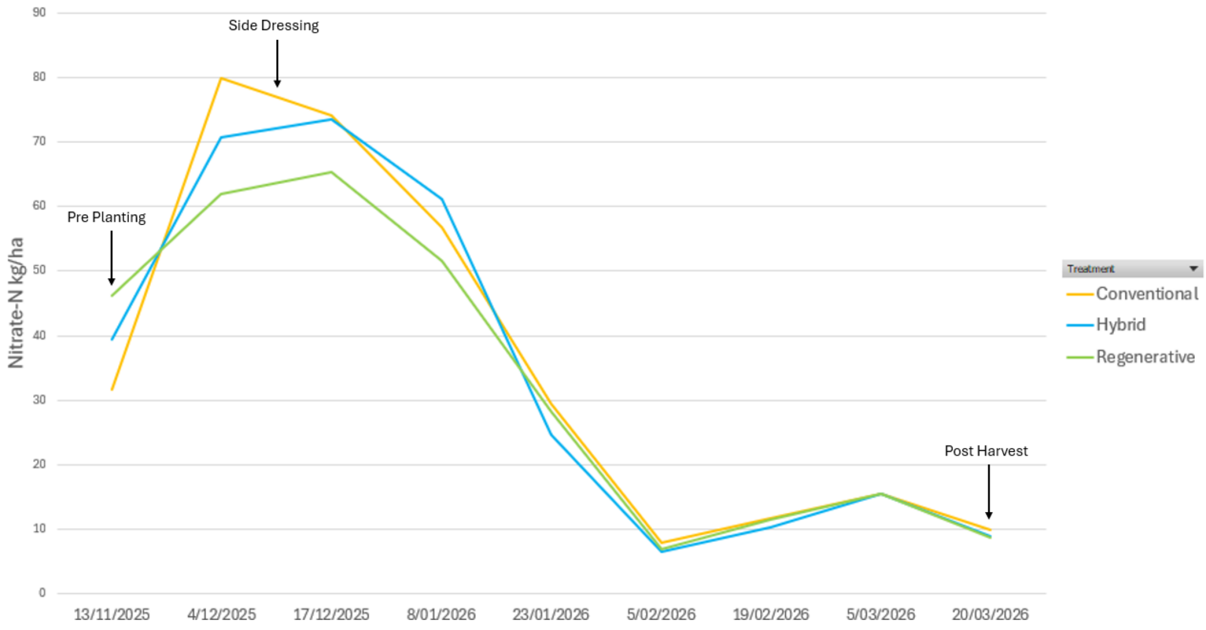


Figure 3-4 Kilograms of nitrate-nitrogen per hectare in the top 30 cm of the soil throughout the butternut crop, by treatment.

3.4 Inputs

All inputs for the butternut crop have been recorded for each treatment.

3.4.1 Nutrients

Decisions relating to nutrient management were made by the operations advisory group, with the support of Mark Redshaw (Yara Fertiliser specialist), Katrina Lorenzen (Ballance Fertiliser Specialist), and Gareth Holder (local butternut grower). Data from our fortnightly nitrate testing was used to help support the decisions. The Conventional treatment received the full standard fertiliser rate, the Hybrid treatment received a slightly reduced rate, and the Regenerative treatment received approximately one-quarter of the standard rate, as it only received granular fertiliser at planting (Table 3-1).

A full breakdown of the nutrient applications can be found in Appendix 1.

Table 3-1 Total nutrients applied to the butternut crop, by treatment.

Treatment	Kg N/ha	Kg P/ha	Kg K/ha	Kg S/ha	Kg Ca/ha
Conventional	77.32	15.00	45.00	24.00	6.88
Hybrid	67.33	15.00	45.11	24.00	5.40
Regenerative	19.17	7.61	23.13	39.01	56.40

3.4.2 Agrichemical applications

3.4.2.1 Herbicide

In all treatments, we took a stale seedbed approach.

The conventional treatment was sprayed with glyphosate before being cultivated and planted (Table 3-2). At planting, pre-emerge (Magister and Frontier P) was applied over the plant line. Before the butternuts germinated, it was sprayed with Buster due to high weed pressure.

Table 3-2 Conventional treatment: butternut herbicide applications.

Timing	Conventional	Active Ingredient	Rate/ha	Water Rate	Application Date
Pre-planting	Lion 490	Glyphosate	3	300	8/10/2025
Pre-planting	Sharpen	Saflufenacil	0.025	300	8/10/2015
Pre-emerge	Magister	Clomazone	0.4	300	16/11/2025
Pre-emerge	Frontier	Dimethenamid-p	0.8	300	16/11/2025
Pre-emerge	Buster	Glufosinate-ammonium	3	300	12/11/2025

The Hybrid (Table 3-3) and Regenerative (Table 3-4) treatments were strip-sprayed with glyphosate before being strip tilled. They were broadcast sprayed pre-planting to kill the living strips and any weeds that had germinated since strip tilling. At planting, they both received the same pre-emerge as the Conventional treatment over the plant line.

Table 3-3 Hybrid treatment: butternut herbicide applications.

Timing	Hybrid	Active Ingredient	Rate/ha	Water Rate	Application Date
Pre-planting	Lion 490	Glyphosate	1* (3 L on strips only)	300	15/9/2025
Pre-planting	Sharpen	Saflufenacil	0.025	300	15/9/2015
Pre-planting	Lion 490	Glyphosate	3.5	300	6/11/2025
Pre-planting	Sharpen	Saflufenacil	0.025	300	6/11/2025
Pre-emerge	Magister	Clomazone	0.4	300	16/11/2025
Pre-emerge	Frontier	Dimethenamid-p	0.8	300	16/11/2025

Table 3-4 Regenerative treatment: butternut herbicide applications.

Timing	Regenerative	Active Ingredient	Rate/ha	Water Rate	Application Date
Pre-planting	Lion 490	Glyphosate	1* (3 L on strips only)	300	15/9/2025
Pre-planting	Sharpen	Saflufenacil	0.025	300	15/9/2015
Pre-planting	Lion 490	Glyphosate	3.5	300	6/11/2025
Pre-emerge	Magister	Clomazone	0.4	300	16/11/2025
Pre-emerge	Frontier	Dimethenamid-p	0.8	300	16/11/2025

3.4.2.2 Fungicide and bactericide

All three treatments received the same spray program, and the EIQ score for all products, excluding Kumulus, was >12 (Table 3-5). Kumulus on its own has an EIQ score of 65.

Powdery mildew is a fungal disease that can affect the butternut leaves, stems, and flowers. To prevent powdery mildew, Talendo and Vivando were applied twice, and

Kumulus once, throughout the growing season. These products were sprayed at 14-day intervals to ensure coverage.

Angular leaf spot is a bacterial disease that affects the butternut leaves and fruit. To prevent Angular leaf spot, copper was applied three times throughout the season when the pressure was high, or we saw signs of angular leaf spot.

Table 3-5 Butternut fungicide and bactericide applications, all treatments.

Product	Product type	Active Ingredient	Rate/ha	Water Rate	Application Date
Talendo	Fungicide	Proquinazid	0.25	300	19/12/2025
Talendo	Fungicide	Proquinazid	0.25	300	2/01/2026
Kocide Opti	Bactericide	Copper	0.70	300	2/01/2026
Vivando	Fungicide	Metrafenone	0.3	300	16/01/2026
Copper Hydroxide 300	Bactericide	Copper	0.80	300	16/01/206
Vivando	Fungicide	Metrafenone	0.3	300	30/1/2026
Kumulus	Fungicide	Sulphur	3	300	13/02/2026
Copper Hydroxide 300	Bactericide	Copper	0.80	300	19/2/2026

3.4.2.3 Insecticide

The main insect pest of butternuts is cutworms. We sprayed Bestseller on all three treatments after finding cutworms and seeing cutworm damage in all treatments (Table 3-6).

Table 3-6 Butternut insecticide applications, all treatments.

Product	Active Ingredient	Rate/ha	Water Rate	Application Date
Bestseller	Alpha-cypermethrin	0.2	300	1/12/2025

3.4.3 Biological and foliar products

A range of different biological products have been used in the Hybrid and Regenerative treatments that align with the treatment philosophies (Table 3-7 & Table 3-9). The Conventional treatment received no biological products (Table 3-7).

All three treatments received a foliar application of Wuxal Calcium and Fertrilon Combi 1, as leaf tests showed all treatments were low in calcium, manganese, and boron.

Table 3-7 Conventional treatment, foliar applications for butternuts.

Product	Description	Rate/ha	Water Rate	Application Date
Wuxal Calcium	Foliar nutrition to prevent or eliminate general calcium deficiencies.	5	300	30/1/2026
Fertrilon Combi 1	Highly concentrated multi-micronutrient fertiliser with emphasis on manganese and iron.	2	300	30/1/2026

Table 3-8 Hybrid treatment, biological and foliar applications for butternuts.

Product	Description	Rate/ha	Water Rate	Application Date
Fulvic acid	Fulvic acid	2	300	15/9/2025
Fulvic acid	Fulvic acid	2	300	6/11/2025
Mycorrcin (BioStart)	Uses extracts from the fermentation of beneficial bacteria to activate indigenous populations of beneficial soil microbes, including mycorrhizal fungi.	4	300	13/11/2025
Trichostart (AgRimm)	Endophytic Trichoderma seed coating.	0.2	-	15/11/2025
Trichostart (AgRimm)	Endophytic Trichoderma liquid injection.	0.1	80	15/11/2025
Biostart N (BioStart)	Azotobacter chroococcum bacteria, which fixes atmospheric nitrogen.	0.1	80	15/11/2025
Mycorrcin (BioStart)	Uses extracts from the fermentation of beneficial bacteria to activate indigenous populations of beneficial soil microbes, including mycorrhizal fungi.	0.8	80	15/11/2025
Seaweed (acadian)	A biostimulant, derived from Ascophyllum nodosum.	1	300	13/12/2025
Wuxal Calcium	Foliar nutrition to prevent or eliminate general calcium deficiencies.	5	300	30/1/2026
Fertrilon Combi 1	Highly concentrated multi-micronutrient fertiliser with emphasis on manganese and iron	2	300	30/1/2026

Table 3-9 Regenerative treatment, biological and foliar applications for butternuts.

Product	Description	Rate/ha	Water Rate	Application Date
Fulvic acid	Fulvic acid	2	300	15/9/2025
Humates	Granular concentrated humic acid	5	-	28/10/2025
Fulvic acid	Fulvic acid	2	300	6/11/2025
Mycorrcin (BioStart)	Uses extracts from the fermentation of beneficial bacteria to activate indigenous populations of beneficial soil microbes, including mycorrhizal fungi.	4	300	13/11/2025
Humates	Granular concentrated humic acid	5	-	15/11/2025
Trichostart (AgRimm)	Endophytic Trichoderma seed coating.	0.2	0	15/11/2025
Trichostart (AgRimm)	Endophytic Trichoderma liquid injection.	0.1	80	15/11/2025
Biostart N (BioStart)	Azotobacter chroococcum bacteria, which fixes atmospheric nitrogen.	0.1	80	15/11/2025
Mycorrcin (BioStart)	Uses extracts from the fermentation of beneficial bacteria to activate indigenous populations of beneficial soil microbes, including mycorrhizal fungi.	0.8	80	15/11/2025
Seaweed	A biostimulant, derived from Ascophyllum nodosum.	1	300	13/12/2025
Megafol	Organo-mineral liquid fertiliser	3	300	13/12/2025
Fulvic acid	Fulvic Acid	2	300	13/12/2025
Bio Marinus	Liquid fish fertiliser with humates, seaweed, and biology, including Bacillus subtilis, Trichoderma, mycorrhizae fungi, etc	3	300	19/12/2025
Megafol	Organo-mineral liquid fertiliser	3	300	15/01/2026
Fulvic acid	Fulvic Acid	1	300	29/1/2026
Foliacin (BioStart)	Combination of compounds from the fermentation of beneficial bacteria and yeast.	0.75	300	29/1/2026
Bio Marinus	Liquid fish fertiliser with humates, seaweed, and biology, including Bacillus subtilis, Trichoderma, mycorrhizae fungi, etc		300	29/1/2026
Wuxal Calcium	Foliar nutrition to prevent or eliminate general calcium deficiencies.	5	300	30/1/2026
Fertrilon Combi 1	Highly concentrated multi-micronutrient fertiliser with emphasis on manganese and iron	2	300	30/1/2026

3.5 Environmental Impact Quotient (EIQ)

EIQ is a Cornell University online tool that can be used to determine the field use environmental impact of specific agrichemicals. The field use EIQ is a score based on the product's active ingredient toxicity and how much has been used per hectare. We use the field use EIQ to compare different product options and help make decisions for spray applications in the Regenerative and Hybrid treatments.

All three treatments received the same spray program and only had slight differences in herbicide application; therefore, there isn't a significant difference in the field use EIQ (Table 3-10).

Table 3-10 Agrichemical EIQ field use, by treatment.

Treatment	Bactericide	Fungicide	Herbicide	Insecticide	Total Field Use EIQ
Conventional	34.50	74.00	85.44	1.26	195.20
Hybrid	34.50	74.00	85.11	1.26	194.87
Regenerative	34.50	74.00	84.52	1.26	194.28

3.6 Water-sensitive paper

Water-sensitive paper was placed in the butternut's canopy. The paper was folded over the butternut leaves to assess spray coverage on the top and bottom of the leaves. One piece was placed high in the canopy, and the other low in the canopy. These water-sensitive papers were placed on the edges of the paddock and within the first subplot in plots 1, 2, and 3.

The water-sensitive paper showed there was good spray coverage on the tops of the leaves at the top of the butternut canopy within the plots (Figure 3-5). Lower down in the canopy, it was too moist, and most of the water-sensitive paper turned blue, making it hard to assess the spray coverage. The water-sensitive papers placed on the edge of the paddock had significantly less spray coverage and large droplets. Since most of the products used throughout the season were systemic, this should not have been an issue.

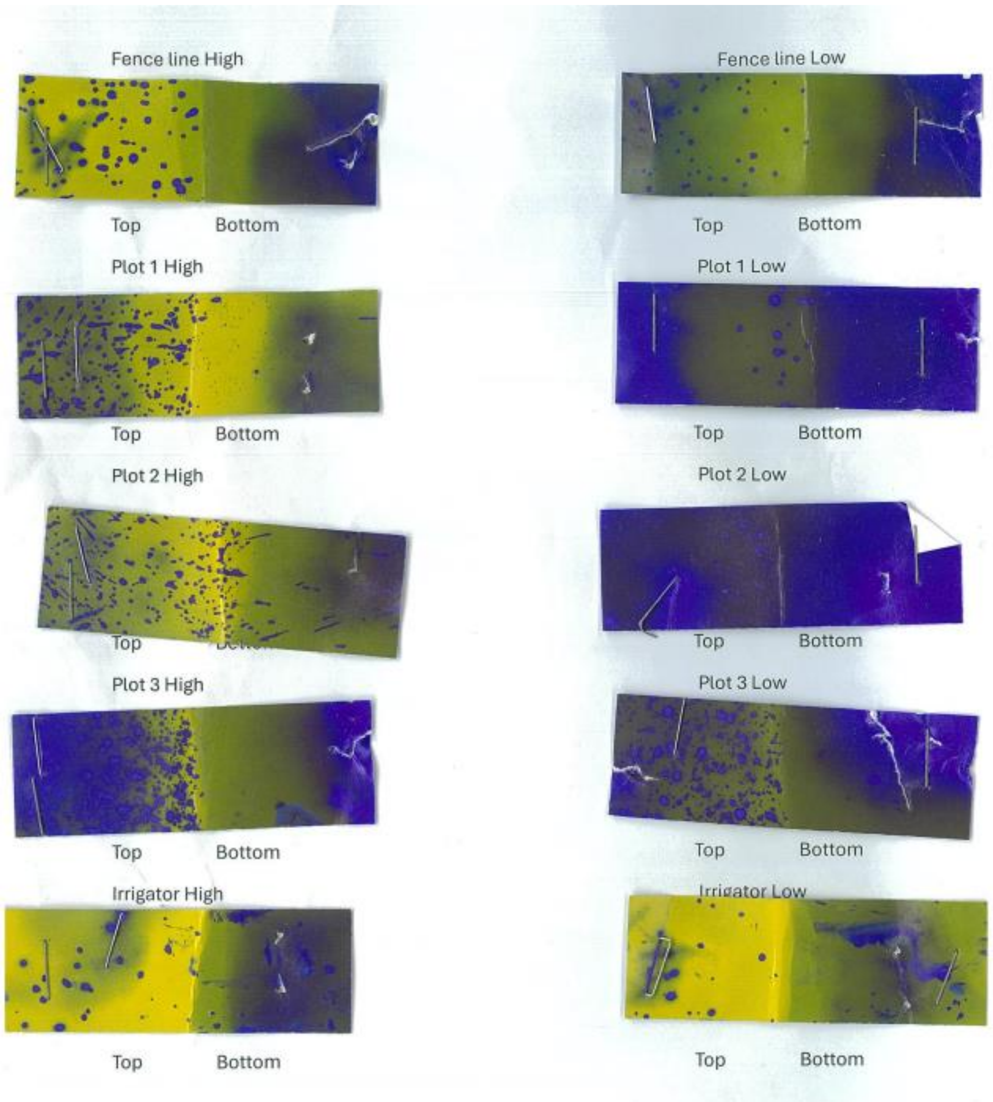


Figure 3-5 Water-sensitive papers that were placed in the paddock before spraying.

4 Year 4 summer harvest

The butternut hand harvest was completed on the 9th and 10th of March (Figure 4-1). Commercial harvest cut and put butternuts into wind rows on the 10th of March, and into bins on the 13th of March.

Figure 4-1 Collecting a residue sample in a hand harvest sample area.

The sample area within each of the subplots was 6 square meters. Spray tracks and areas of the paddock that were affected by rabbits, pūkeko, and cutworms were avoided. All the butternuts within the sample area were cut from the plant, counted, and weighed. A butternut subsample was collected for Brix levels, dry matter, nitrogen, and carbon analysis. The plant residue was weighed, and a subsample was collected for dry matter, nitrogen, and carbon analysis.

4.1 Harvestable yield (hand harvest)

To calculate the butternut fruit yield, the sample area weights were converted to tonnes per hectare (T/ha). The conventional treatment had an average yield of 52.74 T/ha, the Hybrid treatment had 52.00 T/ha, and the Regenerative treatment had 49.44 T/ha. There was no significant difference between any of the treatments (P>0.05) (Figure 4-2).

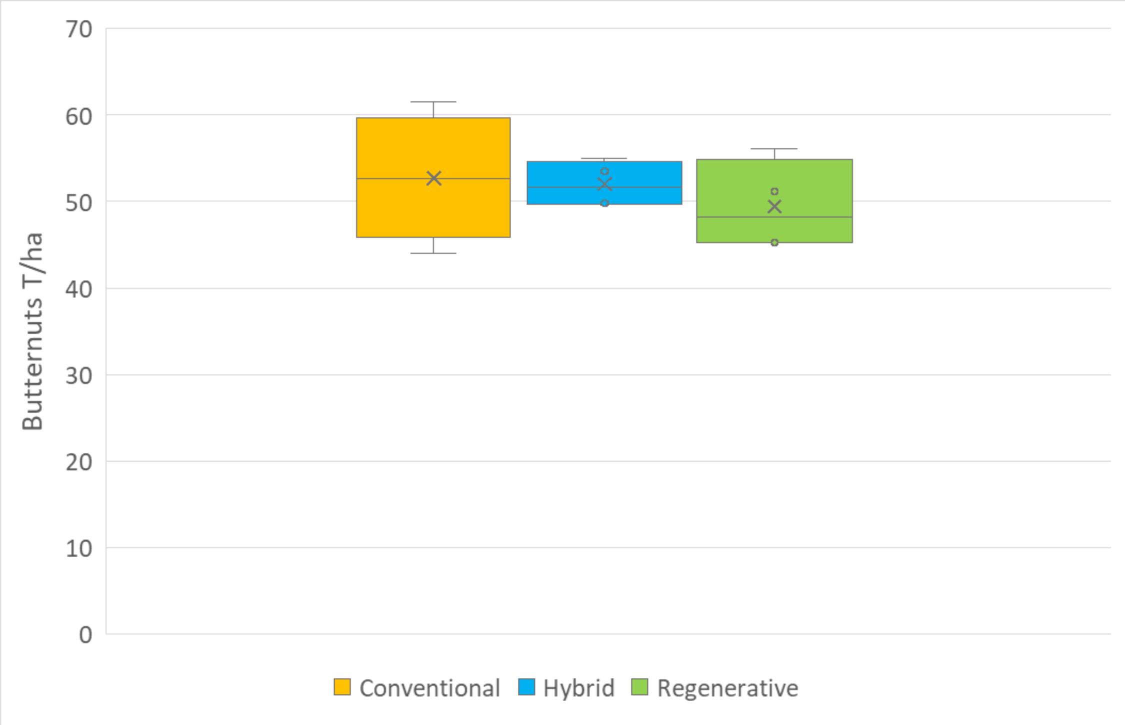


Figure 4-2 Butternut fruit yield tonnes per hectare, by treatment.

4.2 Heinz-Wattie's harvestable yield

Heinz-Wattie's did not harvest the butternuts due to a lack of demand for the product. The crop was accepted by a local grower, but we do not have accurate per plot or treatment harvest data. Over the 1.92 ha that were in butternuts, 167 apple bins of butternuts were harvested. Each bin contained about 400 kg of butternuts. Therefore, 34.79 T/ha were harvested.

4.3 Plant residue biomass

To calculate the butternut plant residue biomass, the sample area residue weights were converted to T/ha. The Conventional treatment had an average residue biomass of 20.57 T/ha, the Hybrid treatment had 20.25 T/ha, and the Regenerative treatment had 17.56 T/ha. There was no significant difference in plant residue biomass between any of the treatments (P>0.05) (Figure 4-3).

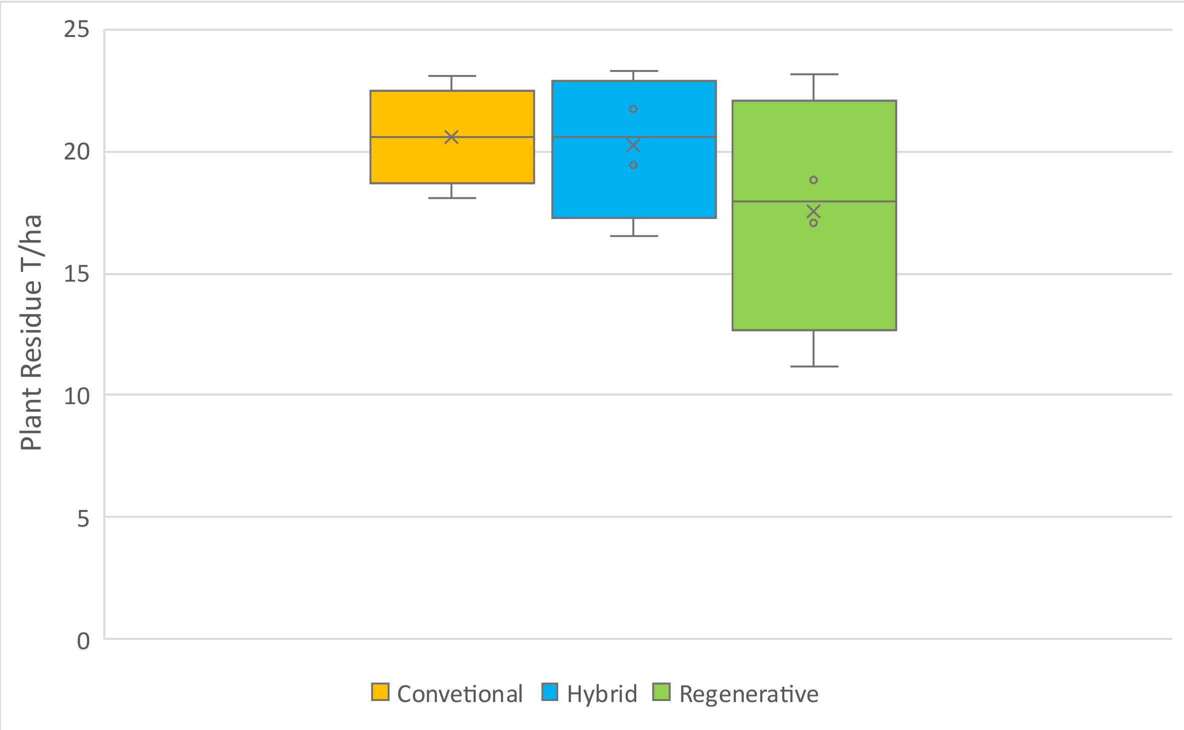


Figure 4-3 Butternut plant residue biomass tonnes per hectare, by treatment.

5 Year 4 summer crop analysis

5.1 Factory quality assessments

5.1.1 Brix

To measure Brix levels, a subsample was taken from two butternuts in each subplot. The subsample was grated and squished in a garlic crusher, and the juice was tested with a Refractometer.

The Conventional treatment had an average Brix level of 7.1%, the Hybrid treatment had 7.9%, and the Regenerative treatment had 7.0% (Figure 5-1). There were no significant differences between treatments ($P > 0.05$).

If Heinz-Wattie's had harvested the butternuts, Brix levels would have been assessed prior to harvest. The minimum acceptable Brix level is 7%, with an ideal range of 9–10%. As the butternuts in this trial were harvested by a local grower approximately one month earlier than Wattie's standard harvest timing, the Brix levels were on the lower side. Brix levels are expected to increase in storage.

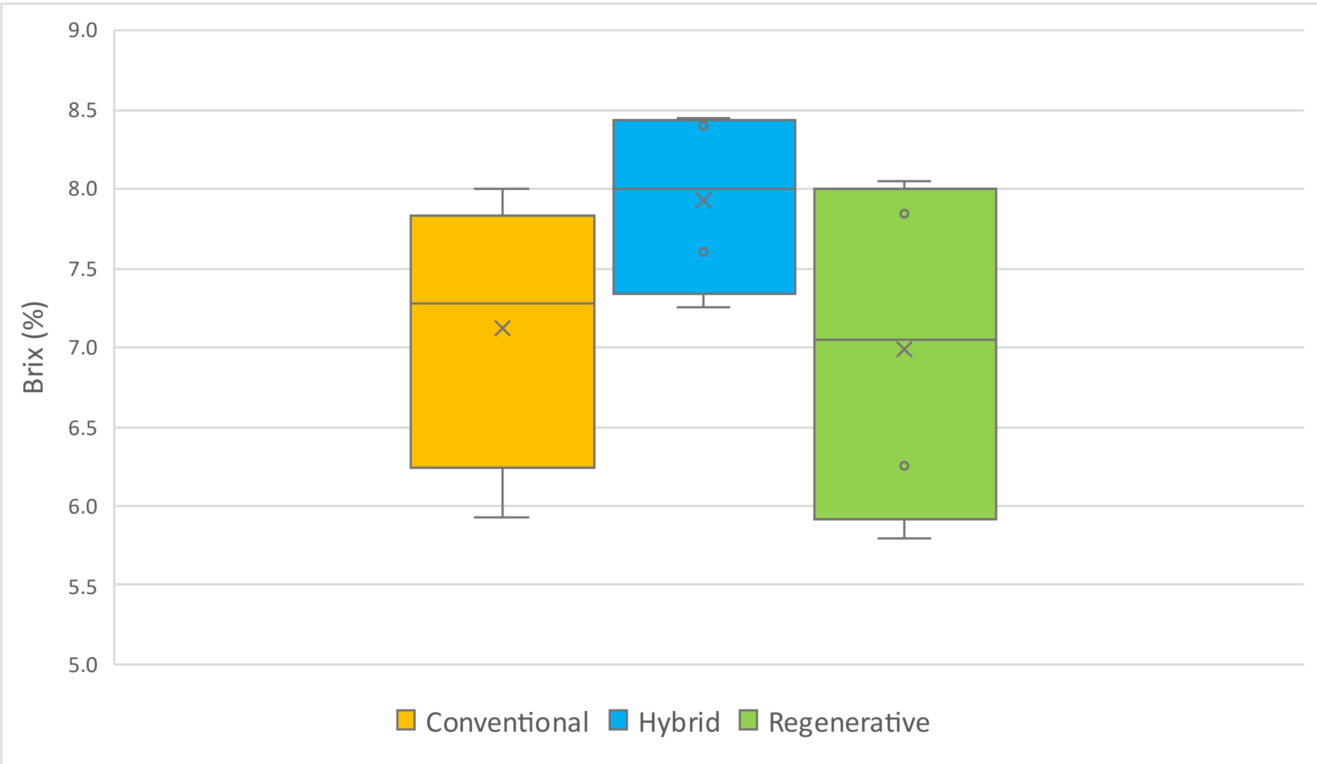


Figure 5-1 Brix percentage measured with a refractometer, by treatment.

5.2 Crop tissue

5.2.1 Dry matter

A subsample of butternut fruit from each sample area was dried to calculate the dry matter percentage. The Conventional and Regenerative treatments had an average dry matter percentage of 10%, and the Hybrid had 12%. There was no significant difference between treatments (P > 0.05).

The Conventional treatment had an average butternut fruit dry matter of 5.41 T/ha, the Hybrid treatment 6.00 T/ha, and the Regenerative treatment 4.85 T/ha (Figure 5-2). There was no significant difference between treatments (P > 0.05).

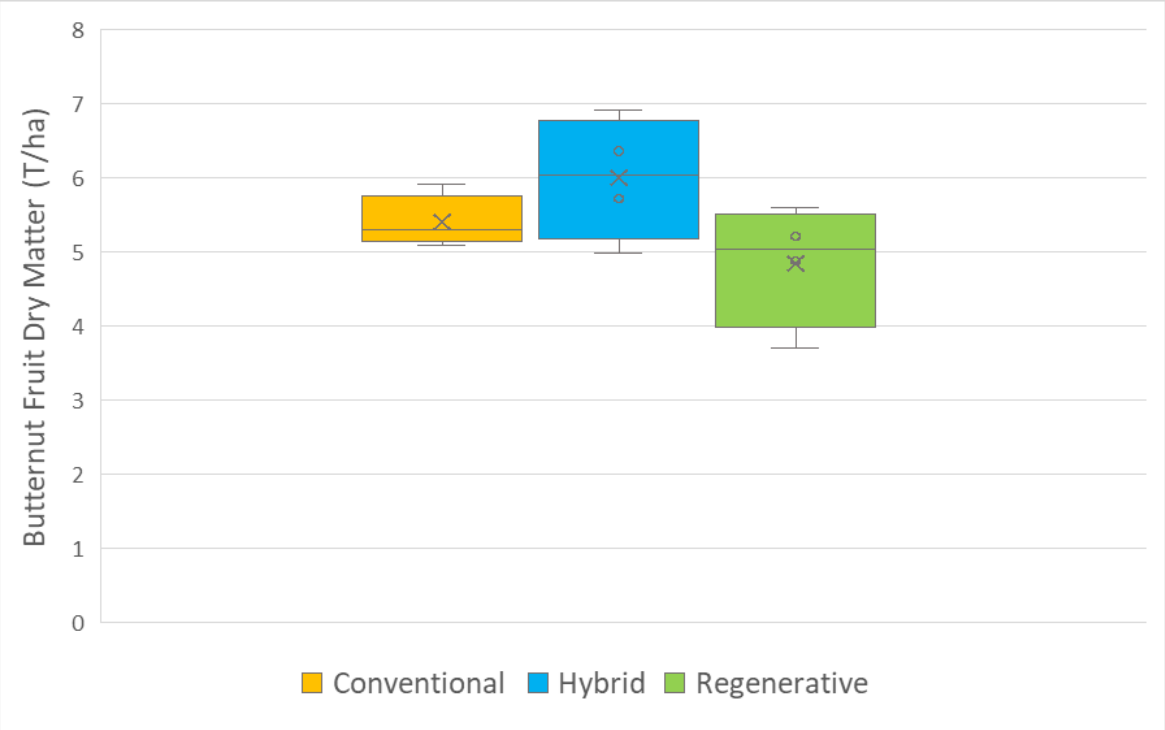


Figure 5-2 Butternut fruit dry matter tonnes per hectare, by treatment.

5.2.2 Nitrogen

The butternut fruit nitrogen percentage was determined by Hill Laboratories. The Conventional treatment had an average nitrogen percentage of 1.78%, the Hybrid treatment had 1.48 %, and the Regenerative treatment had 1.50%. The nitrogen percentage was significantly different between the Conventional and Hybrid treatments ($P = 0.004$). However, there was no significant difference between the Hybrid and Regenerative treatments, or between the Regenerative and Conventional treatments ($P>0.05$).

To calculate the kilograms of nitrogen per hectare in the butternut fruit, the butternut's dry matter (T/ha) was multiplied by the nitrogen percentage and converted to kg/ha (Figure 5-3). The Conventional treatment had 96.13 kg N/ha, the Hybrid treatment had 88.43 kg N/ha, and the Regenerative treatment had 73.58 kg N/ha. There was no significant difference between treatments ($P>0.05$).

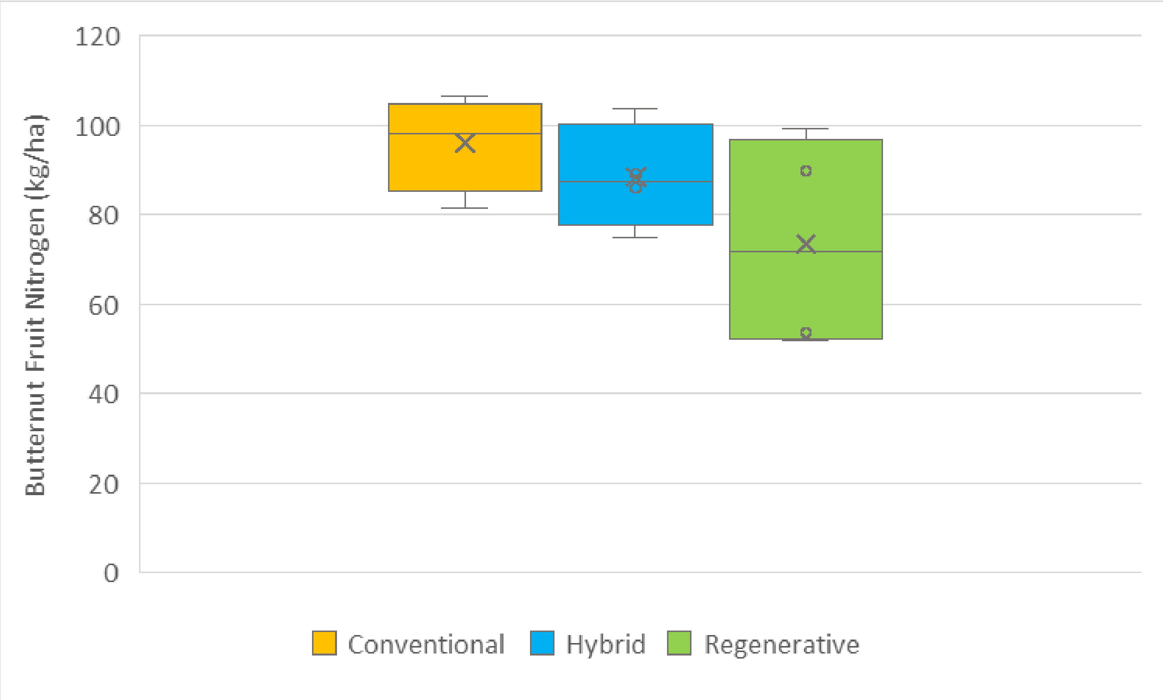


Figure 5-3 Butternut fruit nitrogen, kilograms per hectare, by treatment.

5.2.3 Carbon

The carbon percentage of the butternut fruit was determined by Hill Laboratories. The Conventional treatment had an average carbon percentage of 40.80%, the Hybrid treatment had 39.55%, and the Regenerative treatment had 40.55%. There was no significant difference between treatments (P>0.05).

To calculate the tonnes of carbon per hectare in the butternut fruit, the butternut's dry matter (T/ha) was multiplied by the carbon percentage. The Conventional treatment had 2.18 T C/ha, the Hybrid treatment had 2.37 T C/ha, and the Regenerative treatment had 1.97 T C/ha (Figure 5-4). There was no significant difference between treatments (P>0.05).

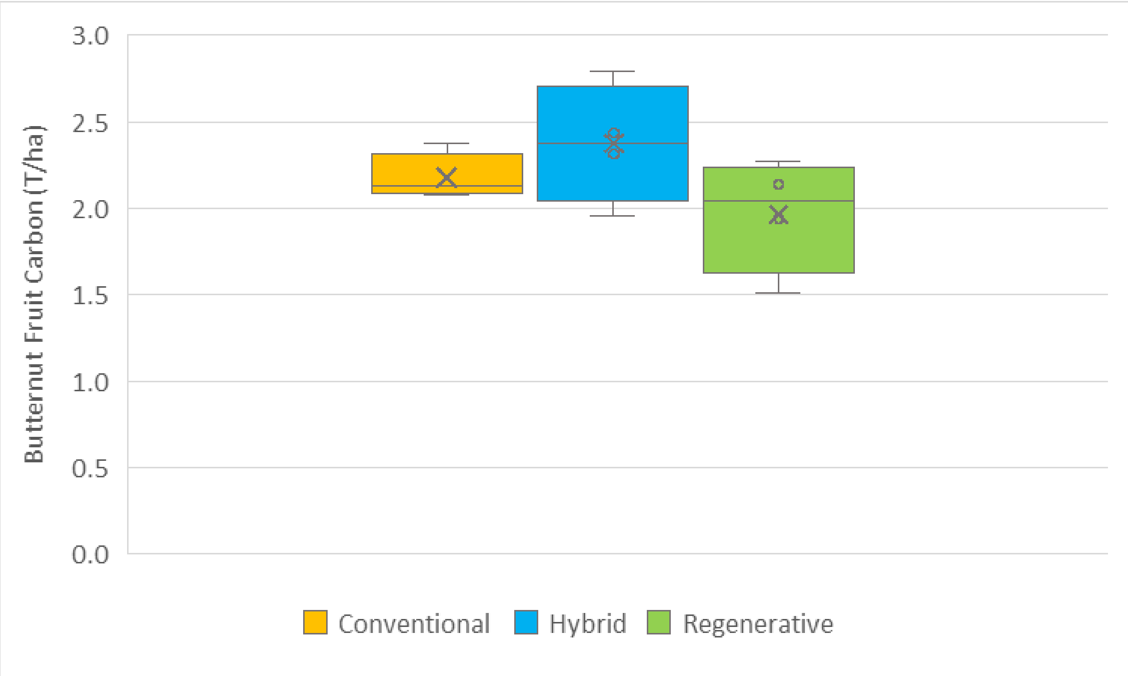


Figure 5-4 Butternut fruit carbon tonnes per hectare, by treatment.

5.3 Residue

5.3.1 Dry matter

A subsample of butternut residue was dried to calculate the dry matter percentage. All three treatments had an average dry matter of 16%. There was no significant difference between treatments (P>0.05).

The Conventional treatment had an average dry matter of 8.44 T/ha, the Hybrid treatment 8.37 T/ha, and the Regenerative treatment 7.77 T/ha (Figure 5-5). There was no significant difference between treatments (P>0.05).

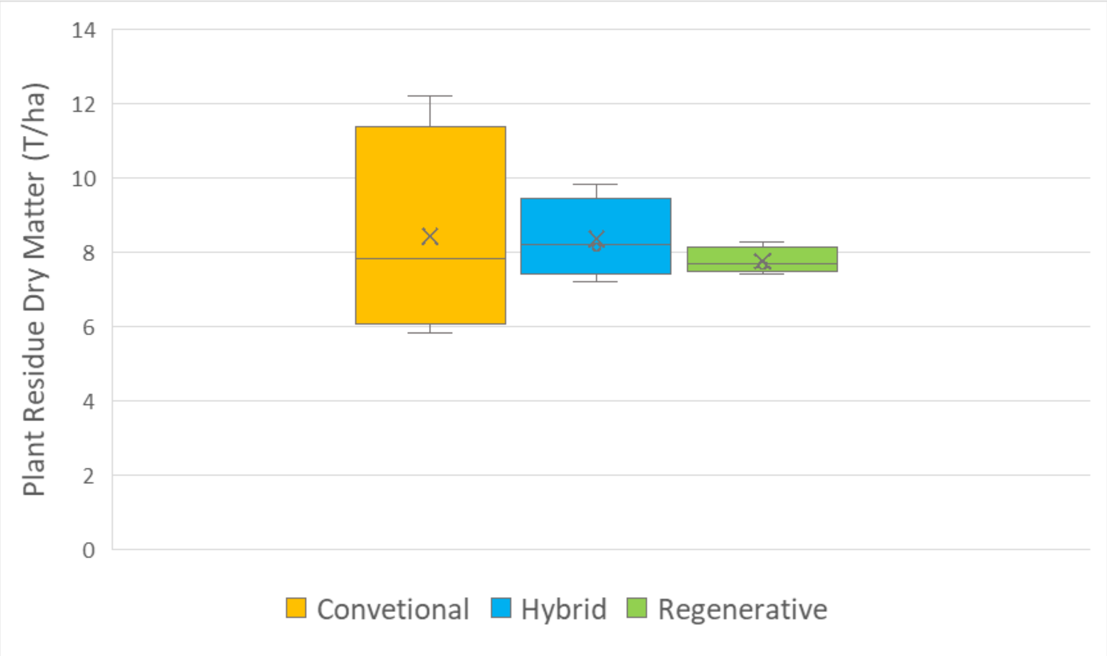


Figure 5-5 Butternut residue dry matter tonnes per hectare, by treatment.

5.3.2 Nitrogen

The nitrogen percentage in the butternut plant residue was determined by Hill Laboratories. The Conventional treatment butternut residue had an average nitrogen percentage of 1.95%, the Hybrid treatment had 1.78%, and the Regenerative treatment had 1.70%. There was no significant difference between the treatments (P>0.05).

To calculate the amount of nitrogen from the butternut residue, the dry matter (T/ha) was multiplied by the nitrogen percentage and converted to kg/ha (Figure 5-6). The Conventional treatment had 163.92 kg N/ha, the Hybrid treatment had 148.63 kg N/ha, and the Regenerative treatment had 131.97 kg N/ha. There was no significant difference between treatments (P>0.05).

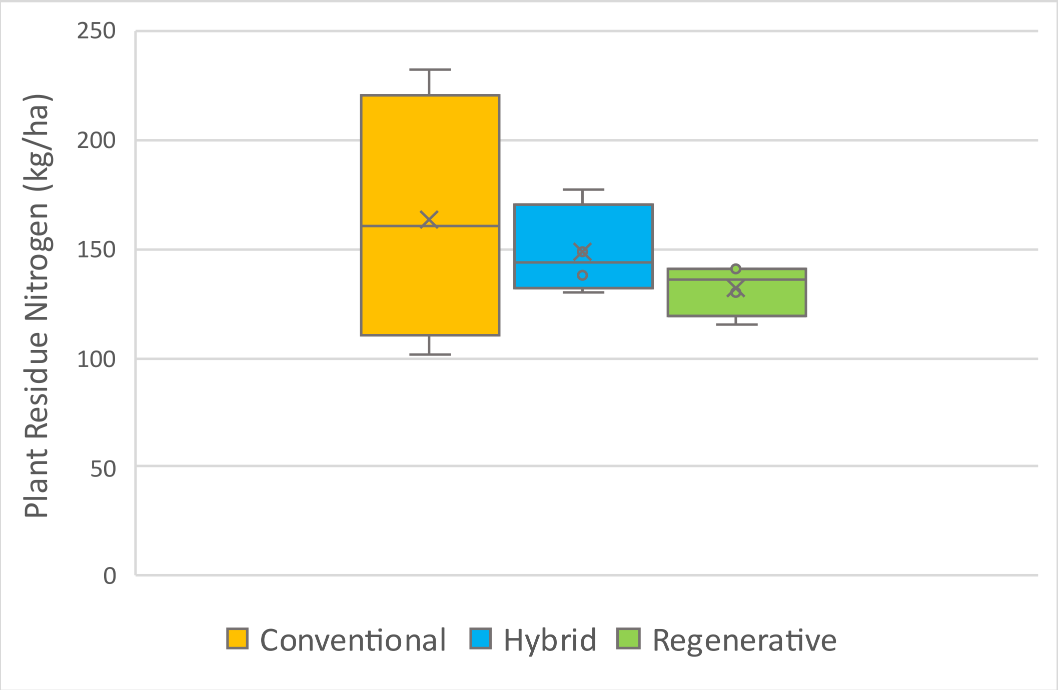


Figure 5-6 Butternut residue nitrogen, kilograms per hectare, by treatment.

5.3.3 Carbon

The percentage of carbon in the butternut residue was determined by Hill Laboratories. The Conventional treatment had an average carbon percentage of 35.25%, the Hybrid treatment had 34.20%, and the Regenerative treatment had 35.50%. There was no significant difference between treatments (P>0.05).

The butternut residue dry matter (T/ha) was multiplied by the carbon percentage to get tonnes of carbon per hectare (Figure 5-7). The Conventional treatment had 2.95 T C/ha, the Hybrid treatment 2.86 T C/ha, and the Regenerative treatment 2.76 T C/ha. There was no significant difference between treatments (P>0.05).

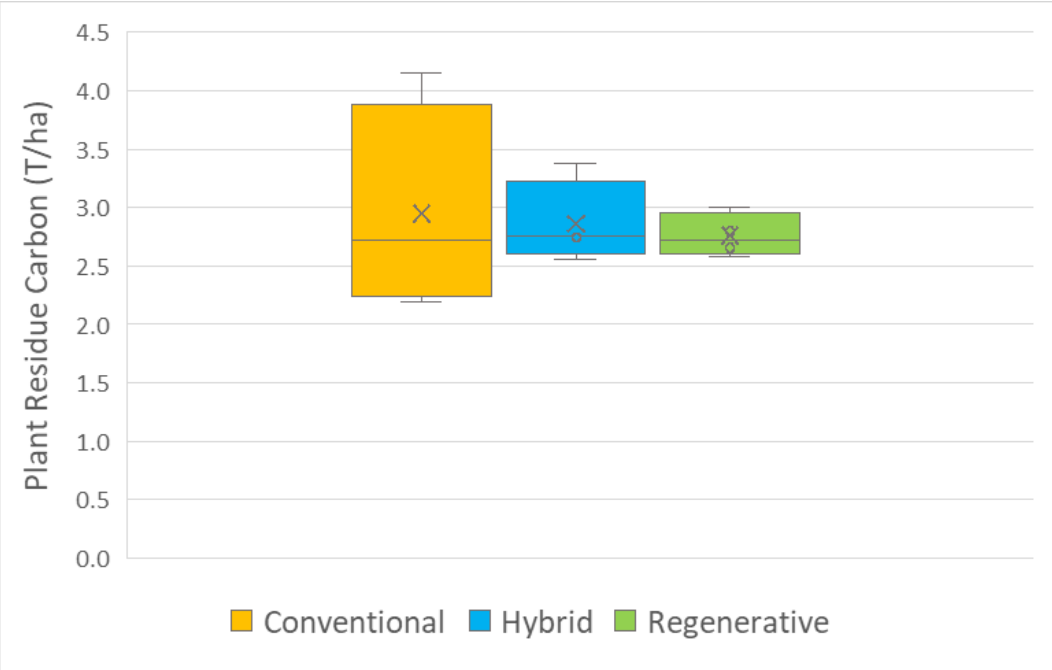


Figure 5-7 Butternut residue carbon tonnes per hectare, by treatment.

6 Post-harvest soil analysis

6.1 Visual soil assessment

The visual soil assessments will be completed in the week starting 18 May. The results will be reported in Milestone 14.

6.2 Hot water extractable carbon

Carbon sampling was completed on 11-12 May, and samples were sent to Hill Labs on 13 May. The results will be reported in Milestone 14.

7 Winter cover crop establishment

All three treatments were disced twice on the 25th of March before being direct-drilled the next day. The conventional and Hybrid treatments were planted with Moata ryegrass, and the Regenerative treatment was planted with triticale and vetch. All three treatments were irrigated after planting to ensure good establishment. Initially, all three treatments were going to be aerated after planting. After seeing how the butternut residue was catching on the direct drill, it was decided we would wait until the residue had broken down to aerate. We plan to do this later in the autumn if the soil moisture conditions are dry enough.

Figure 7-1 First pass with the discs.

Figure 7-2 Cover crop being direct drilled

7.1 Soil moisture

The cover crop's soil moisture was measured to a depth of 20 cm using the Hydrosense II, which produces a volumetric soil moisture percentage. Two measurements were recorded per subplot.

All three treatments show the same trend. They started out dry after the cover crops were planted, recorded the irrigation applied, and have remained moist since. They are however, slowly drying, and with no rain forecast, may drop further.

The average soil moisture has ranged from 16.23 to 31.87% (Figure 7-3).

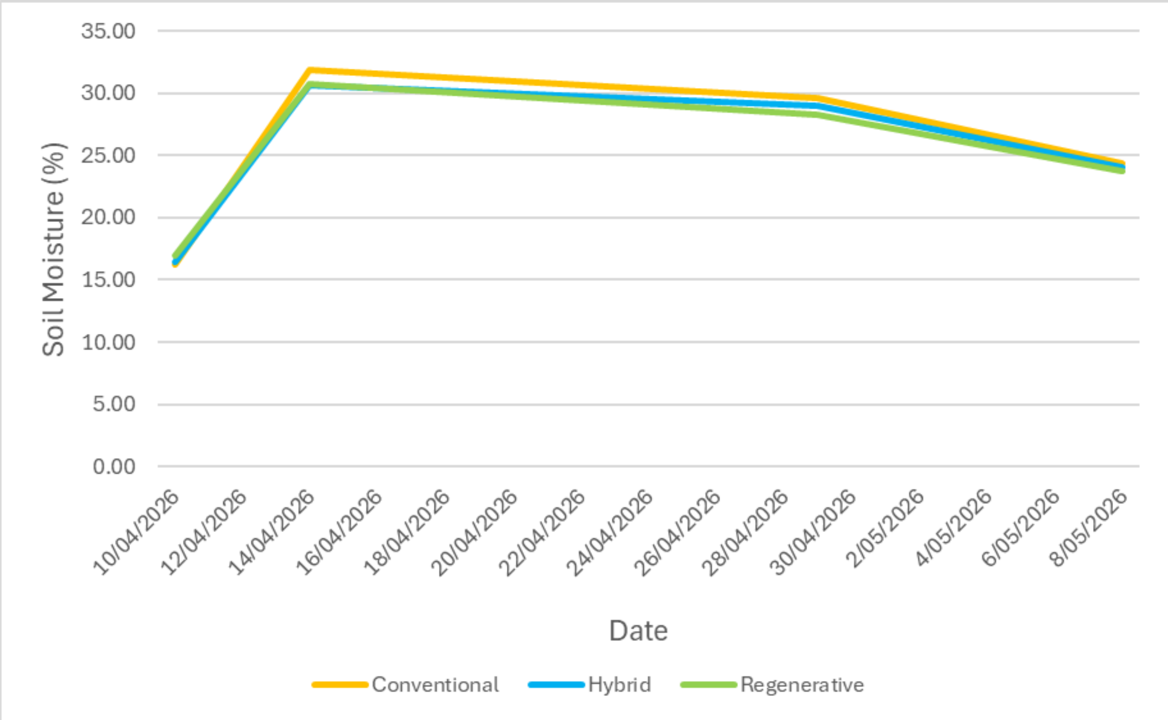


Figure 7-3 Cover crop soil moisture percentage to 20 cm (Hydrosense II), by treatment.

7.2 Canopy development

The Canopeo app has been used weekly to measure the canopy cover development of the winter cover crop. The app measures the fractional green canopy cover and reports it as a percentage.

The Regenerative treatment's cover crop of triticale and vetch took off after planting. Its canopy cover has increased significantly faster than the ryegrass in the Conventional and Hybrid treatments (Figure 7-4).

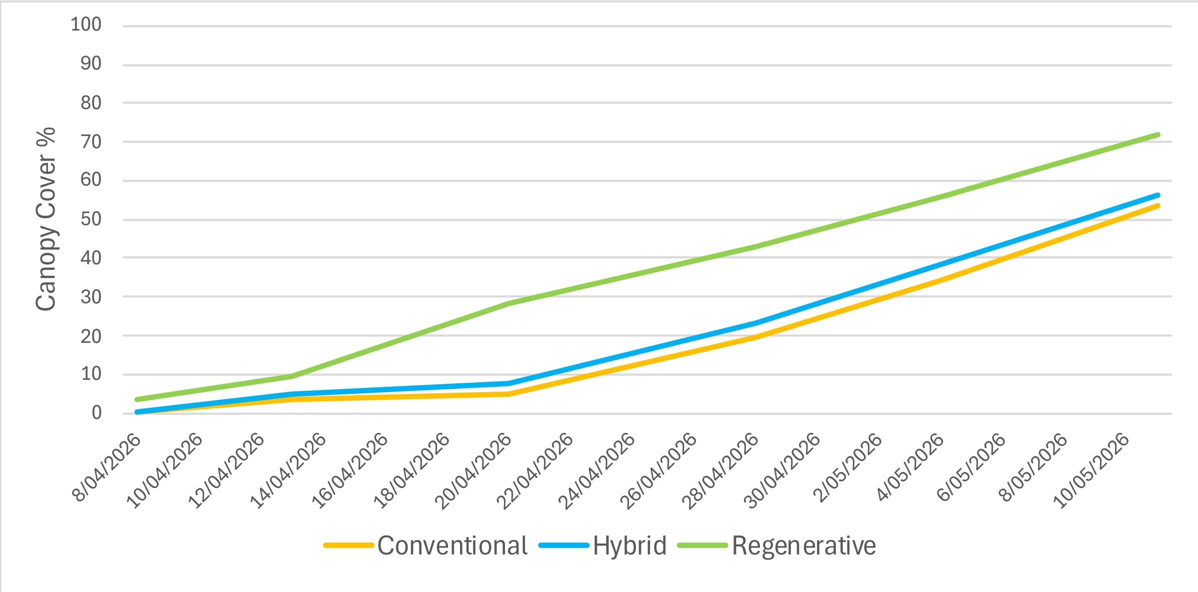


Figure 7-4 The winter cover crops' canopy cover percentage measured with the Canopeo app, by treatment.

7.3 Soil Nitrate (Quick Test)

Fortnightly nitrate samples have been taken at 0-15 cm and 15-30 cm. Eight cores have been collected per plot along the existing sampling transects.

The conventional treatment has had slightly higher soil nitrate levels than the other two treatments (Figure 7-5). This may reflect slightly higher butternut crop residue nitrogen levels and a slightly higher nitrogen to carbon ratio.

All three treatments show similar trends. The soil nitrate level increased after the cover crops were planted. This could be due to the butternut crop residue breaking down. Once the cover crops were established, the soil nitrate level decreased significantly in all three treatments. The soil nitrate level dropped faster in the Regenerative treatment. This could be because the cover crop of triticale and vetch is more established than the ryegrass in the other two treatments.

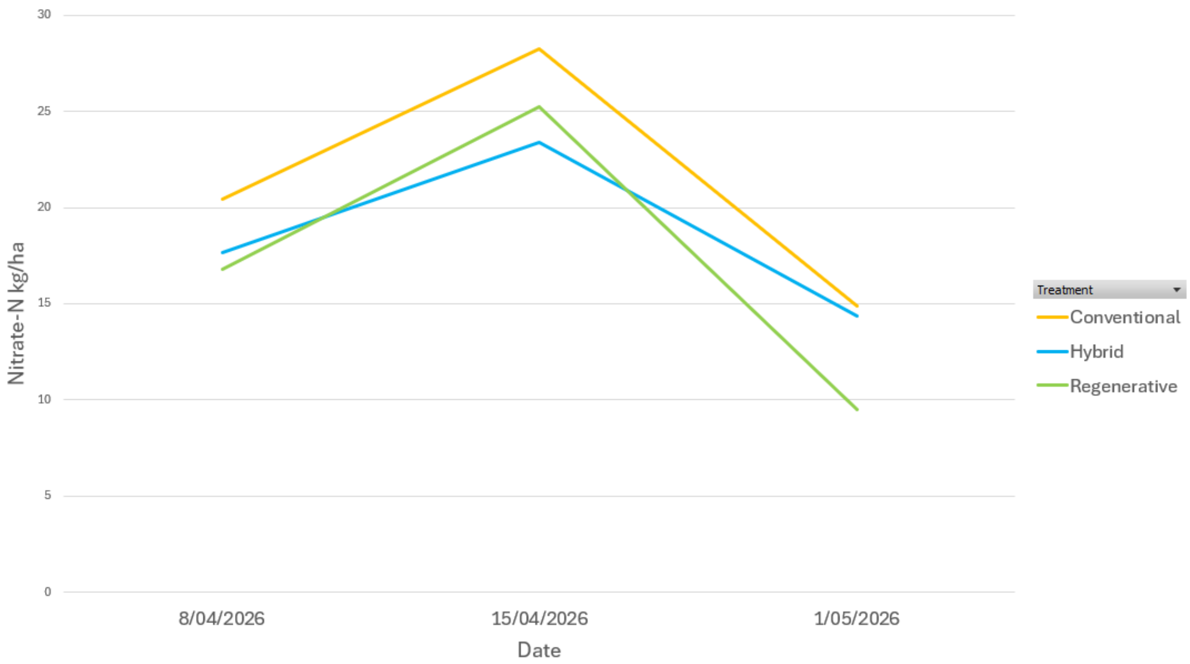


Figure 7-5 Kilograms of nitrate-nitrogen per hectare in the top 30 cm of the soil for the winter cover crops, by treatment.

8 Butternut gross margin

Gross margins were calculated for the butternut crops using 'real-world' costs for each operation carried out in each treatment. The costs reflect typical grower expenses, rather than the research rates we are charged. Research costs are considerably higher due to the smaller plot scale and the additional time required to complete operations.

Hand-harvest yields (kg/ha) for each treatment were used to determine average treatment revenue per hectare, as treatment-level machine-harvest data were not available. The average yield for each treatment was divided by 400 kg (the expected weight of butternuts per apple bin) and multiplied by 100, based on a paid return of $100 per bin.

In the gross margin breakdown, the largest cost difference between treatments was in ground preparation (Table 8.1). Strip tillage, used in the Hybrid and Regenerative treatments, was $441/ha cheaper than the full ground preparation used in the Conventional treatment. In addition, granular fertiliser costs in the Regenerative treatment were $362.45/ha lower than the Conventional treatment and $320.09/ha lower than the Hybrid treatment.

Table 8-1 Gross margins per hectare, by treatment.

Treatment	Conventional	Hybrid	Regenerative
Butternut Expenses	**-$ 7,214.97**	**-$ 7,047.56**	**-$ 7,129.93**
Bactericide	-$ 73.63	-$ 73.63	-$ 73.63
Biostimulants	$ -	-$ 207.06	-$ 407.77
Foliar Fertiliser	-$ 133.64	-$ 133.64	-$ 199.75
Fungicide	-$ 280.40	-$ 280.40	-$ 280.40
Granular Fertiliser	-$ 663.75	-$ 621.39	-$ 301.30
Ground Preparation	-$ 716.00	-$ 275.00	-$ 275.00
Herbicide	-$ 318.23	-$ 318.08	-$ 296.20
Insecticide	-$ 12.80	-$ 12.80	-$ 12.80
Irrigation	-$ 340.00	-$ 340.00	-$ 340.00
Land Lease	-$ 3,500.00	-$ 3,500.00	-$ 3,500.00
Lime	$ -	$ -	-$ 67.50
Molluscicide	-$ 147.00	-$ 147.00	-$ 147.00
Planting	-$ 195.00	-$ 195.00	-$ 195.00
Seed	-$ 241.40	-$ 241.40	-$ 241.40
Soil Test	-$ 130.00	-$ 130.00	-$ 130.00
Spraying	-$ 450.00	-$ 540.00	-$ 630.00
Sticker/Adjuvant	-$ 13.13	-$ 32.18	-$ 32.18
Harvest Income	**$ 13,175.00**	**$ 13,000.00**	**$ 12,350.00**
Gross Profit	$ 5,960.03	$ 5,952.44	$ 5,220.07
Gross Margin	45%	46%	42%
ROI	83%	84%	73%

Another key difference was the use of biostimulants. The Hybrid and Regenerative treatments included biostimulant applications, whereas the Conventional treatment did not. The cost of biostimulants was $207.06/ha in the Hybrid treatment and $407.77/ha in the Regenerative treatment. This included additional spray application costs associated with applying the biostimulants, as certain products couldn't be mixed with copper sprays.

Although there were differences in costs associated with specific management practices, the overall expenses for growing butternuts were similar across all three treatments.

Statistical analysis of gross profit, gross margin, and return on investment (ROI) was conducted at the plot level.

- Plot revenue = average plot yield (kg/ha) / (400 kg/bin x $100/bin)
- Gross profit = plot revenue – expenses
- Gross margin = gross profit / plot revenue x 100 (%)
- ROI = gross profit / expenses x 100 (%).

There were no significant differences between treatments in terms of gross profit (Figure 8-1), gross margin (Figure 8-2), or ROI (Figure 8-3).

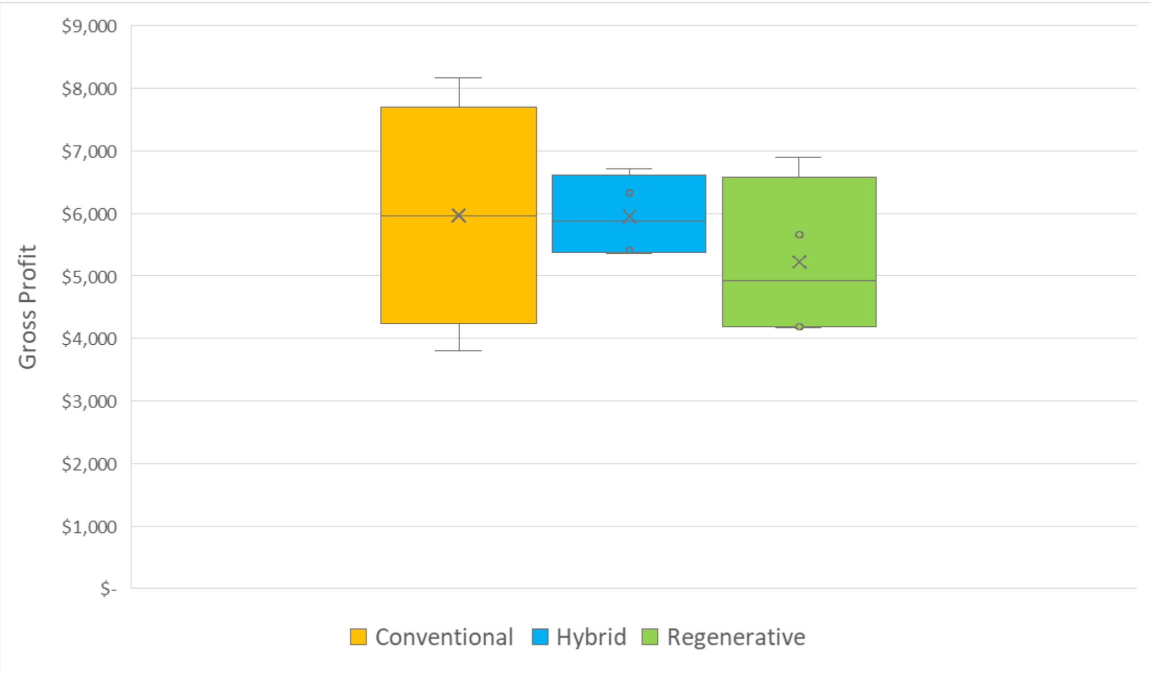


Figure 8-1 Gross profit from the butternut crop, by treatment.

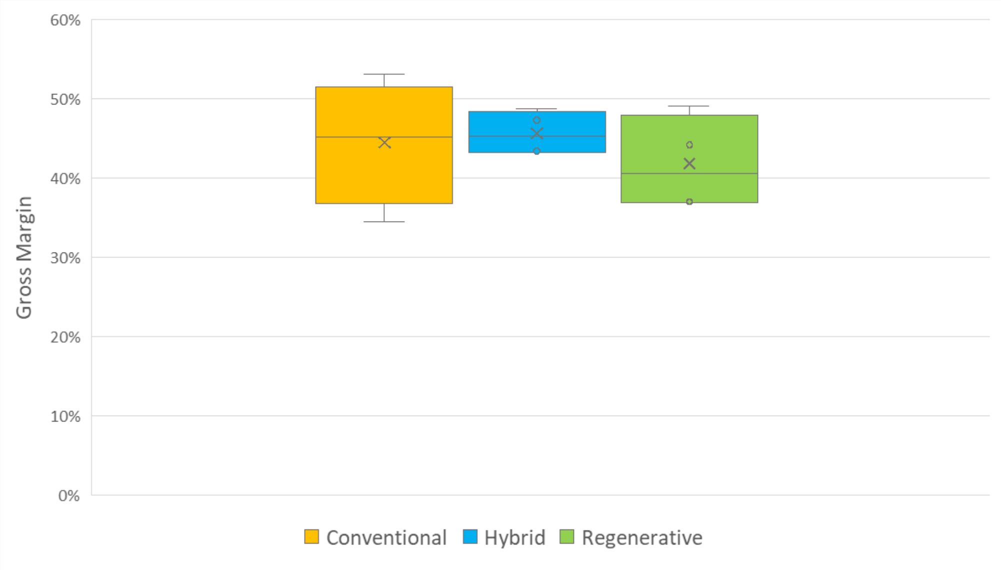


Figure 8-2 Gross margin from the butternut crop, by treatment.

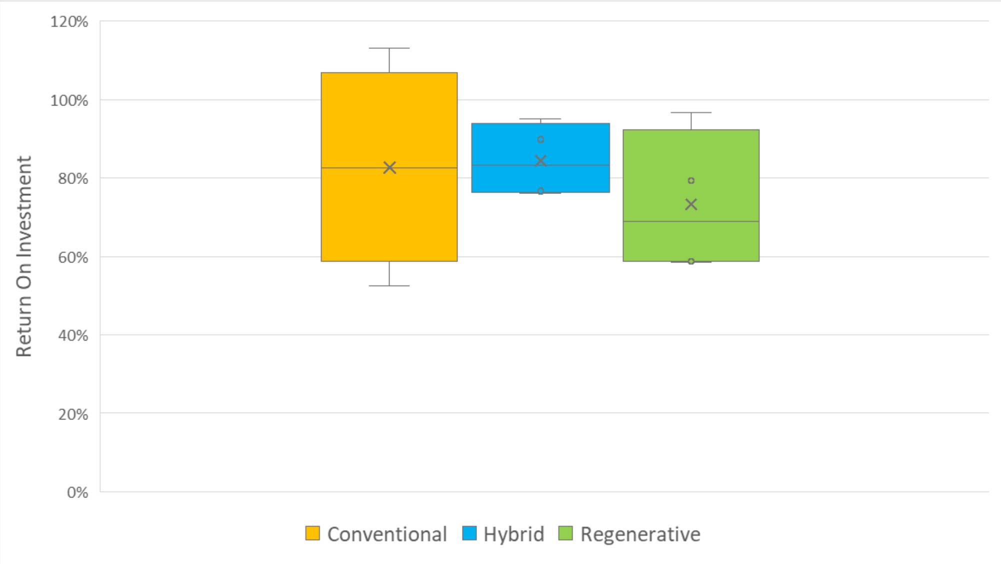


Figure 8-3 Return on investment from the butternut crop, by treatment.

The cost of planting the winter cover crops was not included in the butternut gross margins, but the expenses per treatment have also been calculated (Table 8-2).

Table 8-2 Winter cover crop expenses, by treatment.

Treatment	Conventional	Hybrid	Regenerative
Cover Crop Expenses	**-$ 842.00**	**-$ 842.00**	**-$ 1,192.38**
Biostimulants	$ -	$ -	-$ 25.00
Granular Fertiliser	$ -	$ -	-$ 55.30
Ground Preparation	-$ 270.00	-$ 270.00	-$ 270.00
Lime	$ -	$ -	-$ 67.50
Molluscicide	-$ 147.00	-$ 147.00	-$ 147.00
Planting	-$ 195.00	-$ 195.00	-$ 195.00
Seed	-$ 230.00	-$ 230.00	-$ 432.58

9 Outreach

9.1 Weekly agronomy field walks

The Operation Advisory Group met weekly to discuss butternut crop development, identify pest or disease issues, and develop a management plan for the next week (Figure 9-1).

Figure 9-1 Operation Advisory Group field walks.

9.2 Massey University Farmed Landscapes Research Centre

Dan and Olivia both presented at Massey University's Farmed Landscapes Research Centres (FLRC) conference on the 3rd of February.

Dan presented an overview of the total and labile carbon results and an interpretation of the results (Figure 9-4 & Appendix 2). It highlighted missed opportunities to build soil carbon through a lack of plant photosynthates during fallow periods and the transition between cash crops and cover crops (Figure 9-3).

Figure 9-2 Dan Presenting at FLRC.

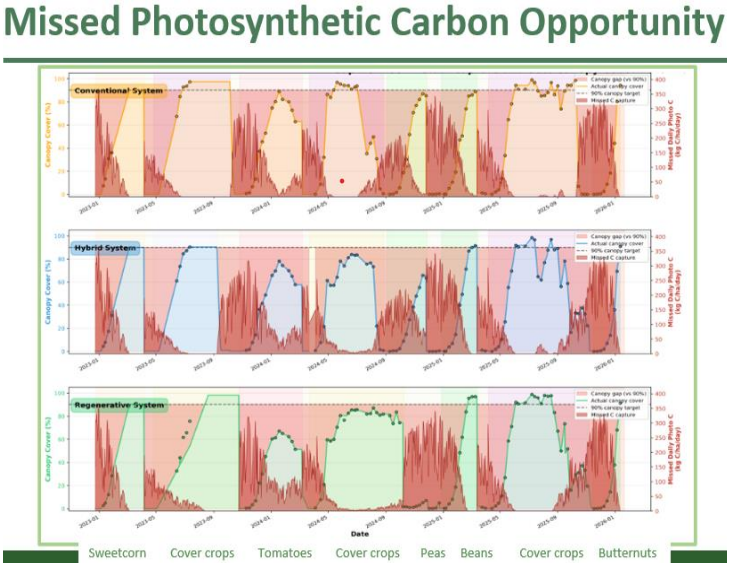


Figure 9-3 Graph of missed photosynthetic carbon opportunities.

Olivia presented two posters at FLRC about tools we have been using in the Carbon Positive trial (Figure 9-4, Appendix 3, & Appendix 4). The first poster was on Slakes, an app used to measure aggregate stability. The second poster was on the Nitrachek device, which we use to monitor soil nitrate levels.

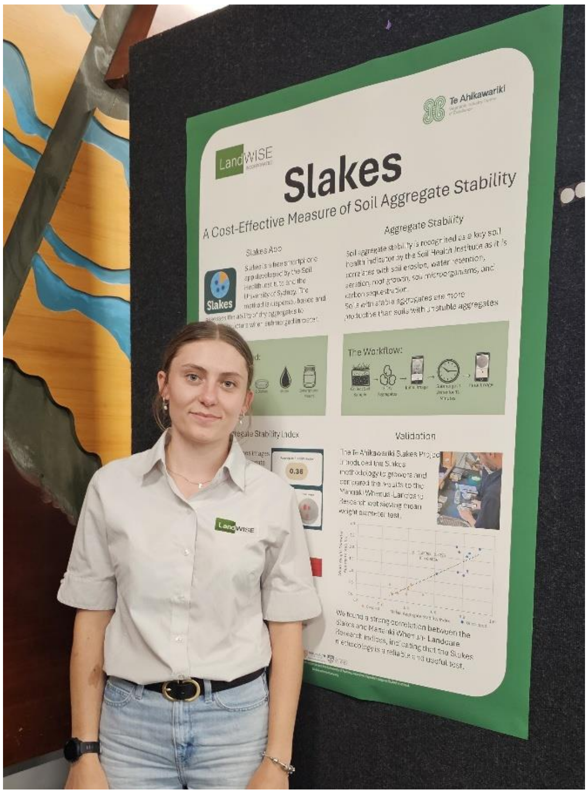


Figure 9-4 Olivia presenting the Slakes poster at FLRC.

9.3 Vegetables Big Day Out 2026

Dan and Olivia both presented at the Vegetable Big Day Out on the 5th of March (Figure 9-5). They presented an overview of the Carbon Positive trial, the carbon results, and lessons learned so far (Appendix 5).

Figure 9-5 Dan presenting at the Vegetables Big Day Out 2026.

9.4 'A Lighter Touch' biodiversity event

We hosted an 'A Lighter Touch' biodiversity event at the LandWise MicroFarm on the 19th of March (Figure 9-6). Dan and Olivia gave an overview of the Carbon Positive trial and why they have implemented annual biodiversity strips and mobile native insectary pods alongside it (Appendix 6). They also discussed challenges like groundwork, establishment, and weed management.

Figure 9-6 Olivia talking about the biodiversity strip under the irrigator cable.

9.5 LandWISE Conference

Olivia and Dan are scheduled to present Carbon Positive trial findings at the LandWISE Conference on the 27th – 28th of May. Olivia's presentation is an overview of the fourth growing season and a breakdown of the butternut gross margins (Appendix 7). Dan's presentation is an interpretation of the total and labile carbon results and the missed opportunities to build soil carbon, similar to the FLRC presentation (Appendix 2).

9.6 International visitors

9.6.1 Charlie White

Dan and Olivia met Charlie White, an extension scientist at Penn State College of Agricultural Sciences, at the FLRC Conference. Following this, he visited the LandWISE MicroFarm, as he was interested in the Carbon Positive trial and other work undertaken by LandWISE. We took him to local farms to meet the farmers and discuss relative cropping approaches.

Since then, Charlie has been using data from the Carbon Positive trial within the Sustainable Vegetable Systems (SVS) tool to explore its functionality. He has also shared information on low-cost carbon dioxide monitors he is using to measure carbon mineralisation. He is having success with these devices, and they appear to be a simple and practical option that we could incorporate into the Carbon Positive trial.

In light of his engagement, he is returning to New Zealand and will be a keynote speaker at the LandWISE Conference.

9.6.2 Lauren Diepenbrock

Lauren Diepenbrock, a Citrus Entomology Extension Specialist at the University of Florida, visited the LandWISE MicroFarm with Bethan Shaw from BSI to discuss the Carbon Positive trial. She was also interested in the annual biodiversity strips and mobile pods and was able to help us identify some insects. We took Lauren and Bethan to a local farm where buckwheat had been sown as a pest-predator friendly cover crop.

9.7 Magazine article

A magazine article was submitted to NZGrower that discusses the butternut crops management, the yield from each treatment, and the establishment of the winter cover crops (Appendix 8). The article should be published in the June edition of the NZGrower magazine.

9.8 LinkedIn

Regular updates about the Carbon Positive trial have been posted on the LandWISE Inc LinkedIn page (Figure 9-7). LandWISE Inc now has 270 followers. Posting on LinkedIn has led to more people interacting with the trial.

LinkedIn: https://www.linkedin.com/company/landwise-inc

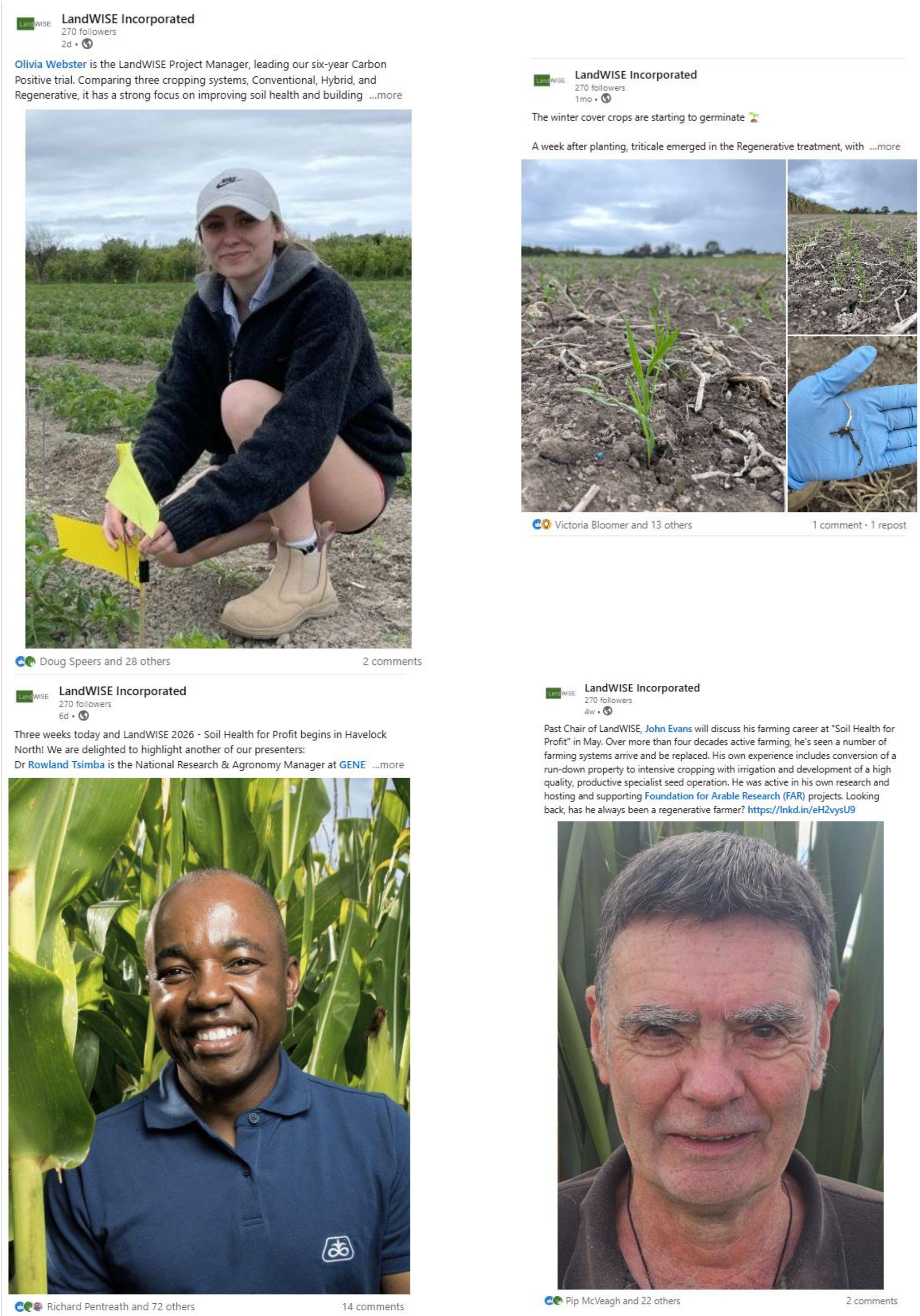


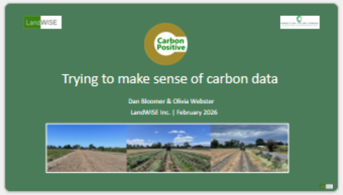
Figure 9-7 Recent LinkedIn posts from LandWISE Inc.

10 Appendices

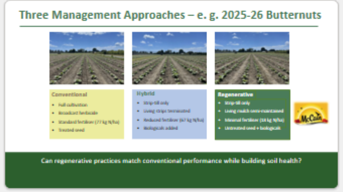
10.1 Appendix 1 – Nutrient inputs

Treatment	Timing	Fertilizer Product	Rate L or kg/ha	N%	P%	K%	S%	Ca%	Kg N/ha	kg P/ha	kg K/ha	Kg S/ha	Kg Ca/ha
Conventional	Planting	Complex	300	12	5	15	8	0	36.00	15.00	45.00	24.00	0.00
Conventional	Side dressing	CAN	150	27	0	0	0	4	40.50	0.00	0.00	0.00	6.00
Conventional	Growing	Wuxal Calcium	5	16.4	0	0	0	17.5	0.82	0.00	0.00	0.00	0.88
Hybrid	Planting	Complex	300	12	5	15	8	0	36.00	15.00	45.00	24.00	0.00
Hybrid	Side dressing	CAN	113	27	0	0	0	4	30.51	0.00	0.00	0.00	4.52
Hybrid	Side dressing	Acadian Seaweed	0.75	0.5	0	14	0	0	0.00	0.00	0.11	0.00	0.00
Hybrid	Growing	Wuxal Calcium	5	16.4	0	0	0	17.5	0.82	0.00	0.00	0.00	0.88
Regenerative	Pre-planting	Calciprills	150	0	0	0	0	37	0.00	0.00	0.00	0.00	55.50
Regenerative	Pre-planting	Sulphur	30	0	0	0	90	0	0.00	0.00	0.00	27.00	0.00
Regenerative	Planting	Complex	150	12	5	15	8	0	18.00	7.50	22.50	12.00	0.00
Regenerative	Side dressing	Acadian Seaweed	0.75	0.5	0	14	0	0	0.00	0.00	0.11	0.00	0.00
Regenerative	Side dressing	Megafol	3	3	0	8	0	0	0.09	0.00	0.24	0.00	0.00
Regenerative	First fungicide	Bio Marinus	3	2.2	2	0	0	0.4	0.07	0.05	0.01	0.01	0.01
Regenerative	Growing	Megafol	3	3	0	8	0	0	0.09	0.00	0.24	0.00	0.00
Regenerative	Growing	Wuxal Calcium	5	16.4	0	0	0	17.5	0.82	0.00	0.00	0.00	0.88
Regenerative	Growing	Foliacin	0.75	4	2.62	4.15	0	0	0.03	0.02	0.03	0.00	0.00
Regenerative	Growing	Bio Marinus	3	2.2	1.55	0.28	0.18	0.37	0.07	0.05	0.01	0.01	0.01

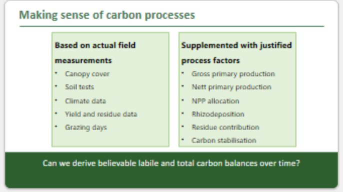
10.2 Appendix 2 - Massey University Farmed Landscapes Research Centre presentation



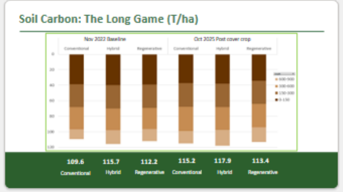
1



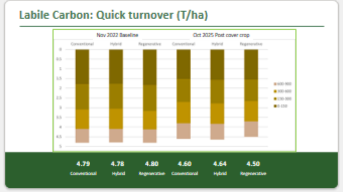
2



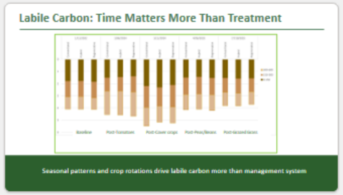
3



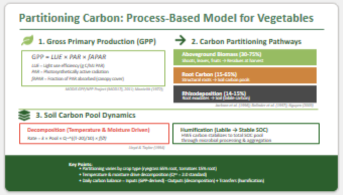
4



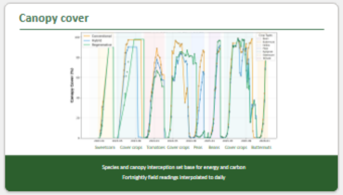
5



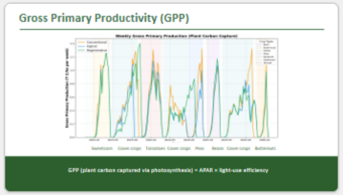
6



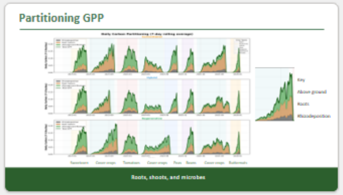
7



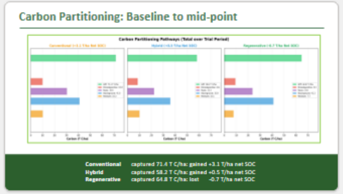
8



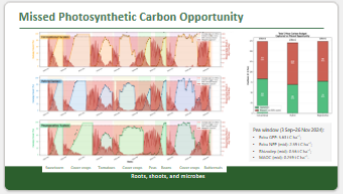
9



10



11

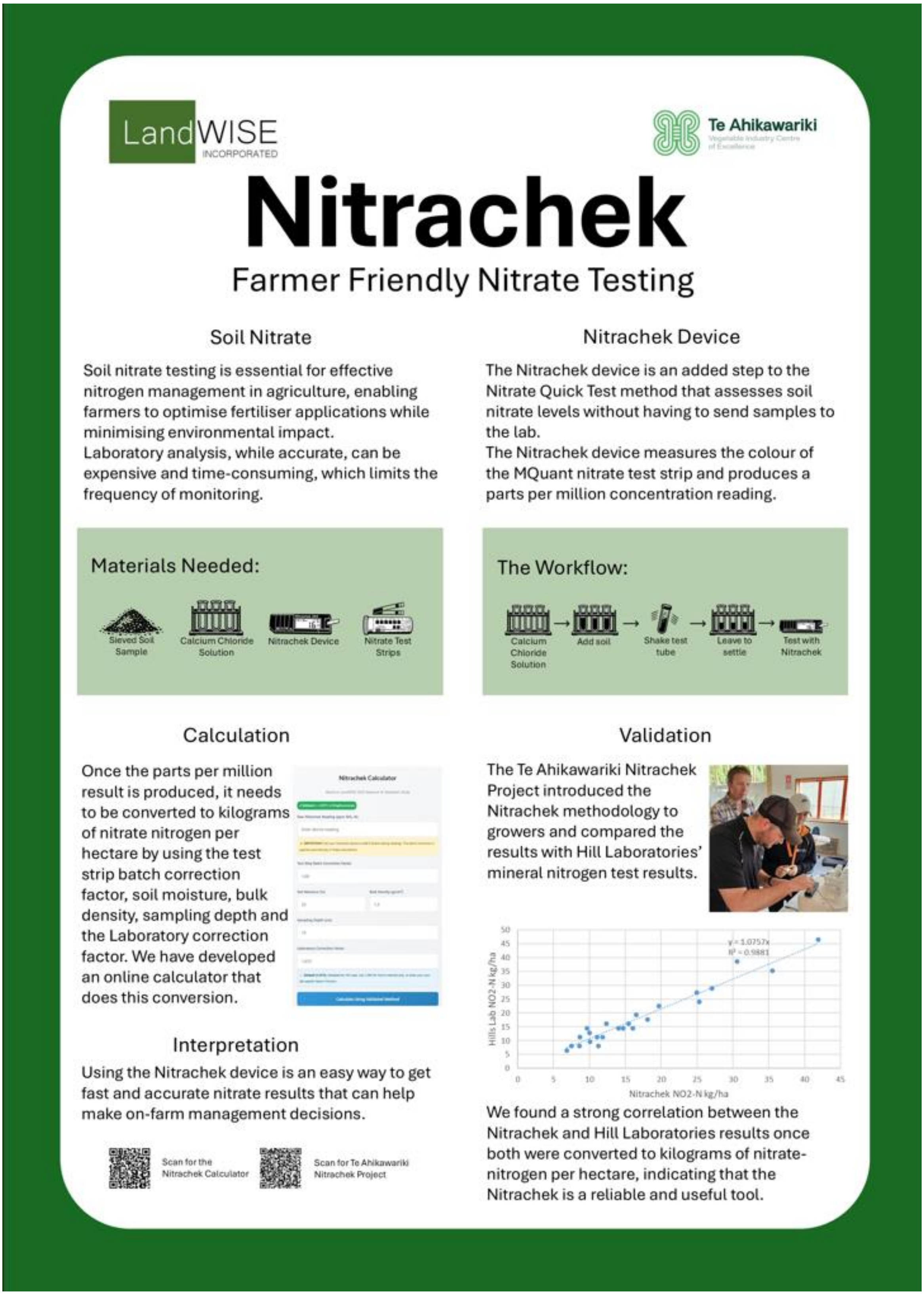


12

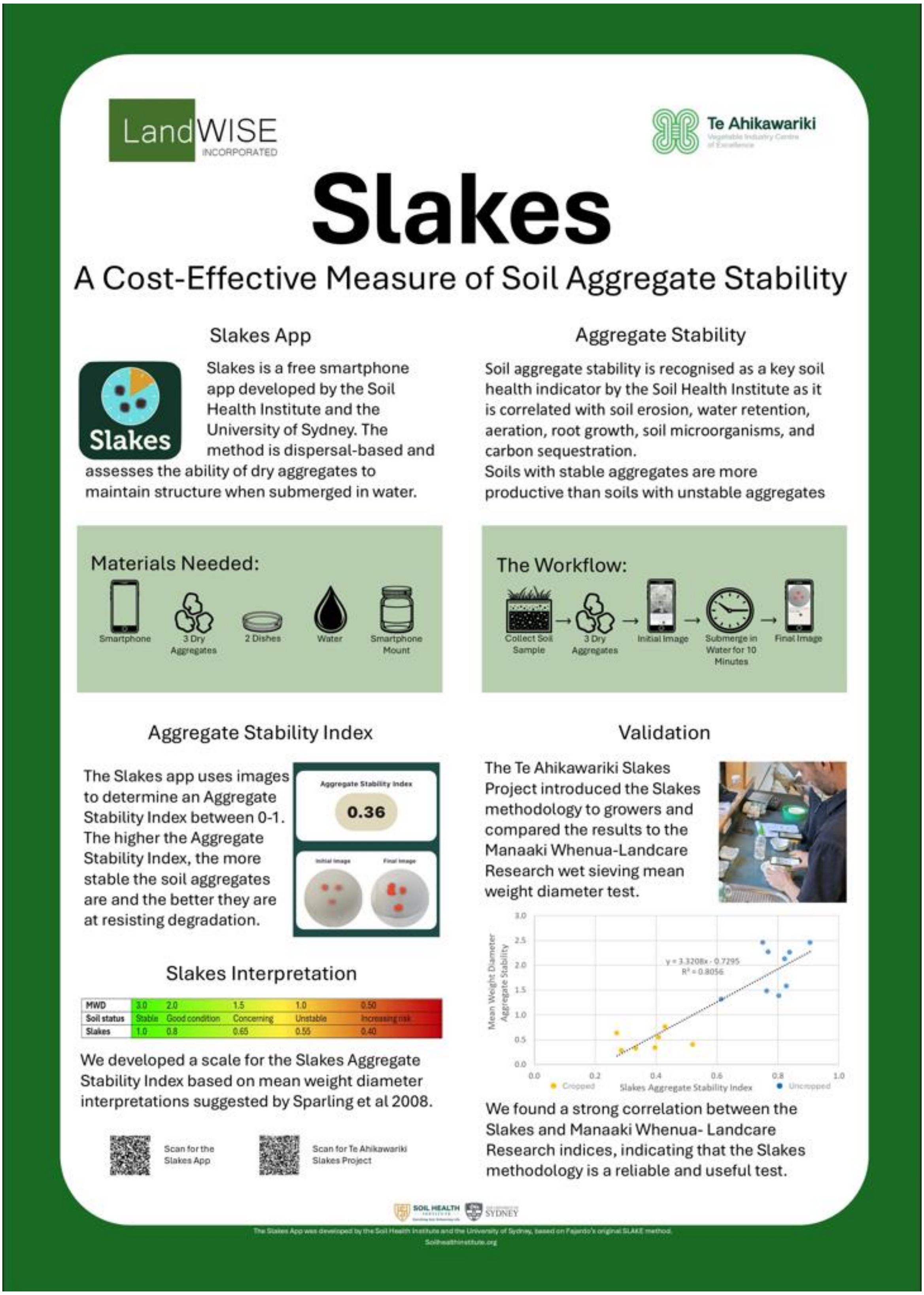
13

14

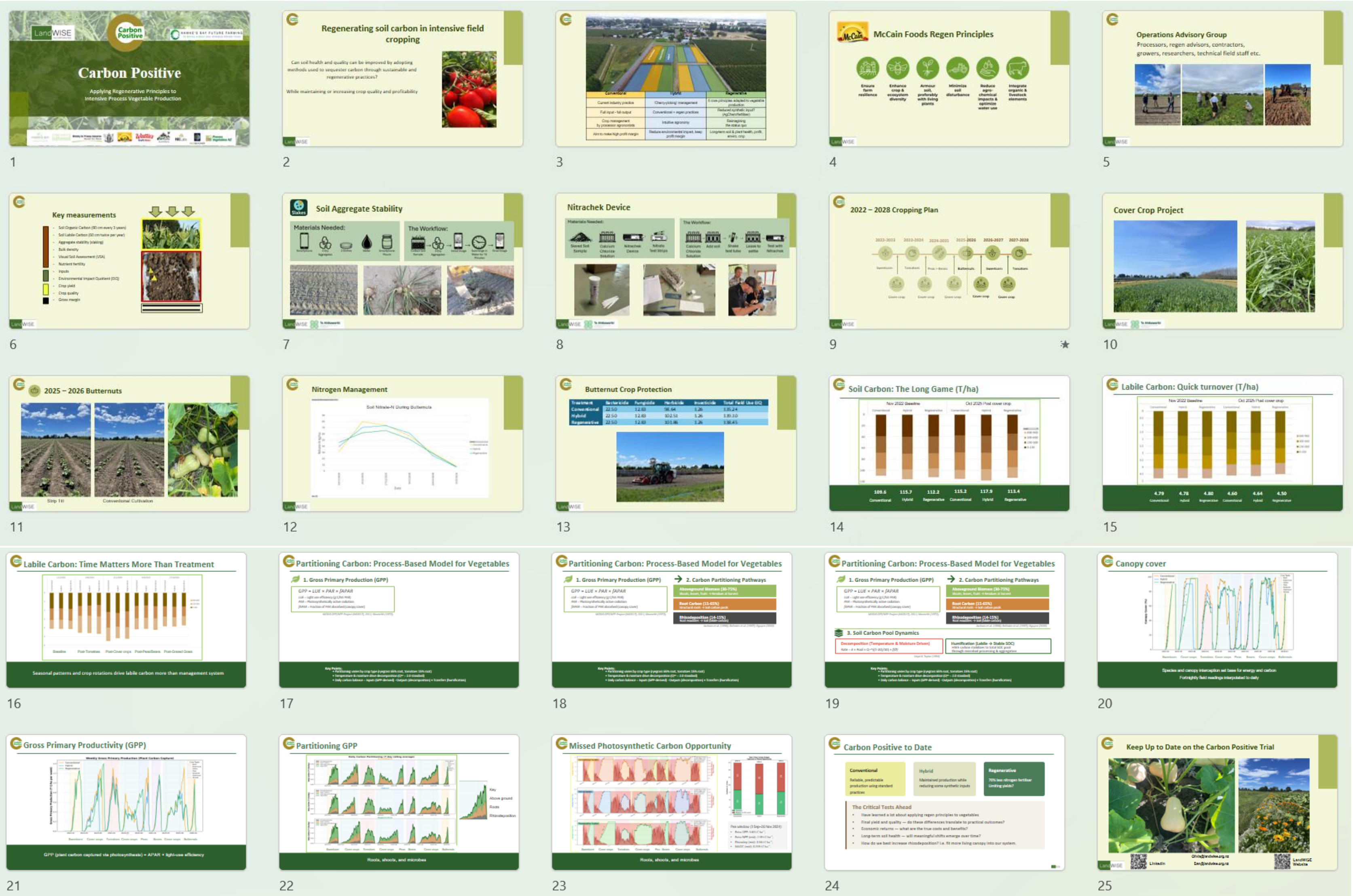
10.3 Appendix 3 – Massey University Farmed Landscapes Research Centre Nitrachek poster



10.4 Appendix 4 – Massey University Farmed Landscapes Research Centre Slakes poster



10.5 Appendix 5 - Vegetables Big Day Out 2026 presentation



10.6 Appendix 6 – 'A lighter touch' biodiversity event

LandWISE INCORPORATED

Bio-strip Field Walk

19 May 2026

Follow on LinkedIn



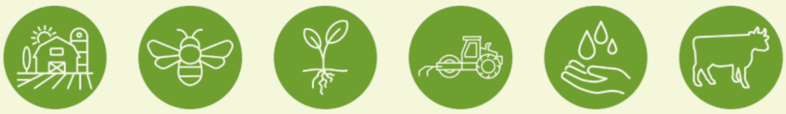






Conventional	Hybrid	Regenerative
Current industry practice	'Cherry-picking' management	6 core principles adapted to vegetable production
Full input - full output	Conventional + regen practices	Reduced synthetic input? (AgChem/fertiliser)
Crop management by processor agronomists	Intuitive agronomy	Reimagining the status quo
Aim to make high profit margin	Reduce environmental impact, keep profit margin	Long-term soil & plant health, profit, enviro, crop

McCain Foods Regen Principles



- Ensure farm resilience
- Enhance crop & ecosystem diversity
- Armour soil, preferably with living plants
- Minimize soil disturbance
- Reduce agro-chemical impacts & optimize water use
- Integrate organic & livestock elements

LandWISE

Key measurements

- Soil Organic Carbon (90 cm every 3 years)
- Soil Labile Carbon (60 cm twice per year)
- Aggregate stability (slaking)
- Bulk density
- Visual Soil Assessment (VSA)
- Nutrient fertility
- Inputs
- Environmental Impact Quotient (EIQ)
- Crop yield
- Crop quality
- Gross margin

LandWISE

Soil Aggregate Stability

Slakes

Materials Needed:

Smartphone | 3 Dry Aggregates | 2 Dishes | Water | Smartphone Mount

The Workflow:

Collect Soil Sample → 3 Dry Aggregates → Initial Image → Submerge in Water for 10 Minutes → Final Image

LandWISE Te Ahikawariki

Nitrachek Device

Materials Needed:

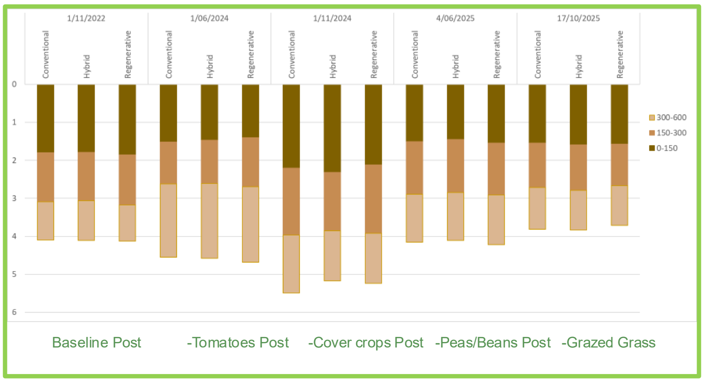
Sieved Soil Sample | Calcium Chloride Solution | Nitrachek Device | Nitrate Test Strips

The Workflow:

Calcium Chloride Solution → Add soil → Shake test tube → Leave to settle → Test with Nitrachek

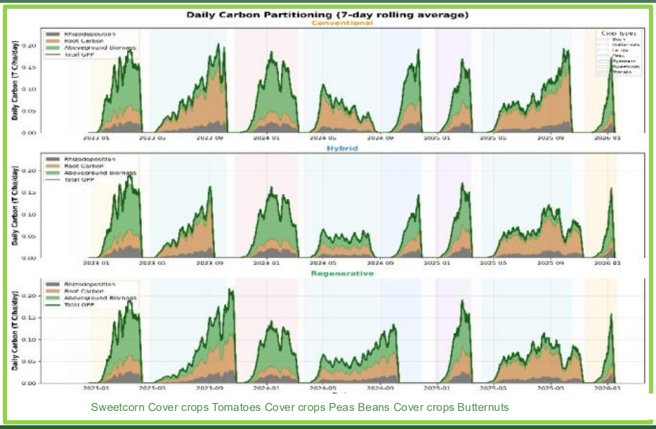
LandWISE Te Ahikawariki

Labile Carbon: Time Matters More Than Treatment



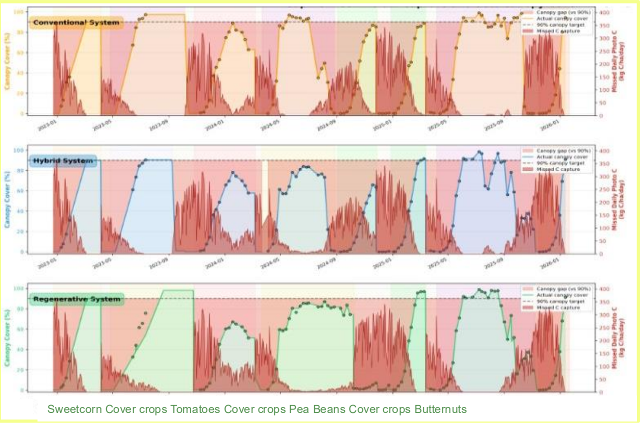
Seasonal patterns and crop rotations drive labile carbon more than management system

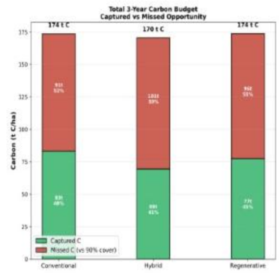
Partitioning GPP



Roots, shoots, and microbes

Missed Photosynthetic Carbon Opportunity





Pea window (3 Sep–26 Nov 2024):

- Extra GPP: 5.63 t C ha^{-1};
- Extra NPP (mid): 2.59 t C ha^{-1};
- Rhizodep (mid): 0.56 t C ha^{-1};
- MAOC (mid): 0.259 t C ha^{-1}.

Roots, shoots, and microbes

10.7 Appendix 7 - LandWISE Conference

10.8 Appendix 8 – NZGrower magazine article

Carbon Positive: Butternuts update

The Carbon Positive Trial is a six-year study based at the LandWISE MicroFarm, comparing three growing systems: Conventional, Hybrid, and Regenerative. The trial aims to answer the scientific question: Can soil health and quality be improved by adopting methods that sequester carbon through sustainable and regenerative practices, while maintaining crop quality and profitability?

We have just completed our fourth cropping season, during which we grew butternut pumpkins. All three treatments have now been planted in winter cover crops.

The main differences between treatments throughout the growing season were soil preparation and nutrition. All three treatments received the same spray programme, as the products used on butternuts have a low Environmental Impact Quotient (EIQ). EIQ is a tool developed by Cornell University that can be used to estimate the 'field-use' environmental impact of specific agrichemicals. This score is based on both the toxicity of the product's active ingredient and the application rate per hectare.

The entire Conventional treatment was sprayed out and cultivated prior to planting. In contrast, the Hybrid and Regenerative treatments were strip-sprayed and strip-tilled, followed by a broadcast spray one week before planting to terminate the remaining winter cover crop and any weeds that emerged after strip tillage.

Throughout the season, the Conventional treatment received 77 kg N/ha, the Hybrid treatment received 67 kg N/ha, and the Regenerative treatment received 19 kg N/ha. The Conventional and Hybrid treatments both received the 'standard' rate of fertiliser at planting, while the Regenerative treatment received half that rate. In addition, the Hybrid and Regenerative treatments received biological inputs via liquid injection, including Trichostart, Biostart N, and Mycorrcin. At side-dressing, the Conventional treatment again received the 'standard' fertiliser rate, while the Hybrid treatment received a slightly reduced rate. The Hybrid treatment also received a foliar application of seaweed. The Regenerative treatment only received a foliar application of seaweed, Megafol, and fulvic acid, as soil tests indicated sufficient nitrate-N levels.

Our plot sampling showed the Conventional treatment averaged 52.74 t/ha, the Hybrid treatment 52.00 t/ha, and the Regenerative treatment 49.44 t/ha, but statistically, these results were not significantly different. All treatments yielded well ahead of the 25 – 30 t/ha we anticipated at sowing! The Brix levels, fruit size, fruit dry matter, residue biomass, residue dry matter, and carbon and nitrogen content in residue and fruit were the same in all treatments.

After the butternuts were harvested, all three treatments were disced twice before being direct drilled. The Conventional and Hybrid treatments were sown in Moata ryegrass, while the Regenerative treatment was planted in a mix of triticale and vetch.

The triticale and vetch established quickly and are expected to provide good ground cover over winter. The Moata ryegrass was slower to establish but is expected to reach full canopy cover within 6–8 weeks, as observed in previous years.

The Conventional treatment will be grazed over winter, while the Hybrid and Regenerative treatments will be left to accumulate biomass.

Carbon Positive is a joint project with LandWISE, Hawke's Bay Future Farming Trust, Heinz-Wattie's and McCain Foods. We are grateful to our Operation Advisory Group members for their attendance and input at regular paddock meetings.

LandWISE

HAWKE'S BAY FUTURE FARMING
TE MATAU A MĀUI AHU WHENUA-HĪKINA TAIAO

PAGEBLOOMER

Wattie's KraftHeinz

Ministry for Primary Industries
Manatū Ahu Matua

McCain

Process Vegetables NZ