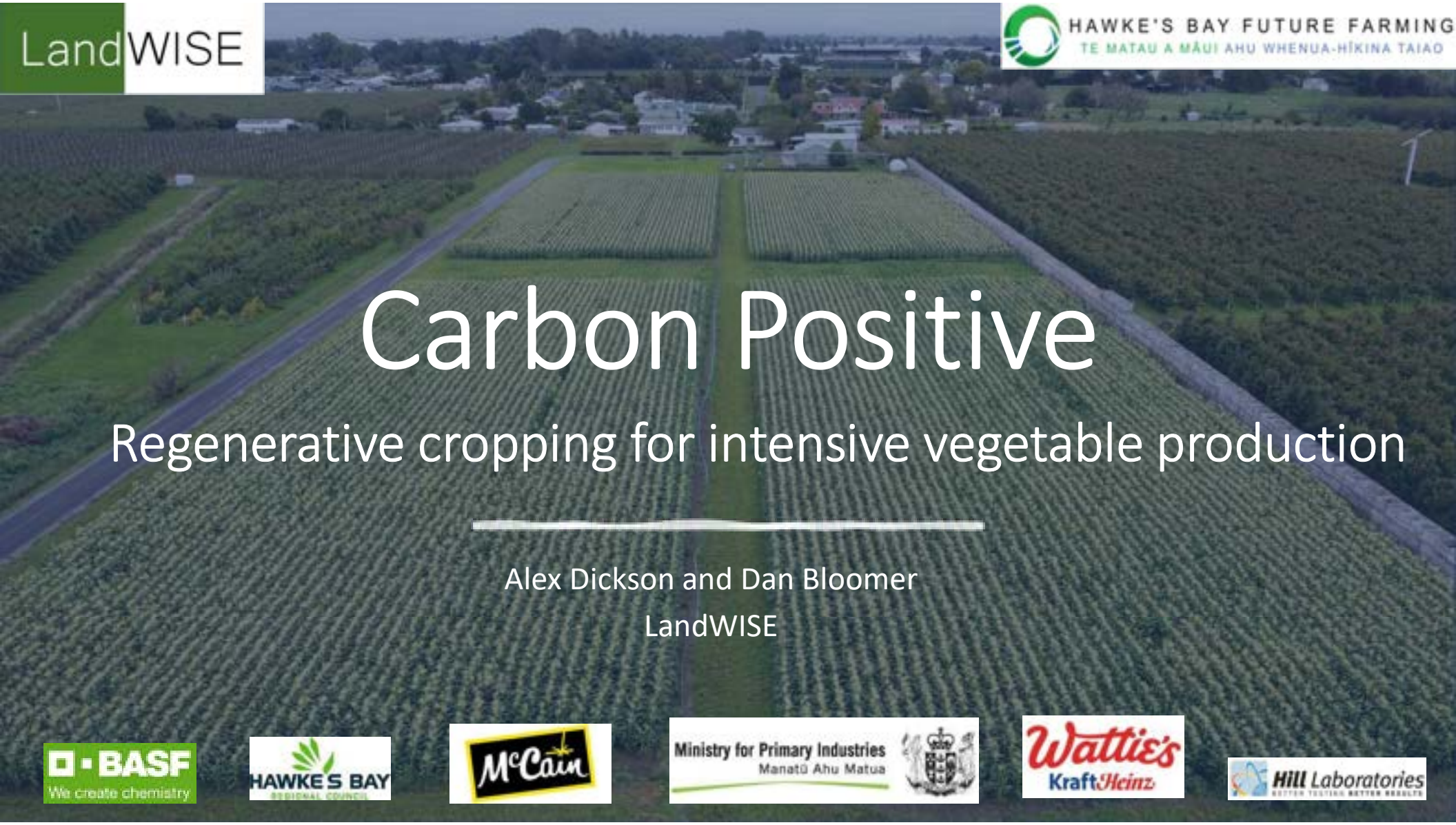


Carbon Positive

Regenerative cropping for intensive vegetable production

Alex Dickson and Dan Bloomer

LandWISE

Why?

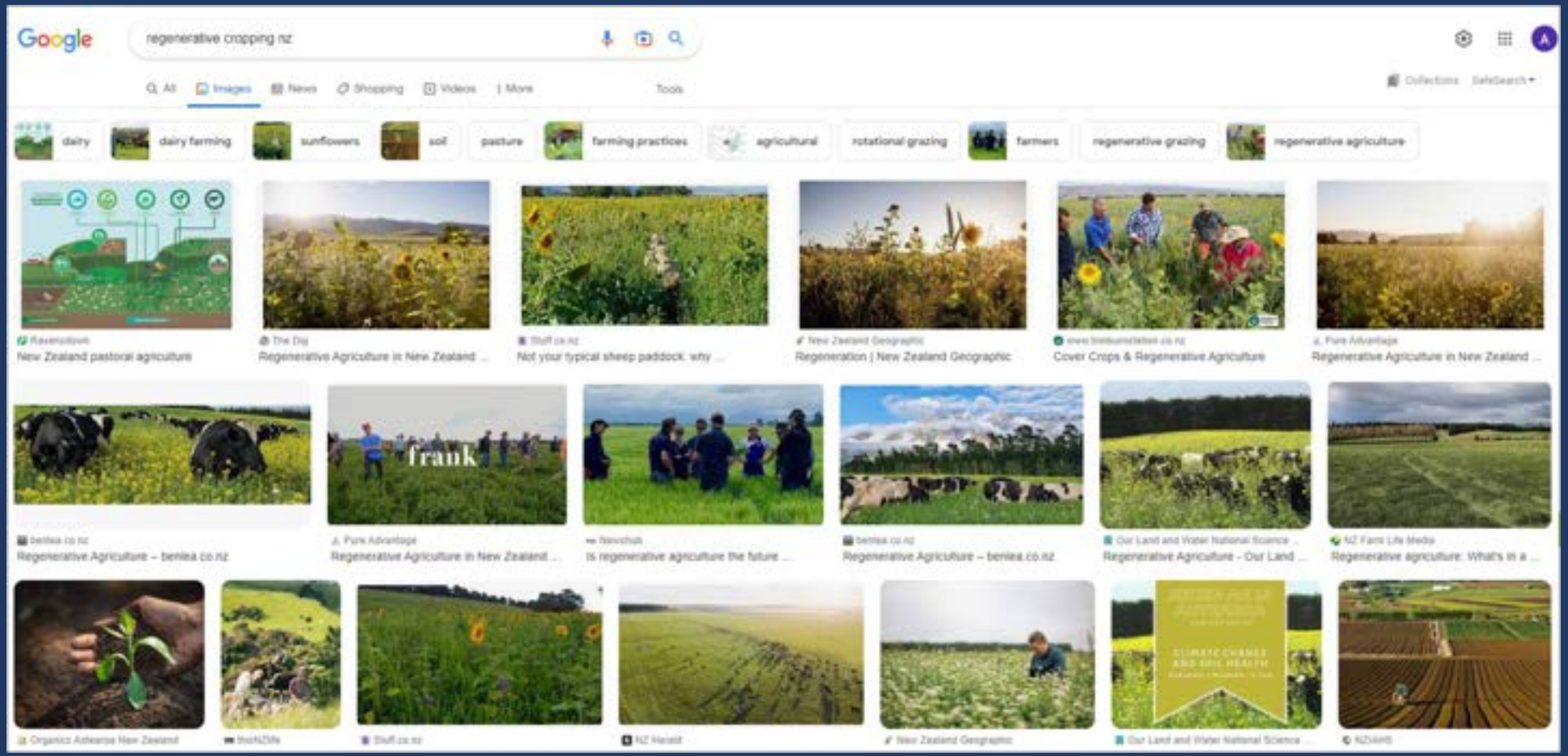
Image from https://www.kraftheinzcompany.com/esg/sustainable-agriculture.html

Image from https://hewakaekenoa.nz/

Image from https://www.mccain.com/media/4036/mccain-foods-regenag-framework.pdf

Image from https://www.mpi.govt.nz/funding-rural-support/sustainable-food-fibre-futures/current-sff-futures-projects/sff-futures-projects-regenerative-farming-practices/

Why?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Regenerative agriculture: What's in a ...

Why?

Government invests $2m in regenerative farming trial for crops and vegetables

RNZ

14 Feb, 2023 04:59 AM · 3 mins to read

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One part of the trial will focus on reducing the use of herbicides, fungicides and insecticides. Photo / File

RNZ

The Government is backing a research project on regenerative farming practices of arable and vegetable crops in Hawke's Bay.

Minister of Agriculture Damien O'Connor announced $2 million will be spent over six years on the New Zealand-first project.

https://www.nzherald.co.nz/the-country/news/government-invests-2m-in-regenerative-farming-trial-for-crops-and-vegetables/ZQH6JOG36BGULDR5RFELL2O7GY/

Regenerating soil carbon in soils used for intensive field cropping

Can soil health and quality be improved by adopting methods used to sequester carbon through sustainable and regenerative practices?

LandWISE

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

Trial Design

Three farm system treatments compared:

- Fully conventional (current industry best practice)
- Fully regenerative (adopting core principles)
- A hybrid system (some conventional and some regenerative practices)

LandWISE

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

System Frameworks

Conventional	***Hybrid***	***Regenerative***
Current industry BMP	*'Cherry-picking' management to achieve 'lower footprint'*	*5 core regen principles adapted to commercial vegetable production*
Full input- full output	*Some conventional practices + some regen practices*	*'Lower Input' (AgChem/synthetic fertiliser)*
Crop management packages delivered by processor agronomists	*Not full system changes- easy for growers to adopt changes*	*Reimagining the status quo*
Plans created with processors, technical advisors	*Plans created with processors, growers, technical advisors*	*Plans created with consultants/growers*
Aim to make high profit margin	*Aim to reduce environmental impact while retaining high profit margin*	*Aim to improve soil and plant health overtime to achieve long term improved profit, environmental, crop performance outcomes*

Practices that degrade soil

CULTIVATION

BARE SOIL

COMPACTION

SURPLUS SOLUBLE NUTRIENTS

HERBICIDE, FUNGICIDE, INSECTICIDE

Regenerative Practices

Minimise Disturbance

Keep the soil covered

Keep living roots in the soil at all times

Grow a diverse range of crops

Introduce grazing animals

MicroFarm Trial

- Testing over 6 years
- Effect of alternative management strategies on
  - Soil quality
  - Carbon levels
  - Nutrient supply
  - Water holding abilities
  - Need for external inputs
- Incorporate Mātauranga Māori principles

Trial Layout

- 4 replicates of each system (12 plots)
- 90 x 12 m = large enough to use commercial cropping equipment

Baseline Sampling

Carbon, Bulk density, Agg Stab, VSA, Worms, Soil moisture, eDNA, Yield, Quality, Gross margins, ….

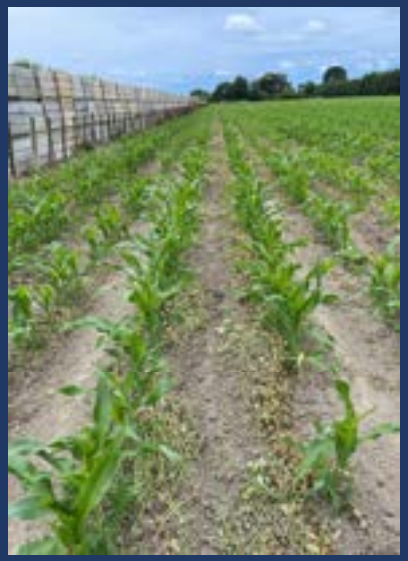
Year 1 McCains Sweetcorn

- Carbon Sampling November 2022
- Planted 23rd December 2022
- Sweetcorn submerged briefly after Cyclone
- Harvested 11th April 2023
- 3 Treatments

Year 1- McCains Sweetcorn

Planted 23rd December 2022

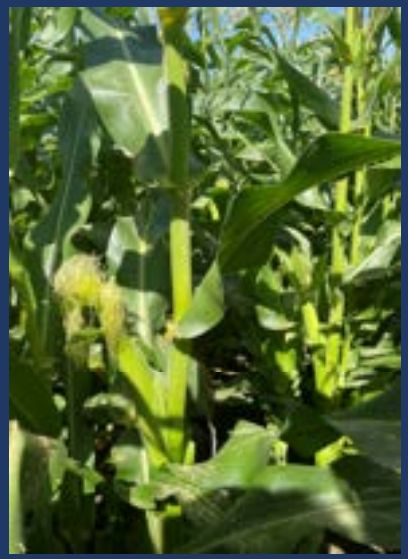
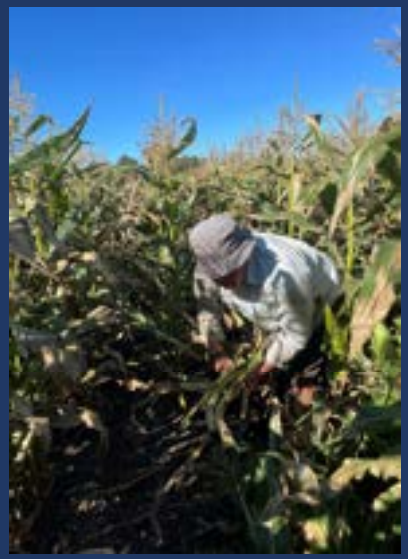


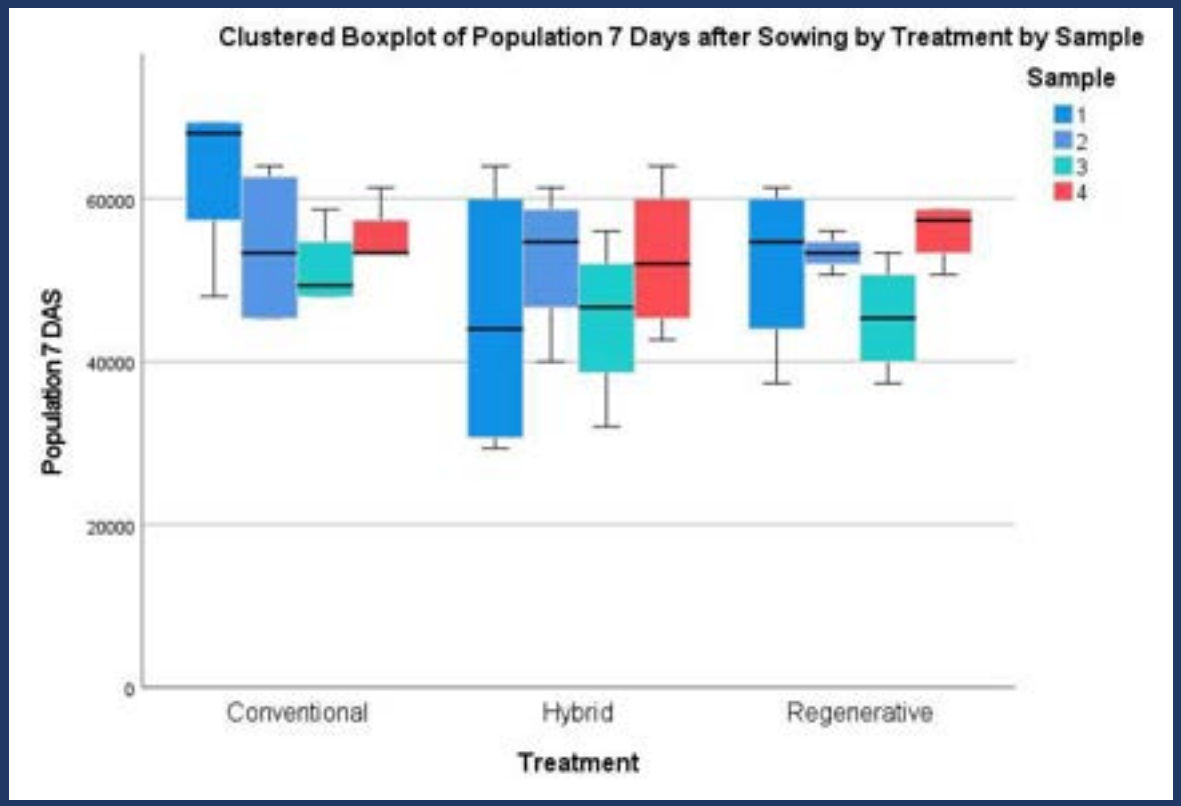

Year 1- McCains Sweetcorn

Planted 23rd December 2022

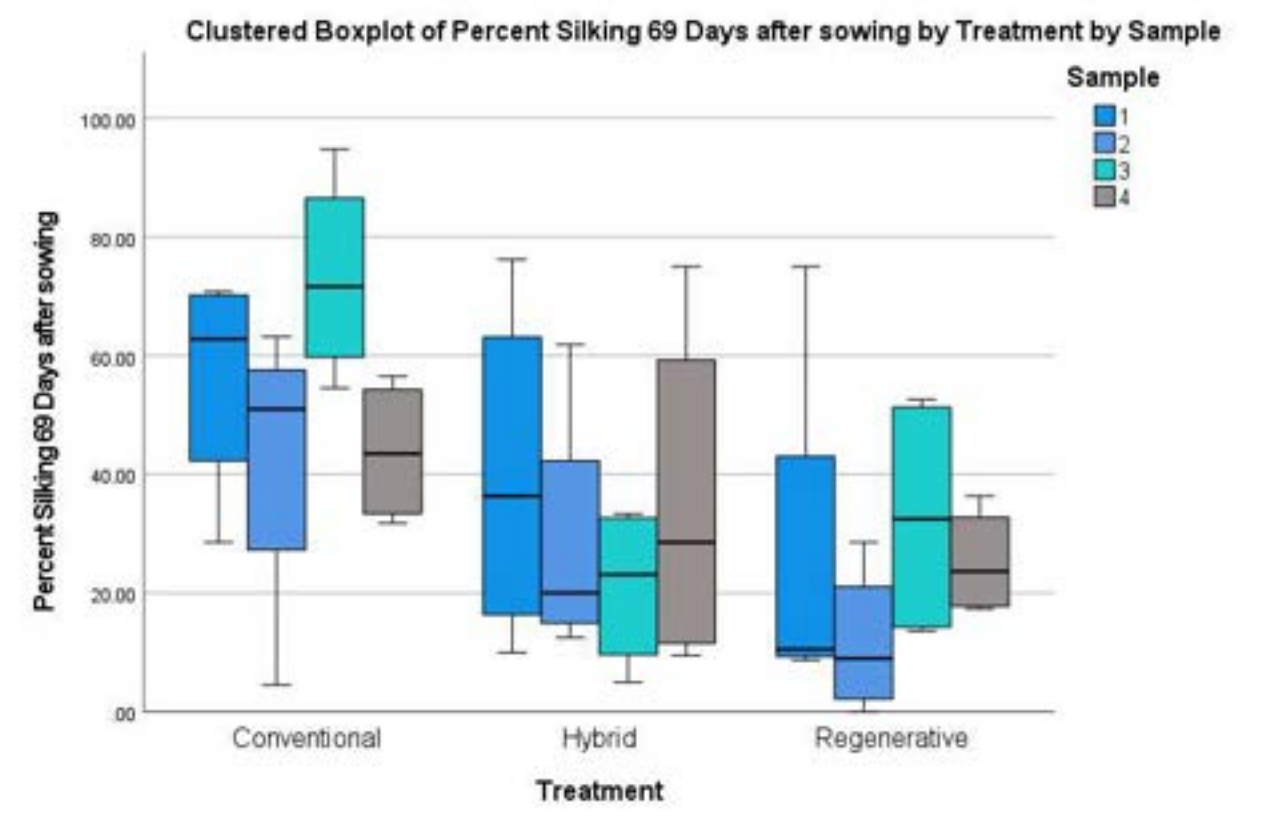


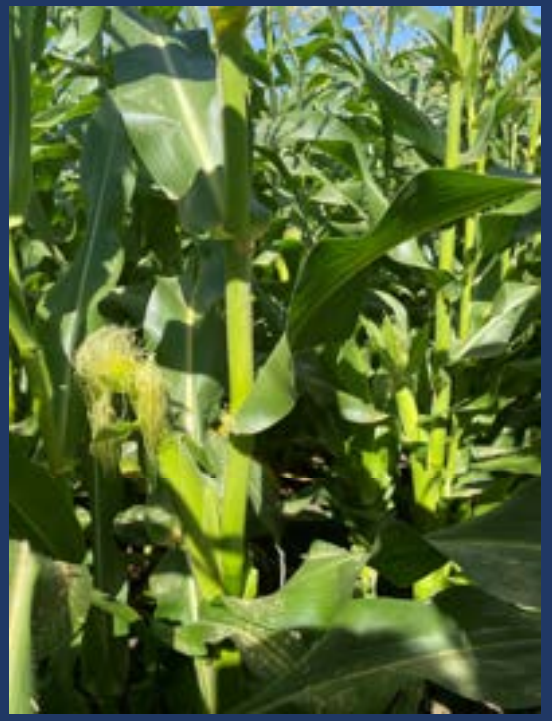




Germination



Silking





Percent Silking 69 Days after sowing

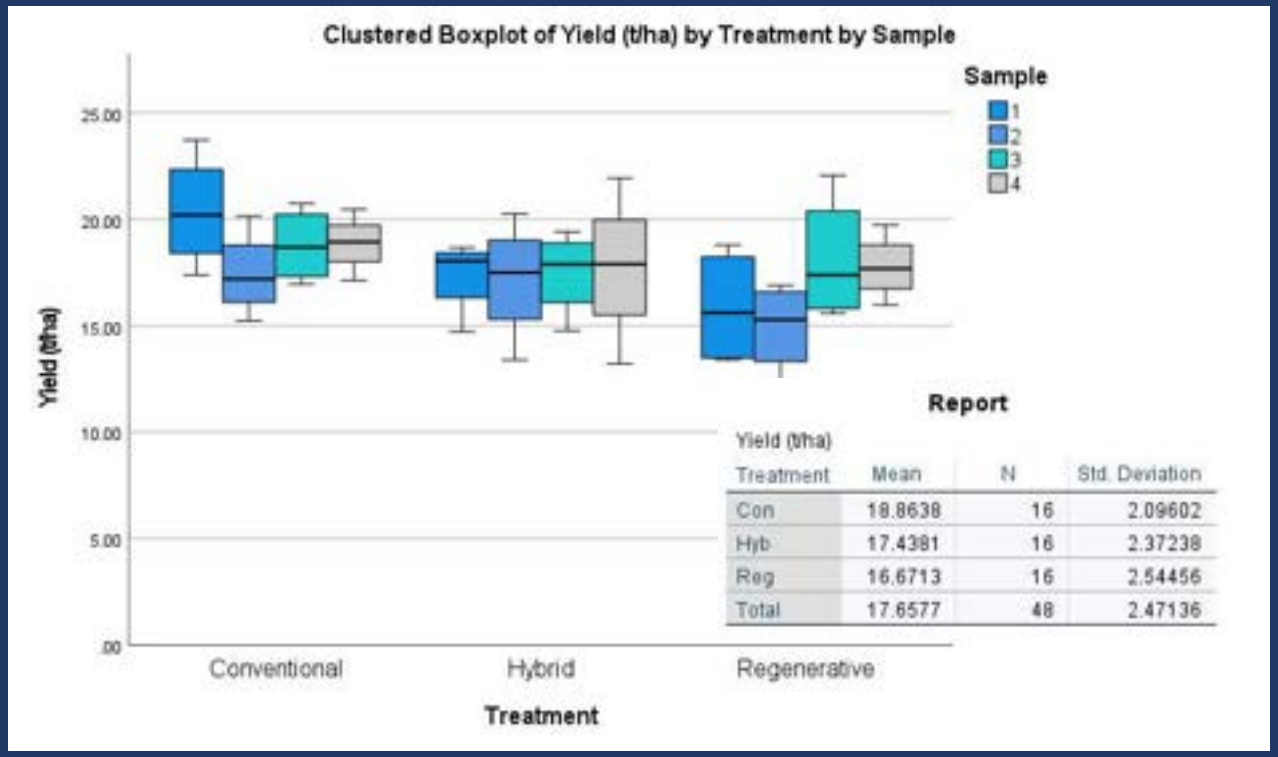
Tukey HSD[a]

Treatment	N	Subset for alpha = 0.05	
		1	2
Regenerative	16	23.9838	
Hybrid	16	31.2313	
Conventional	16		53.9106
Sig.		.619	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 16.000.

Yield



Report

Yield (t/ha)

Treatment	Mean	N	Std. Deviation
Con	18.8638	16	2.09602
Hyb	17.4381	16	2.37238
Reg	16.6713	16	2.54456
Total	17.6577	48	2.47136

Yield (t/ha)

Tukey HSD[a]

Treatment	N	Subset for alpha = 0.05	
		1	2
Regenerative	16	16.6713	
Hybrid	16	17.4381	17.4381
Conventional	16		18.8638
Sig.		.628	.209

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 16.000.

The Bottom Line

Practice	Conventional	Cost/ha	Hybrid	Cost/ha	Regenerative	Cost/ha	
Ground work	Aerator	$ 205.00	Aerator	$ 205.00	Aerator	$ 205.00	
	Strip Till	$ 180.00	Strip Till	$ 180.00	Strip Till	$ 180.00	
	Rotary Hoe	$ 219.00		$ -		$ -	
	Planting	$ 260.00	Planting	$ 260.00	Planting	$ 260.00	
Seed cost	Seed	$ 600.00	Seed	$ 600.00	Seed	$ 600.00	
Base Fert Cost	150kg lime/30kg SP90/10kg Boron	$ 52.80	150kg lime/30kg SP90/10kg Boron	$ 52.80	150kg lime/30kg SP90/10kg Boron	$ 52.80	
Spreader Cost	Cart and spread	$ 73.00	Cart and spread	$ 73.00	Cart and spread	$ 73.00	
Compost (Product)		$ -		$ -	BioRich Compost at 25m3/ha	$ 1,375.00	
Spreader Cost		$ -		$ -	Cart and spread	$ 100.00	
Nutrition (Starter)	200kg/ha Cropzeal 20N	$ 241.60	200kg/ha Cropzeal 20N	$ 241.60	150kg/ha Cropzeal 20N	$ 181.20	
Seed amendment		$ -			200gm/ha Trichoderma	$ 12.00	
Nutrition (AP 1)		$ -		$ -	BioAg Soil and Seed@ 8L/ha +	$ 84.00	
					5kg/ha soluble humates	$ 28.75	
		$ -		$ -	Application cost	$ 50.00	
Nutrition (AP 2)		$ -		$ -	BioAg Root and Shoot 3L/ha	$ 31.50	
					Calcinit 20kg/ha	$ 33.20	
		$ -		$ -	Application cost	$ 50.00	
Nutrition (Side dressing)	250kg Urea/ha	$ 245.00	200kg urea/ha	$ 196.00	100kg Urea/ha	$ 98.00	
SD Spreader cost	Application	$ 150.00	Application	$ 150.00	Application	$ 150.00	
Post Emerge Herbicide	Arietta 0.2 L/ha (Topramezone)	$ 87.48	Arietta (Topramezone) 0.2 L.ha	$ 87.48	Arietta (Topramezone) 0.2 L/ha	$ 87.48	
	Atrazine 3.0L/ha	$ 37.92	Kwickin	$ 12.00	Kwickin	$ 12.00	
	Kwickin	$ 12.00		$ -		$ -	
Insecticide	Slugbait 10kg/ha	$ 93.00	Slugbait 10kg/ha	$ 93.00	Slugbait 10kg/ha	$ 93.00	
Total Spend		$ 2,456.80		$ 2,150.88		$ 3,846.93	$ 2,746.93
Yield	18.86T	$ 5,393.96	17.44T	$ 4,987.84	16.67T	$ 4,767.62	$ 4,767.62
Gross Margin		$ 2,937.16		$ 2,836.96		$ 920.69	$ 2,020.69

** Open for interpretation

Cover Crops

- What do we grow?
- How do we manage over winter?
  - Graze?
  - Grow biomass?
- How do we terminate?
  - What is being planted next?
- Plan will evolve over next 5 years

Practice	Conventional	Hybrid	Regenerative
Post Harvest Residue Management	Mulch	Mulch	Mulch
Cover crop planted	Annual ryegrass- moata	Annual ryegrass- moata	Oats + vetch + lupins
Method of planting	Aerator + rotary hoe + roll + drill	Aerator + roll + direct drill	Aerator + roll + direct drill
Livestock	Yes	No	No
Planting fertiliser	100kg DAP/ha	100kg DAP/ha	Nil
Liquids	Nil	Nil	5kg/ha Soil and Seed
Weed control	See what weeds pop up- option to do broadleaf spray?	Nil? - option to spray out broadleaf	Nil
Other Nutrients	N application after grazing?	Nil?	300 kg Ag lime 30 kg Southern Humates raw humate 5 kg borate 5 kg Omnia soluble humic acid granules (at planting
Method of terminating cover crop	Spray out	Strip spray/mulch	Mulch
Method of planting tomatoes	Conventional transplant	Conventional transplant	Mulchtec Planter?

Looking ahead- Tomatoes

- Planning to plant early November
- Harvest= 135 days
- Target approx. 100T paid yield
- What does management look like for each treatment?
  - Weed/pest/disease management
  - Cultivation
  - Nutrient management
  - Next years cover crop

Looking ahead- MulchTec Planter

Questions?