Cover Crop Demo 2020

Cover Crop Demo 2020

Site prepared February 12,2020 and sown by hand, and raked in on February 13,2020.

An area of compaction, covering ¼ of the length of each plot, was created by tractor trafficking back and forth.



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Cover Crop Demo 2020

Six cover crop demonstration plots were established, based on example needs/scenarios for cover crops. These were:

1 Nematode Suppression

2 Feed Production

3 Weed Suppression

4 Soil Conditioning

5 Pathogen Control

6 Nitrogen Fixation

Cover Crop Demo 2020

Over the course of two months, the growth of these covers was recorded visually, in order to demonstrate growth rates, plant characteristics and root architecture for cover mixes that target specific objectives.

Site conditions over the two months provided exceptional autumn growth with mild temperatures and above annual rainfall.

Brassica's were very quick to germinate, along with the lupins.

Most of the larger legume seeds were late to germinate, most likely attributed to the hand sowing and raking in of seed, which did not provide the ideal sowing depth and 'seed to soil' contact that was required.

Trafficking prior to sowing did impact on germination and crop performance for most cover crop mixes. The soil conditioning blend performed the best under these circumstances, most likely due to their ability to push strong tap roots down through compacted soils.

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1. Nematode Control

Nemat (*Eruca sativa)*

Terranova White Oil Seed Radish (*Raphinus sativa)*


Feb 20,
March 12,
March 23,
April 7 2020
April 22 2020
1. Nematode Control
1. Nematode Control

Four weeks growth - March 12, 2020

Nemat:
This biofumigant is a nematode catch crop with dual action - root exudates attract pest nematodes & suppresses reproduction or kills nematodes within roots, then secondary kill can be achieved upon maceration.

Terranova white oilseed radish:
This is a fantastic all purpose biofumigant. Good at suppressing a wide range of diseases and resistant to Root Knot and Root Lesion nematodes.

These biofumigants can be planted on their own, or as a mix to help supress nematodes. Planted as a mix, the soil benefits from differing root architectures and exudates that assist with improving soil structure and overall soil biology.

Nemat when grown in a mix typically presents as an ‘understory’ plant, being much smaller in growth. When sown as a monoculture, Nemat growth is very strong with greatly increased tap root growth.

No Traffic

April 7 2020

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No Traffic

April 22 2020

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2. Feed Production

Tama Rye Grass (*Lolium multiflorum)*
Pasja Leafy Turnip (*Brassica napus* x *Brassica* oleracea*)*
Tonic Plantain *(Plantago lanceolate)*
Tucana Forage Oat *(Avena sativa)*


Feb 20,
March 12,
March 23,
April 7,
April 22,
2. Feed Production

Four weeks growth - March 12, 2020

Tucana Forage Oats:
Large broad leaf oat for grazing, hay & silage. Mid to late flowering, multiple grazings, suitable for mix with legume, suitable for cattle and sheep.

Tama Rye:
Winter growing italian ryegrass, annual - biennial. Commonly used annual rye, but newer varieties can produce higher yields (Hogan >1TDM/ha over Tama)

Pasja Leafy Turnip:
Fast establishing forage brassica offering multiple grazings. High DM yields, minimal bolting for Pasja2. Suitable for all cattle and sheep.

Tonic Plantain:
Mineral rich perennial grazing herb. Year round production, good cool season growth. Deep root system, assists soil conditioning and drought hardiness.

These crop varieties were chosen in the feed production mix as examples that are commonly grown in the region that would provide good growth, multiple grazings and would be suitable for both sheep and cattle.
In this instance, the oats and rye grass outcompeted the plantain, which from the beginning was much slower to germinate.
The Pasja leafy turnip did not germinate at all. This is most likely attributable to old seed with poor germ. A good lesson to learn – always check the viability of your seed if you have had it lying around for a long time, or stored inappropriately.

No Traffic

April 7 2020

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No Traffic

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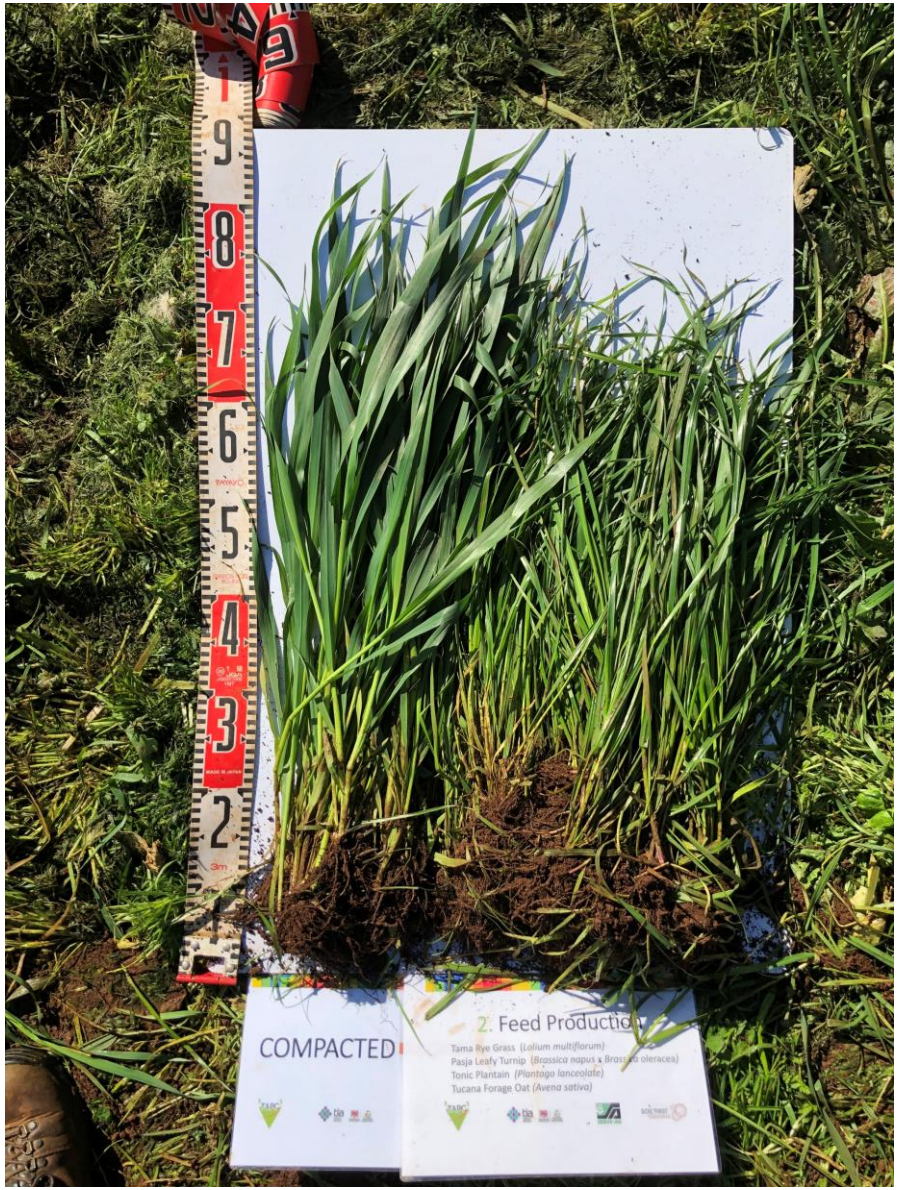
April 22 2020



3. Weed Suppression

Nemat (*Eruca sativa)*
Caliente 199 (*Brassica juncea)*
Saia Oats *(Avena strigosa)*
Buckwheat *(Fagopyrum esculentum)*


Feb 20,


March 12,
3. Weed Suppression


March 23,


April 7
3. Weed Suppression


April 22
3. Weed Suppression

Saia Oats:
Fast establishing oat, fine stemmed, suitable for grazing, hay and silage. Good regrowth following grazing. Tolerates acid soils and is allelopathic assisting with weed suppression.

Buckwheat:
Fast establishing grain that suppresses weeds, attracts insects, and helps to release P bound in soils. Improves top soil tilth and fertility. Allelopathic, breaks down quickly, fast release of nutrients. Good quick summer crop to replace bare fallow. Sets seed very quickly. Best mown 2 weeks prior to flowering. Can thrive in cooler climates.

Caliente 199:
Fast establishing biofumigant brassica very high in specific glucosinolates. Rapid growth suppresses weeds, & production of ITC's upon maceration assists with killing soft seeded weed seed.

Nemat:
Nematode catch crop - dual action - root exudates attract pest nematodes & suppresses reproduction or kills nematodes within roots, then secondary kill upon maceration.

No Traffic

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No Traffic

April 22 2020

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4. Soil Conditioning

Tillage Root Max Rye grass (*Lolium sp)*
Tillage Radish (*Raphinus sativus*)
Blue Lupins *(Lupinus consentinii)*


Feb 20,


March 12,


March 23,


April 7
4. Soil Conditioning


April 22
4. Soil Conditioning

Tillage radish:
Large tuber and tap root. Fast establishment, first grazing in 5 - 6 weeks. 2 - 3 grazings possible before maturity. Suitable for all cattle and sheep. Drought hardy.

Tillage root max (rye):
Highly palatable variety of rye grass, bred specifically for deep fibrous root system. Late maturity, densely tillered diploid.

Blue Lupins:
Deep tap-rooted legume. Helps to free P bound to soils. High protein feed source, but seeds are hard and can therefore cause weed issues.

Tillage radish and tillage root max are well paired for a cover crop, with their differing root architectures, large deep tap root and fibrous system, complimenting the improvement of soil health. Blue lupins can have an equally strong healthy tap root, assisting with soil structure and nutrition.
In this mix, the tillage radish outcompeted the rootmax rye and lupins to a large degree, but was the one cover crop that overcome the compaction caused from trafficking.

No Traffic

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5. Disease Suppression

Nemat (*Eruca sativa)*
Caliente 199 *(Brassica juncea)*
Cereal Rye *(Secale cereale)*


Feb 20,
March 12,
March 23,
April 7
April 22
5. Disease Suppression
Nemat (Eruca sativa)
Caliente 199 (Brassica juncea)
Cereal Rye (Secale cereale)

Caliente199:
Fast establishing biofumigant brassica very high in specific glucosinolates. Rapid growth suppresses weeds, production of ITC's upon maceration suppresses many diseases. Can host Root Lesion nematodes, and be susceptible to sclerotinia if macerated post flower drop. Can host club root.

Nemat:
Nematode catch crop - dual action - root exudates attract pest nematodes & suppresses reproduction or kills nematodes within roots, then secondary kill upon maceration. Can host club root.

Cereal Rye (Ryecorn):
A versatile winter hardy cover crop. Early maturing, scavenges nutrients (N & K), suppresses weeds, green manure, hay or silage, good winter or spring grazing. Reduces pest insects, Root Knot Nematode, and is less susceptible to disease than any other cereal. Cereal rye mulch has reduced disease in some cropping rotations.

These three varieties are examples of cover crops that can be grown to help suppress diseases, although they act in different ways. Caliente and Nemat are biofumigants, specialty cover crops bred to specifically release biocidal compounds to assist with disease suppression. For greatest efficacy they should not be mixed or ‘watered down’ with other crops. Cereal rye is a good example of a cover crop that provides great biomass and does not host most diseases, and can be established much later that biofumigants being highly tolerant of colder climatic conditions.

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6. Nitrogen Fixation

Blue Lupins *(Lupinus consentinii)*
Morgan Peas *(Pisum sativum)*
Small seeded Faba Beans *(Vicia faba)*
Morava Vetch *(Vicia Sativa)*


Feb 20,
March 12,
March 23,
April 7
6. Nitrogen Fixation
6. Nitrogen Fixation

Four weeks growth - March 12, 2020

Blue Lupins:
Deep tap-rooted legume, fixes N & helps to free P bound to soils. High protein feed source, but seeds are hard and can therefore cause weed issues.

Tic Beans:
Nitrogen fixing, tolerates acid and waterlogged soils better than most legumes. Vigorous early growth helps to suppress weeds. Decreases take-all and CCN, so good cover prior to cereals.

Morgan Peas:
Late flowering Dun type of field pea, N fixer. Green manure in cereal production, forage, hay or grain. Good weed suppressor, tall scrambling bulky vegetative growth.

Morava Vetch:
High performing soft seeded vetch. Fixes N. Vigorous growth, good palatability, suitable for green manure in cereal production, forage, hay . Good disease resistance.

This cover crop was very slow to germinate, but did bulk up after two months of growth, with even performance from each. Root development was strong and healthy, with good nodulation occurring. The vetch really kicked in throughout the last few weeks of growth, climbing up among the architecture of the tic beans and lupins. This cover did however perform poorly in the area of compaction caused from trafficking.

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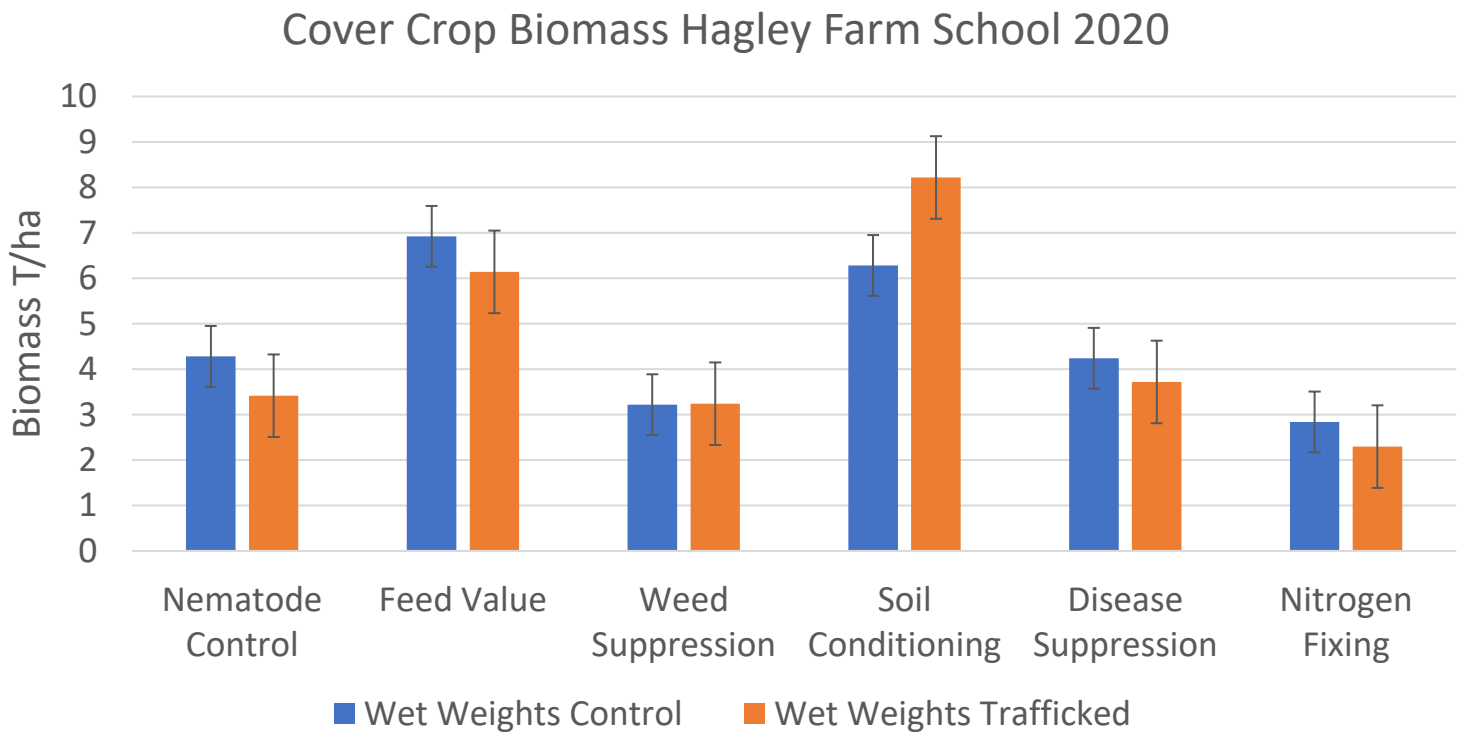
- Penetrometer measurements were taken four times along the length of each cover crop demo
- The third reading for each cover crop was taken in the area where trafficking was simulated
- Trafficking was undertaken when soils were very dry, therefore minimal compaction would have occurred compared to trafficking undertaken on wet soils
- The colour coding on the chart, green through to red, indicates minimal resistance to penetration through to greatest resistance where plant roots will struggle to push their roots down
- Trafficking under dry conditions still impacted on the growth of crops, particularly on the larger seeded covers, where seed depth at sowing was not achieved

	Depth →	0	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25	27.5	30	32.5	35	37.5	40	42.5	45
Nematode Control	1	316	632	912	912	807	1895	2491	2140	2632	2807	2140	2632	2983	35					
	2	140	175	246	351	632	4035	4000	3930	3930	3720	3544	4176	3439	4281					
		561	632	912	1018	1790	3018	2702	3474											
	4	175	246	456	632	1755	2281	2035	3088	4000										
Feed Production	5	105	140	526	737	983	2316	2772	3193	4106	3263									
	6	386	211	667	2316	3018	2983	2912	3088	3965	1333									
		175	597	912	912	947	1965	2842	3193	3404	4106	3649	4316							
	8	175	175	105	211	246	1053	2562	3228	4281										
Weed Suppression	9	140	211	456	561	1123	1965	3544	3263	3158										
	10	246	246	1544	1755	1579	1719	2351	2807	3298	2912									
		316	702	632	667	1404	1579	2246	2772	3614										
	12	175	281	386	316	316	316	386	983	2842	3895	3755	4070							
Soil Conditioning	13	105	175	281	491	772	807	912	1930	2597	2912	2702	3123							
	14	105	105	211	246	386	1404	2246	2176	3579	4035	2246								
		175	456	877	877	1053	1158	1509	2421	3684										
	16	35	105	246	351	1018	1790	2597												
Disease Suppression	17	35	35	105	246	491	1474	1965	2491	2877	3158	4106								
	18	105	175	281	491	772	1228	3544	4562	4141	4421	4597								
		140	281	947	912	947	1860	2807	2772	2807	3614									
	20	35	35	351	351	105	105	2035	2176	2632	2877	2491	2807	3158						
Nitrogen Fixation	21	70	211	246	281	281	1193	1544	1333	1298	1895	2912	3228	4000	4702					
	22	140	140	246	456	912	1509	2281	2842	3509	2386									
		351	877	1088	1158	1509	2702	3404	3263	4035	3579									
	24	70	105	175	351	351	983	2035	3123	3579	4492									
Grazed Turnips		70	105	316	597	1088	2211	2597	3544	3860										

Penetrometer measurements

As a rule of thumb, measurements greater than 2000KPa indicates an upper level of compaction to which plant root penetration is impeded. Across the plots an average root zone depth of 15cm was where most resistance above 2000KPa occurred.

Trafficking & Compaction



After two months of growth, all plant material, above and below ground, was removed from 0.5m square plots from trafficked and non-trafficked areas. Wet weights were recorded for each, along with general plant heights, and biomass per hectare then calculated. From wet weights and plant heights measured for most cover mixes, there was improved plant growth and associated more biomass where trafficking did not occur. The soil conditioning cover was the exception, with increased weights mostly attributable to strong growth of tap roots.

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