

Kiewa Carbon Bash

Farm Demonstrations & Carbon Blitz Sub-Projects

Final Report

Oct 2022

Prepared for Kiewa Catchment Landcare Inc. by Soil Land Food P/L

Soil Land Food is an independent consultancy specialising in ecological agriculture, soils, agroecology, rural landscapes, food systems and rural extension.

Table of Contents

Project Summary	3
Farm Demonstrations.....	4
Farm 1	4
Summary.....	4
Treatments.....	5
Soil Health - Field Assessment**^	5
Soil Health and Fertility - Test Results - Feb 2022	6
Soil DNA Test Results	6
Farm 2	7
Summary.....	7
Treatments.....	8
Soil Health - Field Monitoring**^	8
Soil Health and Fertility - Test Results - Feb 2022	9
Soil DNA Test Results	9
Farm 3	10
Summary.....	10
Treatments.....	11
Soil Health - Field Monitoring**^	11
Soil Health and Fertility - Test Results - Feb 2022	12
Soil DNA Test Results	12
Farm 4	13
Summary.....	13
Treatments.....	14
Soil Health - Field Monitoring**^	14
Soil Health and Fertility - Test Results - Feb 2022	15
Soil DNA Test Results	15
Farm 4 - Pasture & Grazing Monitoring.....	16
Kiewa Carbon Blitz.....	18
Results.....	18

Project Summary

The *Kiewa Carbon Bash* included a *Farm Demonstration* sub-project and a *Carbon Blitz* sub-project. For the Farm Demonstration Project, four demonstration sites were chosen to highlight various Eligible Management Activities that can be used in soil carbon projects. The host farmers chose relevant activities to showcase on their property. Soil monitoring occurred on the four sites. Pasture monitoring also occurred on Farm 4 where a grazing demonstration was conducted.

Due to the short 6 month duration of the project no significant change in soil properties was expected at each site although some change in soil and pasture response may have occurred. The demonstration was intended to act as a learning and engagement tool for local landholders. Because of very wet seasonal conditions no significant changes were seen at three of the four demonstrations. However at the grazing site some influence of the changed grazing practice was noted with the pasture composition and pasture growth improved under the relative higher density planned grazing treatment.



The Carbon Blitz was conducted across the valley. Soil samples were taken from 29 sites to measure soil organic carbon at the 0-10cm depth. This helped landholders to understand the factors that lead to carbon sequestration and the factors that lead to carbon losses from top soils. The soil organic carbon results from 1.8 % Soil Organic Carbon to 8.2% Soil Organic Carbon. A number of factors influenced the level of carbon found at each site. These included soil type, landscape position, vegetation and management history.

Farm Demonstrations

Farm 1

Name: Stuart Crosswaithe

Property Size: 290 hectares

Location: Kergunyah South

Enterprise: Dairy

Summary

This farm demonstration showed some eligible management activities that can be used as part of a soil carbon project under the Commonwealth Government's Emission Reduction Fund.

This demonstration had four trial plots (each approximately one hectare) comparing various farm practices (Treatments 1, 2 and 3) against current management (control). All sites are on a similar soil type on a common landform element. All plots have a similar management history.



This demonstration site is a pasture paddock that forms part of the milking platform for a dairy farm. The landholder looked at the effect of compost and gypsum for improving soil health and soil carbon levels. Compost was trialled at two rates to see whether it can improve soil health and potentially help increase soil carbon levels.

Treatments

Treatments	Paddock	Description
Grazing	35	Grazing with the dairy herd as per current rotation
Grazing + Gypsum + Compost - Light rate	36	Grazing + Gypsum + Compost applied at 10 tonnes/hectare
Grazing + Compost - Heavy rate	37	Grazing + Gypsum + Compost applied at 30 tonnes/hectare

Soil Health - Field Assessment^{*^}

Feb & Oct 2022

Paddock	35		36		37		41	
Indicator	Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct
Topsoil Depth (cm)	7.5	8.5	8.25	8.25	8.75	8	6	-
Water Infiltration (mm/hr)	-	225	50	175	300	175	600	-
pH (1:5 w)	6	6.5	6.5	6.9	6.75	6.5	6.25	-
Slaking (0-3)	2.6	2.75	2.75	2.75	2.3	2.75	2.6	-
Groundcover (%)	85	95	95	100	90	100	65	-
Earthworm Count	3	2	4	3	15	2	0	-

*These are averages of 4 measurements taken in each paddock.

[^] Due to extreme wet and flooding conditions of the spring 2022 La Nina season field assessment could not be conducted on many paddocks in Oct 22.

Soil Health and Fertility - Test Results - Feb 2022

Soil Type

Texture	Medium Clay
CEC	15
Totals	
Calcium	2702
Phosphorous	685
Sulphur	497

Soil Health

	Sample Depth	
	0-10cm	10-30cm
Carbon	4.5	3
C:N Ratio	10 to 1	-
pH (CaCl)	5.2	5.9
ex.Aluminium	0.39	-

Soil Fertility

Available P (Colwell)	74
Available S (KCl)	23
Total N (LECO)	0.45

Soil DNA Test Results

Metagen Lab May 2022

Paddock	35	37
Indicator*		
Bacterial Diversity	8.2	1.5
Fungal diversity	72.7	74.7
Mesofauna Diversity	56	51
Overall Soil Health	22	95

*Scale is 0 - 100

Farm 2

Name: Scott and Belinda McKillop

Property Size: 387 hectares

Location: Dederang

Enterprise: Dairy

Summary

This farm demonstration shows some eligible management activities that can be used as part of a soil carbon project under the Commonwealth Government's Emission Reduction Fund.

This demonstration has three demo plots (each approximately one hectare) comparing various farm practices (Treatments 1 and 2) against current management (control). All sites are on a similar soil type on a common landform element. All plots have a similar management history.



The demonstration site is a pasture paddock that forms part of the milking platform for a dairy farm. The landholder looked at the effect of gypsum on improving soil health and soil carbon levels. A biological product (worm liquid Nutrisoil) was also applied besides the gypsum to see whether it might enhance soil health improvement and potentially increase soil carbon.

Treatments

Treatments	Paddock	Description
Grazing	26	Grazing with the dairy herd as per usual rotation
Grazing + Gypsum	20(d)	Grazing + gypsum applied at 3 tonnes /hectare in Feb 2022.
Grazing + Gypsum + Biological (Nutrisoil)	20 (c)	Grazing + gypsum (3t/ha) applied in Feb 2022 + biological treatment (3-5 L/ha) applied to pasture after grazing event in late summer/early autumn.

Soil Health - Field Monitoring^{*^}

Feb & Oct 2022

Paddock	20c		20d		26	
Indicator	Feb	Oct	Feb	Oct	Feb	Oct
Topsoil Depth (cm)	7.5	-	8	-	7.75	-
Water Infiltration (mm/hr)	175	-	500	-	475	-
pH (1:5 w)	6.2	6.4	6	6.5	6.25	6.25
Slaking (0-3)	2	2.25	2.25	2.75	2.5	2.4
Groundcover (%)	90	85	100	90	90	85
Earthworm Count	8	-	2	-	1	-

*These are averages of 4 measurements taken in each paddock.

[^] Due to extreme wet and flooding condition of the spring 22 La Nina season field assessment could not be conducted on many paddocks in Oct 22.

Soil Health and Fertility - Test Results - Feb 2022

Soil Type

Texture	Sandy Clay Loam
CEC	13
Totals	
Calcium	1752
Phosphorous	748
Sulphur	321

Soil Health

	Sample Depth	
	0-10cm	10-30cm
Carbon	3.2	1
C:N Ratio	11 to 1	-
pH (CaCl)	6	6.0
ex.Aluminium	0.09	-

Soil Fertility

Available P (Colwell)	129
Available S (KCl)	9.7
Total N (LECO)	0.28

Soil DNA Test Results

Metagen Lab May 2022

Paddock	26	20c
Indicator*		
Bacterial Diversity	16.6	20.7
Fungal diversity	67	74
Mesofauna	21	16
Overall Soil Health	17	19

*Scale is 0 - 100

Farm 3

Name: Trent Taylor

Property Size: 88 Hectares

Location: Staghorn Flat

Enterprise: Regenerative Grazing

Summary

This farm demonstration showed some eligible management activities that can be used as part of a soil carbon project under the Commonwealth Government's Emission Reduction Fund. The demonstration had three plots (each approximately one hectare) comparing various farm practices (Treatments 1 and 2) against current management (control). All sites were on a similar soil type on a common landform element. All plots had a similar management history.



This site is a pasture paddock that forms part of the grazing paddock for a mixed regenerative property with beef cattle. Trent looked at the effect of ripping and increased plant diversity in improving soil health and soil carbon levels. A multi-species pasture mix was used to increase plant diversity. A Yeoman's plough was used to rip.

Treatments

Treatment	Paddock	Description
Grazing	Central	Grazing with the beef herd as per usual rotation
Grazing + Multi-species	North	Grazing + a deep soil rip at appropriate moisture content before autumn 2022
Grazing + Ripping + Multi-species	South	Grazing + deep soil rip + a cool season multi-species pasture mix to be direct drilled in early autumn.

Soil Health - Field Monitoring^{*^}

Feb & Oct 2022

Paddock	North		Central		South	
Indicator	Feb	Oct	Feb	Oct	Feb	Oct
Topsoil Depth (cm)	8	-	9.25	-	8.5	-
Water Infiltration (mm/hr)	130	-	155	-	125	-
pH (1:5 w)	6	-	6	-	6.25	-
Slaking (0-3)	3	-	2.8	-	3	-
Groundcover	100	-	100	-	100	-
Earthworm Count	13	-	11	-	15	-

*These are averages of 4 measurements taken in each paddock.

[^] Due to extreme wet and flooding condition of the spring 22 La Nina season field assessment could not be conducted on many paddocks in Oct 22.

Soil Health and Fertility - Test Results - Feb 2022

Soil Type

Texture	Sandy Clay Loam
CEC	4.4
Totals	
Calcium	731
Phosphorous	271
Sulphur	189

Soil Health

	Sample Depth	
	0-10cm	10-30cm
Carbon	2.5	0.47
C:N Ratio	14 to 1	-
pH (CaCl)	5.0	5.1
ex.Aluminium	10	-

Soil Fertility

Available P (Colwell)	31
Available S (KCL)	4.5
Total N (LECO)	0.17

Soil DNA Test Results

Metagen Lab May 2022

Paddock	North	Central
Indicator*		
Bacterial Diversity	13.5	1.8
Fungal Diversity	29	67
Mesofauna	48	44
Overall Soil Health	3	17

*Scale is 0 - 100

Farm 4

Name: Jess & Toby Brain

Property Size: 24 hectares

Location: Tangambalanga

Enterprise: Grazing - sheep

Summary

This farm demonstration showed some eligible management activities that can be used as part of a soil carbon project under the Commonwealth Government's Emission Reduction Fund. The demonstration had four plots (each less than one hectare) comparing different grazing tactics (Treatments 1, 2 and 3) against no grazing (Control). All sites were on a similar soil type on adjoining landform elements. All plots had a similar management history.



This demonstration site was a pasture paddock that forms part of a rural lifestyle property with sheep. The landholders wanted to look at the effect of grazing intensity and duration on improving soil health and soil carbon levels. Four paddocks were used to control grazing. Detailed pasture and grazing records were kept during this demonstration.

Treatments

Treatments	Paddock	Description
Nil Grazing	1	No sheep. Native herbivore impact only.
Planned Grazing - high stock density	2a	Planned Rotational Grazing at a relatively high stocking rate. 243 DSE / hectare. Maintaining a minimum herbage mass of 1800kg/hectare all year round.
Planned Grazing - low stock density	2b	Planned Rotational Grazing at a relatively low stocking rate. 114 DSE / hectare. Maintaining a minimum herbage mass of 1800kg/hectare all year round.
Planned Grazing - low stock density	3	Planned Rotational Grazing at a relatively low stocking rate. 119 DSE / hectare. Maintaining a minimum herbage mass of 1800kg/hectare all year round.

Soil Health - Field Monitoring^{*^}

Feb & Oct 2022

Paddock	1		2a		2b		3	
Indicator	Feb	Oct	Feb	Oct	Feb	Oct	Feb	Oct
Topsoil Depth (cm)	5.1	8.25	7.5	8			7	8.5
Water Infiltration (mm/hr)	450	112	212.5	150			550	133
pH (1:5 w)	6.2	6.1	6.2	5.75			6	6.1
Slaking (0-3)	3	2.6	2.4	2.4			2.75	2.75
Groundcover	95	100	100	-			100	-
Earthworm Count	12	1	0	0			6	9

*These are averages of 4 measurements taken in each paddock.

[^] Due to extreme wet and flooding condition of the spring 22 La Nina season field assessment could not be conducted on many paddocks in Oct 22.

Soil Health and Fertility - Test Results - Feb 2022

Soil Type

Texture	Sandy Clay Loam
CEC	4.9
Totals	
Calcium	796
Phosphorous	250
Sulphur	195

Soil Health

	Sample Depth	
	0-10cm	10-30cm
Carbon	2.4	0.52
C:N Ratio	13 to 1	-
pH (CaCl)	5.2	5
ex.Aluminium	4.5	-

Soil Fertility

Available P (Colwell)	28
Available S (KCL)	2.4
Total N (LECO)	0.19

Soil DNA Test Results

Metagen Lab May 2022

Paddock	1	3
Indicator*		
Bacterial Diversity	2.3	18
Fungal Diversity	58	57
Mesofauna	77	24
Overall Soil Health	11	13

*Scale is 0 - 100

Farm 4 - Pasture & Grazing Monitoring

Approximately 45 dorper sheep were used as part of the farm's paddock demonstration. Pastures and stock movements were monitored every fortnight. Notes were taken of field conditions, pasture composition and animal feeding behaviour during the project. The key variables of grazing management recorded were:

- **Feed Grown** - how much pasture was available in a period
- **Feed Demand** - how many animals needed to be fed in the period
- **Utilisation Rate** - how much pasture the animals consumed during a grazing event
- **Residual Pasture** - how much pasture remained after a grazing period
- **Recovery Period** - how long pasture was left to recover after a grazing event
- **Stock Density** - how many animals were grazed per hectare in any given grazing event

Paddock Details

Paddock	Size (Ha.)	Treatment
1	0.62	Control
2a	0.24	High Density
2b	0.51	Low Density
3	0.48	Low Density

Grazing Records

		Paddock			
		1	2a	2b	3
	Units				
Area	Ha	0.62	0.24	0.51	0.48
Start Date		6-4-22	6-4-22	6-4-22	6-4-22
End Date		18-8-22	18-8-22	18-8-22	18-8-22
Duration	Days	133	133	133	133
Period Rainfall	mm	209	209	209	209
Pasture at Start	kg DM/Ha	1500	2000	2000	2250
Pasture at End	kg DM/Ha	3750	3600	2550	3300
Resilience Base	kg DM/Ha	1800	1800	1800	1800
Days Grazed	Days	0	4	4	4.5
DSE Days Grazed	DSE Days	0	234	234	237
Stock Density	DSE/Ha	0	243	114	119

Calculations

	Paddock				
		1	2a	2b	3
DM consumed	kg DM	0	972	456	535.5
Total Pasture Grown	kg DM/Ha	2250	2572	1006	1585.5
Pasture Growth Rate	kg DM/Day/Ha	16.9	19.3	7.5	12

Pasture Conditions - Start & Finish

Paddock 1

Date	Pasture Height	Herbage Mass	Gound Cover	Dry Matter	Green Matter
	cm	kg DM/Ha	%	%	%
6-4-22	6	1500	80	50	50
18-8-22	12.5	3750	100	10	90

Paddock 2a

Date	Pasture Height	Herbage Mass	Gound Cover	Dry Matter	Green Matter
	cm	kg DM/Ha	%	%	%
6-4-22	8	2000	90	80	20
18-8-22	12	3600	95	25	75

Paddock 2b

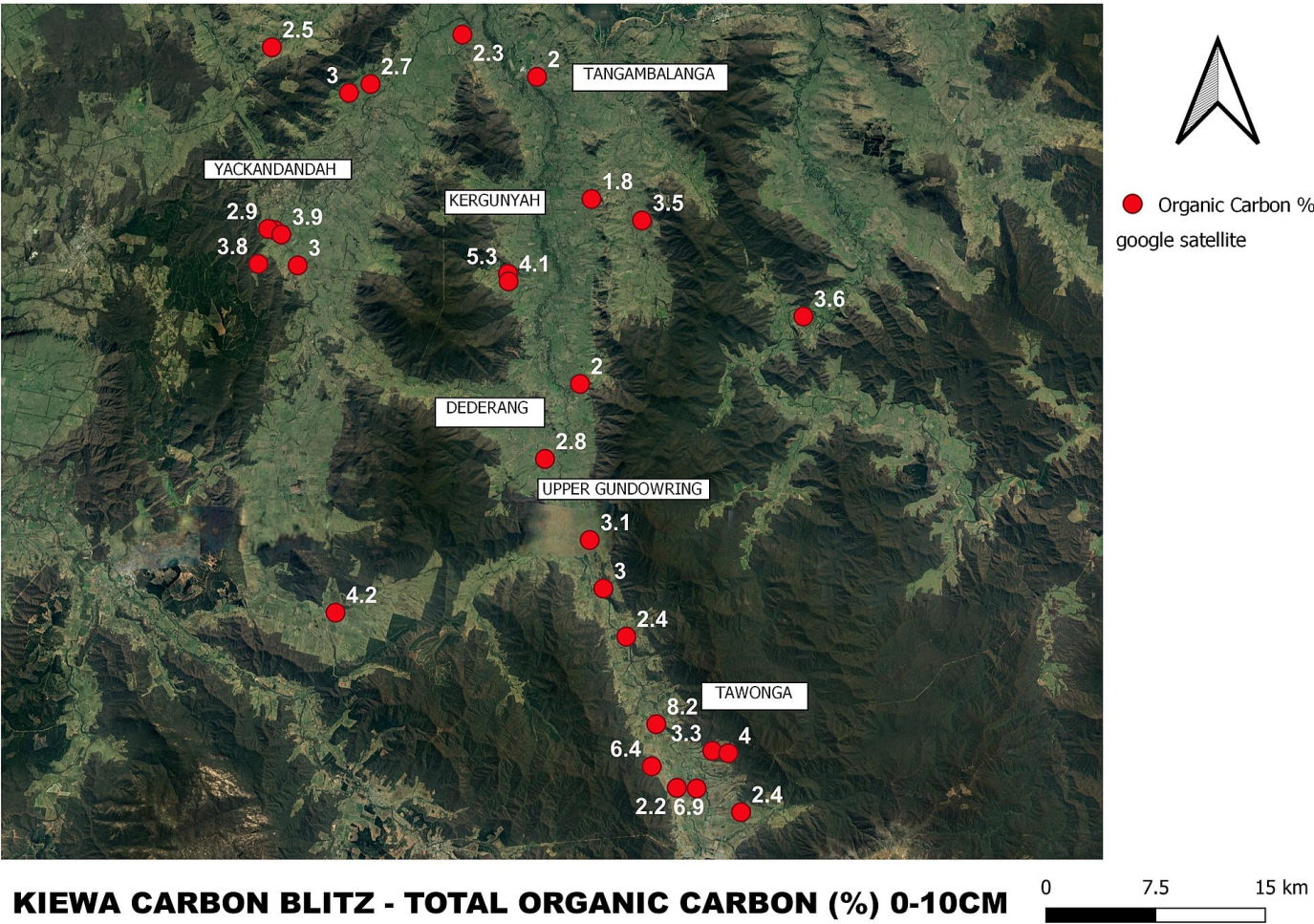
Date	Pasture Height	Herbage Mass	Gound Cover	Dry Matter	Green Matter
	cm	kg DM/Ha	%	%	%
6-4-22	8	2000	85	70	30
18-8-22	8.5	2550	95	15	85

Paddock 3

Date	Pasture Height	Herbage Mass	Gound Cover	Dry Matter	Green Matter
	cm	kg DM/Ha	%	%	%
6-4-22	9	2250	95	70	30
18-8-22	11	3300	100	15	85

Kiewa Carbon Blitz

Results



Soil Test Results: 0 - 10cm depth

Sample ID	Location	Total Organic Carbon (%)	pH	Total Nitrogen (%)
1	Gundowring	1.8	5.9	0.17
2	Talgarno*	1.9	6.4	0.19
3	Tangambalanga	2.0	5.4	0.19
4	Gundowring	2.0	6.2	0.18
5	Tawonga	2.2	4.6	0.21
6	Staghorn Flat	2.3	6.1	0.21
7	Mongans Bridge	2.4	6.0	0.23
8	Tawonga	2.4	5.6	0.23
9	Yackandandah	2.5	5.6	0.23
10	Allans Flat	2.7	5.2	0.26
11	Dederang	2.8	5.0	0.27
12	Yackandandah	2.9	5.1	0.27
13	Allans Flat	3.0	5.0	0.26
14	Yackandandah	3.0	6.1	0.26
15	Upper Gundowring	3.0	6.0	0.25
16	Upper Gundowring	3.1	6.1	0.30
17	Tawonga	3.3	5.2	0.25
18	Sandy Creek	3.5	5.0	0.29
19	Tallandoon*	3.6	6.6	0.33
20	Yackandandah	3.8	5.3	0.30
21	Yackandandah	3.9	4.6	0.33
22	Tawonga	4.0	5.0	0.31
23	Kergunyah	4.1	5.0	0.32
24	Rosewhite*	4.2	5.1	0.35
25	Yackandandah	4.5	5.8	0.42
26	Kergunyah	5.3	4.8	0.41
27	Tawonga	6.4	5.0	0.27
28	Tawonga	6.9	5.6	0.63
29	Tawonga	8.2	4.8	0.71

**Locations outside the Kiewa Catchment Area.*

Blitz Ranges

Lowest - 1.8%

Highest - 8.2%

Median - 3.1%

Indicative Benchmarks - Total Organic Carbon - <0.5 (Very Low), 0.5-1.5 (Low), 1.5 – 2.5 (Medium), 2.5-5.0 (High), >5.0 (Very High)