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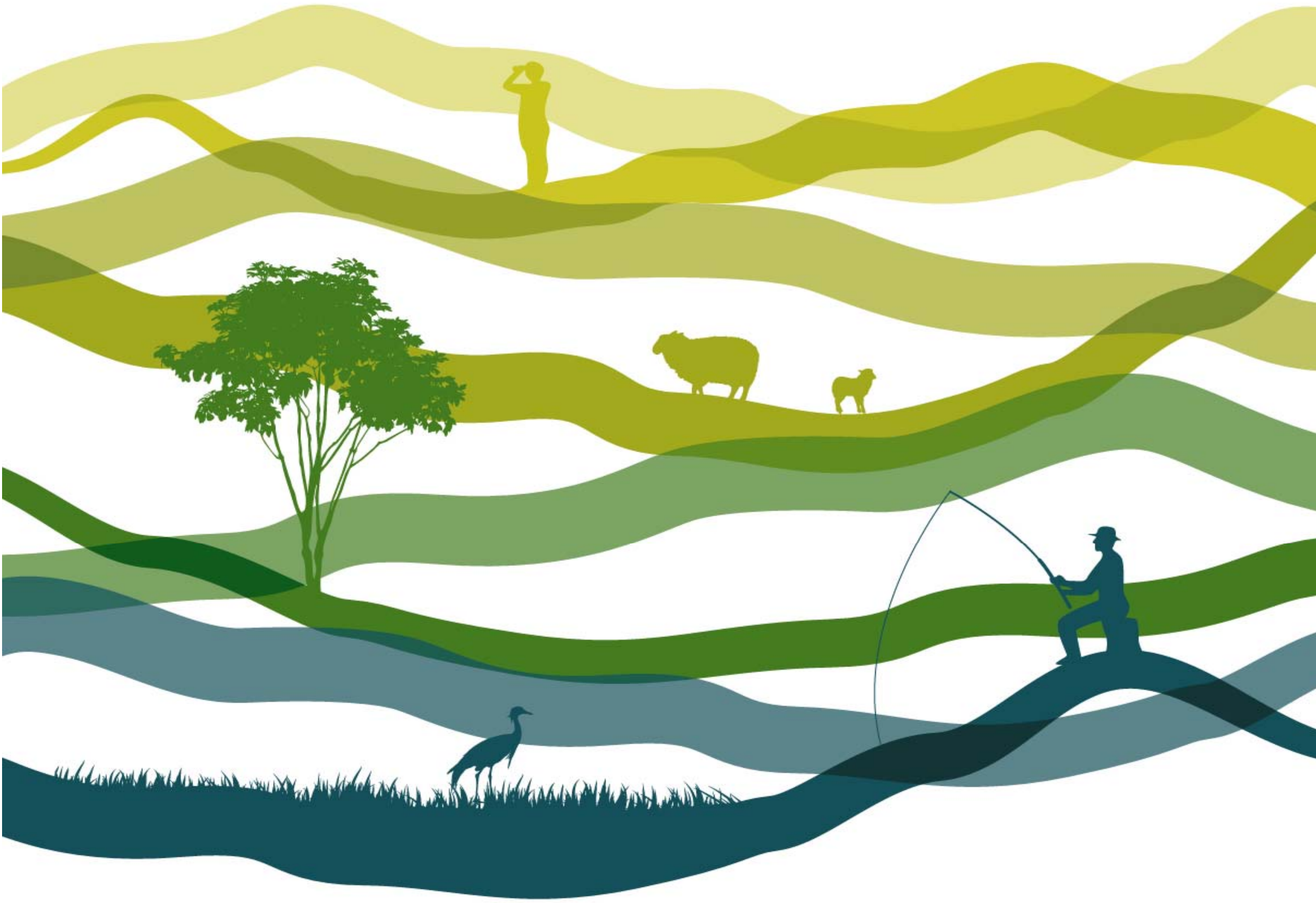
BESTWOOL BESTLAMB

GOULBURN BROKEN CATCHMENT MANAGEMENT AUTHORITY



Project Summary - Costerfield Subsoil Chicken Manure trial

This project is jointly funded through the Goulburn Broken CMA and Australian Government Funding.

Healthy, resilient and increasingly productive landscapes supporting vibrant communities.

Project:	**Costerfield Subsoil Chicken Manure trial**
	Summary prepared February 2015
Location	Costerfield, Victoria
Organisation	Soil Health Bestwool Bestlamb Group & Beyond SoilCare
Contact	Rhiannon Apted 03 5797 4408 rhiannona@gbcma.vic.gov.au
Fund source	Australian Government Natural Resource Funding
Year of demo	Funded 2013-14 to 2014-15
Objectives	• To increase crop yield by 50% for a period of 3 years. • To improve soil carbon and thereby soil water holding capacity, CEC (Cation Exchange Capacity), soil biological activity and resilience to drought periods. • To improve the water cycle to allow cropping into perennial pastures – formerly not viable in this area. Aim is to have dual season crops/growth to maximise net primary productivity.
Basis of trial	The most common soils in Victoria, Sodosols, are chemically inhospitable, hard setting in summer and waterlogged in winter, creating a significant constraint to productivity for many farmers. Plot research of subsoil manuring on a Sodosol has shown an average increase in crop production of 50% with lasting effects. The plot research was initiated on sodic clays in the Western District of Victoria. Given that large areas of the Goulburn Broken Catchment are Sodosols, this type of treatment may have great benefits for the region. This trial tests the efficacy of the practice at farm-scale. We expect it to enhance ecosystem functions vital for farm resilience to climate change by improving soil water, nutrient and carbon cycling. Subsequent improvements in soil health and water holding capacity will make available a range of management options, such as cropping into perennial systems, which were formerly not feasible for participating farmers. The farmer was inspired by a subsoil manure trial presentation by Dr Peter Sale from LaTrobe University. The farmer took some of his worst country, applied chicken manure at depth in plots and sowed a high value seed oat crop across the whole site. The aim of the seed oat crop was to re-coup the costs of the manuring [from previous trial work ca $1200/ha] quickly. Then use the paddock with its increased 'bucket size' [porosity and water holding capacity] for grazing crops and better quality pasture through a lengthened growing season. While the practice is expensive depending on cartage for the manure, with surrounding land prices at $3000+/ha, increasing the production of existing land could be a much better and cheaper option. Treatment number 4 below was included to test if the amount of manure could be reduced if humates were added.
Treatments	The trial includes three replicates of four treatments: 1. Control 2. Deep rip to 40cm 3. Deep rip chicken manure 20t/ha to 40cm 4. Deep rip chicken manure 12t/ha + 1t/ha humates to 40cm

	An additional treatment was added with two replicates: 5. Chicken manure 20t/ha surface applied and lightly worked in Plots are 40m x 100m, or 0.4ha each in size
Measurements	• Soil chemical test • Soil bulk density (see http://www.soilquality.org.au/factsheets/bulk-density-measurement) • Dry matter production kg/ha • Plant tissue test • Feed quality test
Results	*Refer to the table below for figures.* **Soil -** Baseline soil chemical and physical data were collected in October 2013. • In 2014, September soil sampling attempted to coincide with soil moisture to allow for soil cores to be taken, however, with a dry finish to winter the ground was too dry and hard to take soil bulk density cores. These will be taken in 2015. • **Yield -** In 2013 no harvest or yield data were collected as the crop failed due to poor germination, thought to be from waterlogging after sowing. • In 2014 the crop failed again after poor germination; however, in November 2014 the visual differences between the plots in volume of unsown annual rye grass was such that the farmers took pasture cuts from each treatment to verify actual difference.
Comments	After sowing in June 2013 the trial plots became waterlogged. The behaviour of the soil in the paddock outside of the trial plot area appeared to be different, with water not ponding on the surface as it was in the trial plots. There were a couple of theories about this; one, that the ripping/subsoiling disturbed the dispersive and hardsetting subsoil and allowed water in but trapped it there, not unlike a bath. Or two, that the process of subsoiling had a negative impact on the soil surface, with dispersive subsoil brought up by the subsoiling machine slumping and sealing after the rain. The surrounding paddock (no disturbance) showed less infiltration with water running off over partly capped surfaces rather than infiltrating. The successive crop failures have been discussed by the Bestwool Bestlamb group at the site, including the variety of oats sown, why the rye grass could be performing so well, and timing of sowing. In 2015, the farmer will dry sow half the trail to Saia Oats and half to perennial rye grass. Volunteer rye at the site is currently growing so well, much better than outside the plots, they decided to see how it performs ‘officially’. This demo site and the practice of subsoil manuring has generated significant further interest with other graziers. Another demonstration site (see: *Katunga demonstration trial summary*) has since been established and applications for further work by other farmers are currently in place.

From the results of the original trial work, farmers see great potential to improve their 'bucket' and increase their net primary productivity. In a pastoral system, the cost is currently prohibitive due largely to the cost of manure transport and the volume required. Local farmers are working to try to bring the costs down, including using cheaper or more locally available organic materials and using combinations of materials to bring the volume required down.

Trial site in October 2013, 3 months after treatments applied, rip lines are clearly evident. The capeweed is outside the plot area.

Taking initial loose density soil cores at the site.

This photo shows the inhospitable soil on the surface and below ground in the soil bulk density cores.

Soil results – October 2013

	topsoil 0-10cm	subsoil 10-30cm	Chicken manure	Humates
Olsen P (mg/kg)	14.6	2.3		
Phosphorus (%)			2.1	0.02
pH ($CaCl_2$)	5.6	6	6.5	3.9
ESP (%)	5.9	18.5		
Organic carbon (%)	2.71	1.17		
Total carbon (%)	3.21	1.28	29.17	54.6
Calcium	5.87 meq/100g	1.86 meq/100g	10.02%	0.69%
Magnesium	2.52 meq/100g	6.09 meq/100g	0.64%	0.27%
Soil bulk density (g/cm^3)	1.4	1.7		

Soil results – September 2014

	control 0-10cm	control 10-30cm	surface 0-10cm	surface 10-30cm	deep rip 0-10cm	deep rip 10-30cm	20t 0-10cm	20t 10-30cm	12t + humates 0-10cm	12t + humates 0-10cm
Olsen P (mg/kg)	15.1	3.5	23.5	3.5	9	1.5	22.1	9.4	10.6	4.3
pH ($CaCl_2$)	5.8	6	6.2	6	5.5	5.4	5.5	6.4	5.4	6.3
ESP (%)	4.3	15.8	4.9	20.5	6.5	19.6	6.7	15.2	6.4	17.1
Organic carbon (%)	2.85	0.86	2.6	0.67	2.72	0.76	2.43	0.98	2.7	0.65
Total carbon (%)	3.43	1.28	3.07	1.06	3.11	1.01	2.83	1.3	3.15	0.9
Calcium (meq/100g)	6.92	2.21	6.01	1.61	4.88	1.22	4.57	3.51	5.4	2.53
Magnesium (meq/100g)	2.49	5.45	2.49	6.84	2.22	6.09	2.15	7.76	2.67	7.82

Yield (pasture cuts) – November 2014

	control	surface	deep rip	20t	12t+humates
Dry matter kg/ha	3300	4730	3320	5080	4970
% extra growth	0	43%	>1%	54%	51%