



# What is Multispecies Cover Cropping?

Michael Gooden  
RCS Australia



# ACKNOWLEDGEMENTS:

- ❖ HENRY CROOK – HAIRFIELD
- ❖ STEVE SCOTT - HENTY
- ❖ COL SEIS - GULGONG



**Local Land  
Services**



Australian Government

National  
Landcare  
Program



**Regional Agriculture  
Landcare Facilitator**



**RCS**  
Transforming Agriculture



# WHAT IS A MULTISPECIES COVER CROP?



- Growing more than **one** species of plant in a crop or pasture.
- A crop that is sown with the aim of producing grain, that can be grazed, with two or more species.
- A crop that is not harvested, but grown to protect or improve the agroecosystem.
- Its more about the goal rather than a definition.



Source: Cotswold Seeds



# Cover Crop Species

- Legumes

- Faba bean
- Peas
- Vetch
- Clovers
- Lupin
- Mung bean
- Lab Lab
- Cowpea
- Lucerne

- Broadleaves

- Phacelia
- Buckwheat
- Sunflower
- Quinoa
- Mustards
- Radish
- Kale
- Flax
- Safflower
- Chicory

- Monocots

- Oats
- Triticale
- Barley
- Millet
- Cereal rye
- Ryegrass
- Sorghum
- Maize
- Grasses (many)

*Source : Joel Williams – Integrated Soils 2020*

# Cover Crop Chart

GROWTH CYCLE	PLANT ARCHITECTURE	RELATIVE WATER USE
A = Annual	Y = Upright	● = Low
B = Biennial	* = Upright-Spreading	●● = Medium
P = Perennial	≡ = Prostrate	●●● = High

---COOL---			---WARM---		
---GRASS---			---BROADLEAF---		
A ANNUAL FESCUE Y BARLEY Y OAT Y SPELT Y WHEAT Y CEREAL RYE Y TRITICALE Y SALINE TOLERANT Y	LEGUME			---GRASS---	
	A/B	A/P	A	A	A
	CAMELINA	MUSTARD	BALANSA CLOVER	CHICKPEA	MEDIC
	PHACELIA	CANOLA	BERSEEM CLOVER	PEA	LUPIN
	FLAX	RADISH	CRIMSON CLOVER	LENTIL	FABA BEAN
	KALE	TURNIP	RED CLOVER	LESPEDEZA	SWEET CLOVER
	SPINACH	BEET	WHITE CLOVER	BIRDSFOOT TREFOIL	ALFALFA
A BROWNTOP MILLET Y FOXTAIL MILLET Y PEARL MILLET Y PROSO MILLET Y GRAIN SORGHUM Y SUDAN GRASS Y TEFF Y CORN Y	A	A	A	A	A
	AMARANTH	BUCKWHEAT	QUINOA	CHICORY	CUCURBITA
	SAFFLOWER	SUNFLOWER	PEANUT	SUNNHEMP	PARTRIDGE PEA
	SOYBEAN	MUNG BEAN	PIGEONPEA	VELVET BEAN	JACK BEAN
	CLUSTER BEAN	COWPEA	LABIAB	FENUGREEK	CLUSTER BEAN
	CHICKPEA	BALANSA CLOVER	MUSTARD	CAMELINA	OAT
	PEA	BERSEEM CLOVER	PHACELIA	SPELT	WHEAT

## WHICH SPECIES - WHAT'S THE GOAL?

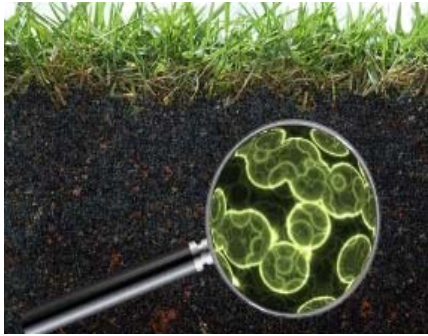
- N Fixation
- P Release
- Nutrient Capture
- Nutrient cycling
- Disease suppression
- Pollinators / Predators
- Weed Suppression
- Increase SOM
- Compaction alleviation



*Source : Joel Williams – Integrated Soils 2020*



## RCS - 6 Soil Health Principles



- Plan, Monitor and Manage
- Maximise living plant production
- A focus on biology will heal and repair soil health
- Introduce biodiversity
- Maximum thickness and availability of groundcover
- Livestock and nature's recyclers



## STEVE SCOTT COVER CROP MIXTURES AND COST

Paddock Name	Area	Purpose	Species Sown	Rate/Ha	\$/Ha	Seed \$/Ha
Cotttage Hayshed	10	<b>Graze &amp; Grain</b>	Eurabbie Oats	40	\$ 20.00	
						<b>\$ 20.00</b>
Twin Bank	35	<b>Graze &amp; Hay</b>	Eurabbie Oats	35	\$ 17.50	
			Blast Rye Grass	10	\$ 35.90	
			Forage Raddish	1	\$ 8.42	
						<b>\$ 61.82</b>
School Bus	30	<b>Graze &amp; Hay</b>	Eurabbie Oats	40	\$ 20.00	
			Common Vetch	18	\$ 41.37	
						<b>\$ 61.37</b>
Munyabla Hill	20	<b>Graze &amp; Silage</b>	Eurabbie Oats	35	\$ 17.50	
			Blast Rye Grass	10	\$ 35.90	
			Forage Raddish	1	\$ 8.42	
			Common Vetch	15	\$ 34.41	
						<b>\$ 96.23</b>
Munyabla Woolshed	10	<b>Perennial Pasture</b>	Phalaris/ Sub Clover	9	\$106.63	
						<b>\$ 106.63</b>
Munyabla Mailbox	30	<b>Graze &amp; Grain</b>	Kittyhawk Wheat	100	\$ 44.00	
			Forage Raddish	1	\$ 8.42	
			PT Turnip	0.5	\$ 3.25	
						<b>\$ 55.67</b>

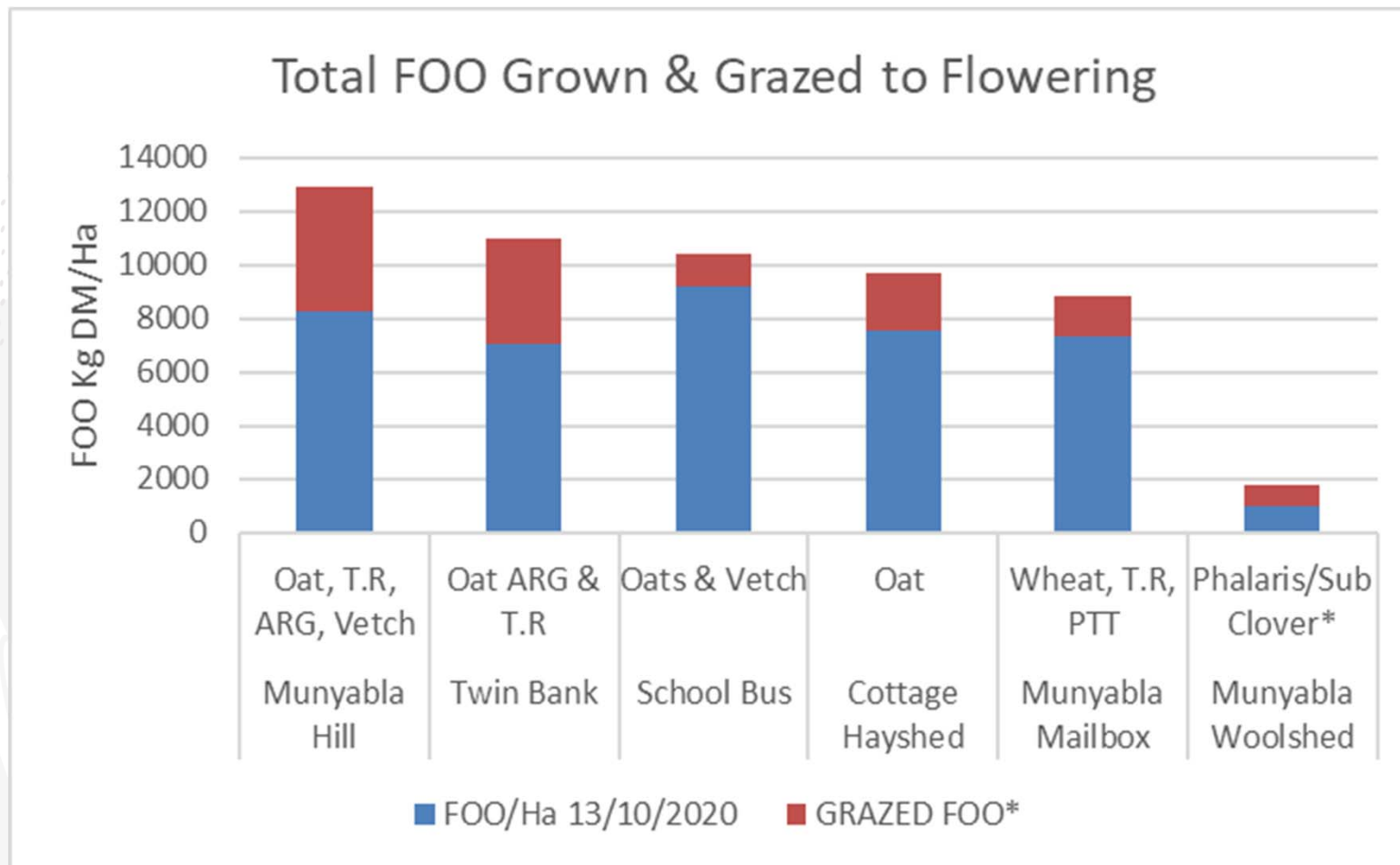
Source : JM Livestock 2020

## TILLIAGE RADISH



*Source : Steve Scott - 2020*

## FOOD ON OFFER AT STEVE SCOTTS



Source : JM Livestock 2020



## CATTLE GRAZING RADISH AND WINTER WHEAT MIXTURE.



*Source : Steven Scott – Scotts Angus Henty 2020*

## MONOCULTURE - BARLEY

Single species sown at

50kg/ha of barley =

\$100/ha

- Cost of barley crop -

**\$140 /ha** (Seed and  
fertiliser)





## MULTISPECIES – BARLEY, PEAS, BEANS, BRASSICA, RADDISH, TURNIP

Multi-Species crop:

- Barley - 30 kg/ha
- Field pea- 10 kg/ha
- Faba bean- 10 kg/ha
- Forage brassica- 2 kg/ha
- Tillage radish - 2 kg/ha
- Turnip - 1 kg/ha.
- 50kg/ha of croplift

15 (N 14.6 - P 12 - S 11.6)



Cost of Multi-species crop **\$183 /ha** (Seed and fertiliser)

*Source : Col Seis – 2020*



## MONOCULTURE - BARLEY

Weight gain & profit

Barley crop

228 Merino lambs – 55 days

Av Weight gain per day –

153grams

Av Wt gain -55 days – 8.09 kg

Lamb price/kg dressed - \$7

$3.8 \text{ kg} \times \$7 = 26.60 / \text{lamb}$

Profit /ha = \$1010.80

Minus the cost of sowing the  
crop - \$140 (Seed and fertiliser)

**Profit/Ha \$870**



*Source : Col Seis – 2020*

## MULTISPECIES – BARLEY, PEAS, BEANS, BRASSICA, RADDISH, TURNIP

Weight gain & profit

Multi-species crop

228 Merino lambs – 55 days

Average weight gain per day –  
300 grams

Weight gain -55 days- 16.87 kg

Lamb price/kg dressed \$7

$7.92 \text{ kg} \times \$7 = \$55.44/\text{lamb}$

Profit /ha = \$2106.72

Minus cost of sowing crop

\$183/ha (seed and fertiliser)

**Profit/ha \$1923.72**



*Source : Col Seis – 2020*



## SOIL SAMPLE FROM TRIAL CROPS

Single Species Barley Crop



Multispecies Crop



*Source : Col Seis 2020*



## SOIL TEST RESULTS

	Multi	Mono
Carbon	+ 21%	- 15%
Total N	+ 16 %	- 21 %
P (Colwell)	+ 125 %	+ 62 %
Calcium	+ 13 %	- 3 %
Magnesium	+ 3 %	- 8 %

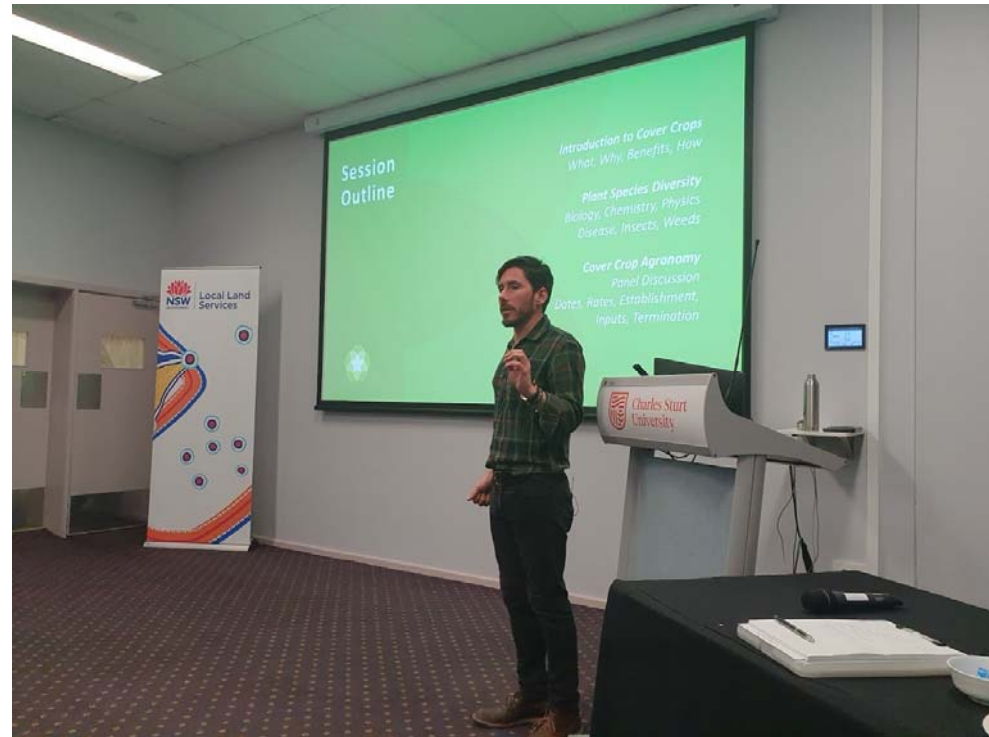
Note: Not all of the nutrients/minerals increased in the Multispecies.  
Some minerals in both crops declined.



Source : Col Seis – 2020

## THE SCIENCE BEHIND MULTISPECIES

- Workshop with Joel Williams on 10 March 2020 @ CSU Wagga Campus
- Attended by 53 Local Producers
- Recorded and put in the LLS YouTube Channel, Watched over 2300 times



*Source : Michael Gooden – RLLS 2020*

# THE SCIENCE BEHIND MULTISPECIES

*Ecology*, 84(8), 2003, pp. 2042–2050  
© 2003 by the Ecological Society of America

## PLANT DIVERSITY, SOIL MICROBIAL COMMUNITIES, AND ECOSYSTEM FUNCTION: ARE THERE ANY LINKS?

DONALD R. ZAK,<sup>1,4</sup> WILLIAM E. HOLMES,<sup>1</sup> DAVID C. WHITE,<sup>2</sup> AARON D. PEACOCK,<sup>2</sup> AND DAVID TILMAN<sup>3</sup>

<sup>1</sup>*School of Natural Resources and Environment, University of Michigan, Ann Arbor, Michigan 48109-1115 USA*

<sup>2</sup>*Center for Biomarker Analysis, University of Tennessee, Knoxville, Tennessee 37932 USA*

<sup>3</sup>*Department of Ecology, Evolution and Behavior, University of Minnesota, St. Paul, Minnesota 55108 USA*

**Abstract.** A current debate in ecology centers on the extent to which ecosystem function depends on biodiversity. Here, we provide evidence from a long-term field manipulation of plant diversity that soil microbial communities, and the key ecosystem processes that they mediate, are significantly altered by plant species richness. After seven years of plant growth, we determined the composition and function of soil microbial communities beneath experimental plant diversity treatments containing 1–16 species. Microbial community biomass, respiration, and fungal abundance significantly increased with greater plant diversity, as did N mineralization rates. However, changes in microbial community biomass, activity, and composition largely resulted from the higher levels of plant production associated with greater diversity, rather than from plant diversity per se. Nonetheless, greater plant production could not explain more rapid N mineralization, indicating that plant diversity affected this microbial process, which controls rates of ecosystem N cycling. Greater N availability probably contributed to the positive relationship between plant diversity and productivity in the N-limited soils of our experiment, suggesting that plant–microbe interactions in soil are an integral component of plant diversity’s influence on ecosystem function.

*Source : Joel Williams – Integrated Soils 2020*



## MANY QUESTIONS ARE RAISED WITH THIS DATA?

- Why is livestock performance higher on Multispecies?
- How come there are less metabolic issues?
- What is happening with soil biology and nutrient uptake?
- Would there be a benefit from successive Multispecies crops?
- How would different grazing management improve?
- Many more question.



# Research Opportunities?



# Questions ?







# What is Multispecies Cover Cropping?

Contact Details:

Michael Gooden

[mgooden@rcsaustralia.com.au](mailto:mgooden@rcsaustralia.com.au)

0428283330

RCS Australia

