

## State-wide Multi-species Cover Cropping Demonstration Project

### Project Outline March 2015

**Funded by: National Landcare Programme, Glenelg Hopkins CMA, North Central CMA, Goulburn Broken CMA, Wimmera CMA, DEDJTR**

### Project Summary

Cover crops are a mixed-species plantation designed to be terminated prior to seed-set for maximum benefit for the soil environment. Ultimately, covers are not cash crops as the profit made from growing a cover crop is recouped in the ongoing and subsequent mono-culture crops and sown pasture, through the improved soil health and nutrient availability over time.

Currently 2% of US farmers use cover crops in their system. In Pennsylvania, 18% of farmers have adopted cover crops for improved soil health. Presently research in cover cropping in Australia using updated information is nearly non-existent. With new research from the USA about covers in mixed and monoculture cropping systems, the release of Tillage Radish™ in Australia and the awareness of opportunity summer cropping, Vic No Till Farmers Association is taking the lead with the state-wide demonstration.

The demonstrations will be planted prior to sowing season. The seeds may remain dormant until rainfall occurs, which is expected if the sites are dry sown. These multi-species will need to grow to their potential until July or August 2015. Participants will then need to terminate their trial prior to seed-set, to stop the plants utilising their energy for fertilization, and subsequent seed drop.

A winter cover crop is the precursor to planting a summer cash crop. These trial sites are demonstrations to observe the potential of changing rotations and utilising summer rainfall for cash crop production. These demonstrations are inclusive for mixed farmers to demonstrate the importance of cover crops between grazing and cropping systems for sustainable soil management.

In March 2015, 19 cover cropping demonstration sites of approximately 0.1 ha square metres in size will be planted across five catchments in Victoria.

### Background

The purpose of these trials is to eliminate financial risk to growers for on farm cover crop research and development and demonstrate localised species survival across the State, while configuring a trial design that suits participants' winter cropping systems.

VNTFA's aim is to demonstrate the following points for observation and discussion:

- The role of using a multi-species crop in a mono-culture cropping system for improved soil health and biodiversity;
- Builds on the keynotes from Jay Fuhrer regarding the importance of plant diversity, including:

- varied rooting depths to penetrate compaction layers,
- possible disease suppression,
- weed management,
- improved soil ecosystem function,
- soil biology diversity,
- increased residue,
- improved water holding capacity,
- the role of stock on stubbles,
- improved soil aeration, and
- nitrogen fixation from legumes.
- Precision planting demonstration to showcase planter set up and seed singulation to growers;
- Row spacing demonstration on a 15" system for maximum ground cover;
- Controlled Traffic Farming using 3 m wheel tracks in a 9 m system;
- The benefits of using effective residue managers in high stubble load crops;
- One pass liquid fertilizer application at planting.

### Variation to work plan

The Victorian No Till Farmers Association's State-wide Multi-species Cover Cropping Demonstration Project work plan has been varied due to the low spring rainfall and revised cover cropping information.

This cover crop project will continue to demonstrate a wide range of positive soil health attributes to farmers and the agricultural services sector however the timing of the planting, length of growing season, species selection and the trial layout has been varied. Instead of a pre-sowing summer cover crop demonstration, this project demonstrates winter cover cropping.

### Trial

The species selected for the state-wide demonstrations are based upon recommendations from David Cook, Australian Nuffield Scholar specialising in cover crops, USDA Natural Resource Conservation Service soil health specialist, Jay Fuhrer and Pennsylvania farmer and Cover Crop Solutions tillage radish pioneer, Steve Groff.

The species are cool season varieties selected for vigour and cold climate adaptability.

Mix one	Winter wheat (cool season C3 grass)
	Forage oats (cool season C3 grass)
	Tillage radish
Mix two	Faba beans (cool season broadleaf legume)
	Long season forage peas (cool season broadleaf legume)
Mix three	Linseed (cool season broadleaf)
	Winter canola (brassica)

There are twelve (12) boxes on the planter and seven (7) species being demonstrated and three (3) mixes determined by seed size and inoculant requirements. Each mix will added to four boxes. The planter is set up for 30" rows, therefore a second inter-row pass will be performed to achieve 15" row spacing. It is intended that the cover species will cover the soil surface on this spacing.

**Seeding rate:**

Seeding rates have been calculated according to each seed size to achieve 20 plants per square meter.

**Project phase 2:**

Vic No Till is currently in the concept, development and planning process to increase the length of this demonstration project. Using the trial plots, together with funding from investors and donations from sponsors and seed companies, it is highly likely that the sites will continued to be used into 2016 for either of the two the possible demonstrations:

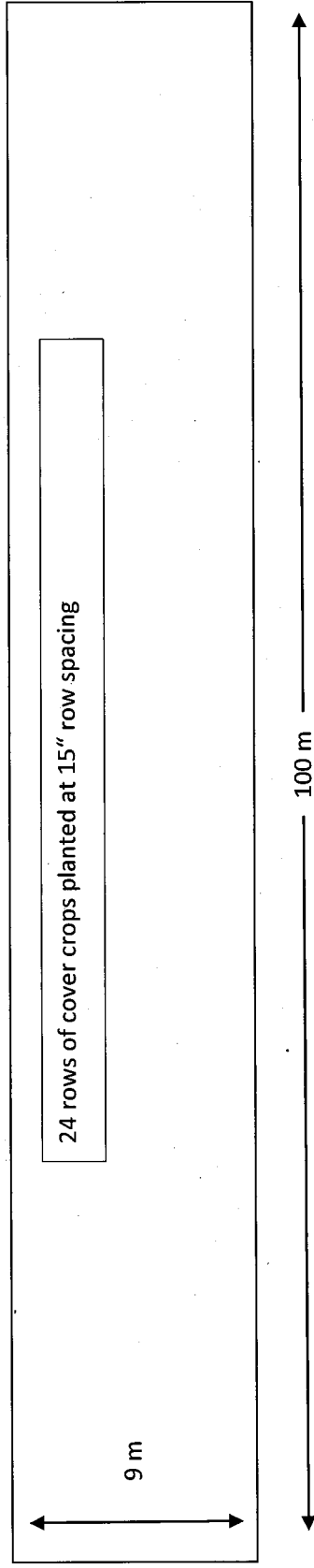
- 1) Summer cash crop demonstration (eg. Forage sorghum for grazing, mungbean, corn), or
- 2) Summer cover crop demonstration (warm season mix of species).

Depending on the rainfall during 2015, especially after the demonstrations have been terminated and prior to planting season in October, the project will follow either option 1 or 2. There may also be potential to demonstrate both summer cover and cash crops across simultaneously across the state due to climatic variation between catchments and hosts' choice. Either way, both species demonstrations will fit into existing systems to provide soil health benefits in continuous cropping and grazing businesses.

Trial phase 2 provides the opportunity to question the fundamental belief and past research that stored summer rainfall and chemical fallow is the preferential practice for an increase in winter crop yield.

iii) Trial design

The demonstration will be on the edge of a paddock, clear from trees. The demonstration is not to disrupt the hosts' sowing plans for the 2015.



**Commitments of trial hosts:**

**i) Date of planting**

Planting will commence at the end of February and conclude mid-March 2015.

**ii) Tractor:**

Participants' tractor requires three point linkage to be attached to the planter and GPS for inter row planting. The planter will be transported on a trailer between farms. For more information about using a planter, please go to <http://www.thedunstanplantation.com.au/10/row-crop-planter-hire/>

**iii) Trial size:**

A long strip of harvested crop with standing or grazed stubble is required. The planter will plant one long pass of 9 m wide by 100 m in length. The trial will demonstrate a 381 mm rows this pass.

The aim of this design is to disrupt the participants' winter cropping program as little as possible. The Dunstan Plantation will work with trial participants to locate an appropriate site with mutual benefits to VNTFA and the participant.

**iv) Termination of plants:**

The trials will be terminated to store soil water from late winter rainfall events, onwards. It is the amount of rainfall received from the date of termination to the planting time for the Phase 2 of the project that will define whether a cash crop or cover crop will be planted.

Plants will mature much earlier in the Mallee than the Glenelg Hopkins catchment therefore it is difficult to recommend a state-wide "spraying out date" for the trials. Participants will need to terminate their crop prior to any seed set from mid-July onwards.

The Dunstan Plantation is very comfortable liaising with participants about when to spray out the crop.

**v) Grazing:**

Cover crops can be used to diversify nutrient intake for stock. Before grazing the site, secondary roots must have developed for continued soil health benefit and plant survival. Once the cover crop has been terminated, stock may graze the site, ensuring that the soil is still covered after grazing.

According to Steve Groff, once the top of a tillage radish has been chewed by a sheep, the tap root will terminate.

**vi) Data collection and case studies:**

VNTFA will be asking trial hosts to record rainfall and frosts during the life of the cover crop. The Executive Officer would appreciate any informal record information about change in yields, pasture health, change in soil health and so forth on the former trial plot location over time as the benefits of cover cropping can be evident in the long term.

VNTFA really appreciates support in collecting positive data and being able to share the results with its members through case studies, social media and press releases. These demonstrations are likely to be used for future project bids to build on the outcomes.

**vii) Field days:**

Crop walks and machinery demonstration days are regular activities held for VNTFA members and interested farmers and agronomists. The trial sites are likely to be used for cover cropping specific events and bus tours throughout the year.

# State-wide Mixed Species Cover Cropping Demonstration Results 2015

Funded by: National Landcare Programme, Glenelg Hopkins CMA, North Central CMA, Goulburn Broken CMA, Wimmera CMA, DEDJTR

## Results and observations

CMA	District	Grower	Plant date	Average plants per linear metre (2 X 1 m measured and no. species counted/2)			Performance	
				Canola / Linseed mix	Tillage Radish/ Winter wheat/ Oats mix	Peas / beans mix	Germ rate	Growth
Mallee	Swan Hill	Leigh Bryan	17/3	3 Canola 4 Linseed	8 Tillage radish 5 Winter wheat 7 Oats	6 Peas 7 Beans	Excellent	Early growth was stunted due to an accidental full rate of Brodal herbicide. The species surprisingly recovered, reaching a maximum height of 40 cm. The site was terminated mid August.
Mallee	Piangle	Mark Kentish	18/3	5 Canola 4 Linseed	6 Tillage radish 5 Winter wheat 7 Oats	5 Peas 7 Beans	Excellent	Growth was moderate. The faba beans performed exceptionally well. There was an infestation of wild mustard competing against plant growth. The cover mix did not perform well where there was free-lime in the topsoil.
North Central	Pine Grove	Grant Sims	19/3	6 Canola 4 Linseed	4 Tillage radish 5 Winter wheat 6 Oats	3 Peas 7 Beans	Excellent	Plants not terminated; reached seed and flowering stages. Max height to 1.5 m. Equal growth of all plants but rows not fully filled in due to low rainfall.
North Central	Pyramid Hill	Chris Leed	18/3	4 Canola 3 Linseed	3 Tillage radish 4 Winter wheat 4 Oats	3 Peas 6 Beans	Very good	Site terminated 4 September. Growth was affected by low rainfall but all species present. Soil tilth was relatively soft.
North Central	Smeaton	Steve Rieniets	24/3	6 Canola 4 Linseed	7 Tillage radish 5 Winter wheat 4 Oats	7 Peas 4 Beans	Excellent	Plants not terminated in preparation for mulch and mould board ploughing. Excessive biomass to average height of 1.4 m with Tillage radish not the tallest species unlike other sites. Brazil winter

North Central	Corack	Mark Brennan	23/3	3 Canola 3 Linseed	7 Tillage radish 3 Winter wheat 5 Oats	6 Peas 5 Beans	Very good	canola stand out species at 1.6 m in height pre flowering. The growth was poor given the below average rainfall.
Glenelg Hopkins	Telangatuk East (Sth)	Warren Blake	26/3	2 Canola 4 Linseed	5 Tillage radish 3 Wheat 3 Oats	3 Peas 4 Beans	Very good	Site terminated in August. Some impact from spray drift. Estimated height of 40 cm. There was moisture to the surface and soil could hold a ball shape. Tillage roots were rotting; macro organisms present. Ideal set up for summer crop if rainfall predicted in near future.
Glenelg Hopkins	Stockyard Hill	Simon Taylor	25/3	5 Canola 6 Linseed	8 Tillage radish 4 Winter wheat 6 Oats	8 Peas 4 Beans	Excellent	The stubble had been grazed followed harvest per planting. The volunteer oat seed emerged with the cover crop, filling the demonstration site. Given the weed competition at the site, the Tillage radish and the Linseed were the stand out species. The average height of the cover was approx 1.4 m. Peas and bean nodulation was as expected.
Glenelg Hopkins	Streatham	Scott Blurton	20/3	5 Canola 6 Linseed	6 Tillage radish 5 Winter wheat 6 Oats	5 Peas 7 Beans	Excellent	Plants not terminated. Max height 1.7 m. Vigorous growth with rows completely filled in. Faba beans were the stand out species with superior growth and nodulation.
Glenelg Hopkins	Willaura	Stephen Heard	23/3	2 Canola 2 Linseed	2 Tillage radish 6 Winter wheat 6 Oats	5 Peas 4 Beans	Good	Suspected herbicide carry-over from 2014 cropping season. All cereals grew well however the broadleaf species were stunted and dying. Biomass was poor and the plants were small with an average height of 50 cm.
Glenelg Hopkins	Lake Bolac	Neil Valance	20/3	4 Canola 7 Linseed	4 Tillage radish 5 Winter wheat 5 Oats	6 Peas 4 Beans	Very good	This site was terminated in early July due to an excessive annual ryegrass population in the cropping trial paddock. All cover species were present. Both faba beans



Wimmer a	Rupanyup	Paul Oxbrow	16/3	3 Canola 2 Linseed	4 Tillage radish 4 Winter wheat 3 Oats	8 Peas 2 Beans	Very good	Plants not terminated. Biomass was good with the Tillage radish average height of 1.2 m. Plants not terminated. Tillage radish reached an average 1 m in height. Peas also performed very well. Linseed and winter canola were least impressive. Both the field peas and faba beans nodulated well. Site very similar to Ben Cordes' demo.
Wimmer a	Rupanyup	Ben Cordes	16/3	4 Canola 6 Linseed	5 Tillage radish 2 Winter wheat 4 Oats	4 Peas 4 Beans	Very good	Plants not terminated. Tillage radish reached an average 1 m in height. Peas also performed very well. Linseed and winter canola were least impressive. Both the field peas and faba beans nodulated well. Site very similar to Paul Oxbrow's demo.
Wimmer a	Telangatuk East (Nth)	Tom Dunstan	15/3	3 Canola 6 Linseed	4 Tillage radish 3 Winter wheat 5 Oats	6 Peas 3 Beans	Excellent	Plants not terminated. Max height 1.9 m. Vigorous growth with rows completely filled in. Peas and beans filled pod to commercial seed size. Tillage radish roots to 40 cm in length. Some weeds present but being outcompeted. This site has a fallow and full tillage radish demo alongside mixed species for farmer R&D.
Wimmer a	Murtoa	Craig Schodde	16/3	6 Canola 3 Linseed	4 Tillage radish 4 Winter wheat 5 Oats	7 Peas 4 Beans	Excellent	Plants not terminated. From the Wimmera sites, this demo was the shortest with an average 80 cm in height. All species had established well in dry conditions but the biomass was poor. The peas and Tillage radish were the best performing species.
Wimmer a	Brim	Nathan Dart	17/3	0	0	0	Unknown	Knock down spray drift upon early plant emergence. No plants to record.
Goulburn Broken	Pine Lodge	David Cook	21/3	3 Canola 5 Linseed	5 Tillage Radish 3 Winter wheat 4 Oats	4 Peas 3 Beans	Very good	The site had been sprayed and sown to sunflowers. The plants had been pushed to the ground by the Crossslot drill,

Goulburn Broken	Pine Lodge	Peter Jeffery	22/3	4 Canola 4 Linseed	5 Tillage Radish 5 Winter wheat 3 Oats	6 Peas 5 Beans	Excellent	effectively rolling the cover. Biomass was impressive. Standing height of the crop would have averaged 1.6 m. Tillage radish and oats were the tallest species. Faba bean population was slightly lower than predicted. Plants were not terminated. Biomass was impressive with an average plant height of 1.7 m. There was more biomass on this site than the other GB site. Rows had completely filled; some rye grass was evident.
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These sites were surveyed from the last week of September into mid October 2015.

#### Results summary:

This project was successful in demonstrating that mixed species cool season cover crops can be grown, through seed singulation dry sown, with well below average seasonal winter rainfall across Victoria.

The plant species germinated equally and successfully at every site. Rainfall was mainly responsible for the varying growth and biomass; some human error with spraying, spray drift and burning affected the success at some sites. There was some early seedling death, relative to early rainfall events with no subsequent rainfall; this was predominant in the northern catchments.

The preceding crops in 2016 and beyond will need to be monitored for changes in plant health and yield, following germination on the site which has experienced plant root diversity in dry conditions, and in some cases residue diversity, in 2015.

Ideally the project was aimed to demonstrate potential cover crop vigour and the result from inter-species competition per catchment zone. As a consequence of low rainfall the demonstrations have only been an indication of how cover crops can perform. However these results are still meaningful for dry conditions and can be used as a reference for future cover crop projects.

Host farmer feedback and recommendations

CMA	District	Grower	Plan for site	Potential for site	Feedback/ Notes
Mallee	Swan Hill	Leigh Bryan	The demonstration was planted in the same paddock as a brown manure pea crop. This is earmarked for Canola in 2016.	In the exception of flood-like summer rainfall conditions, summer cash crops are not suitable for dryland production in this area.	The cover crop was terminated in August to capture as much spring and summer rainfall as possible for next year's winter crop. This paddock demonstrated exceptional ground cover on sandy soil, prone to wind erosion. Leigh has been growing brown manure crops for a number of years as part of his rotation. Leigh does not want grasses in his cover mix, but will continue to grow species mixes on a broad scale for soil health, disease break and soil moisture conservation.
Mallee	Piangle	Mark Kentish	This demonstration was planted in the same paddock as a brown manure vetch crop. This is earmarked for Canola in 2016.	In the exception of flood-like summer rainfall conditions, summer cash crops are not suitable for dryland production in this area.	The cover crop was terminated in August to capture as much spring and summer rainfall as possible for next year's winter crop. Mark has been growing brown manure vetch crops for a number of years as part of his rotation. Mark does not want grasses in his cover mix.
NC	Pine Grove	Grant Sims	The demo was planted next to a faba bean crop. This site would be terminated for summer fallow and planted to winter crop.	Harvest seed	Grant Sims is part of a local grower driven cover crop group which just includes David Cook, Fraser Pogue and Luke Barlow. Grant has irrigated cover crops and uses plant diversity as soil health and conditioner. Grant has had great success in using Tillage radish for breaking the hard pan and increasing nutrient cycling. Grant is very keen to start a cover crop farmer-coop where farmers can swap cover crop seed and learn about what performs best in which soil types and climates.
NC	Pyramid Hill	Chris Leed	Summer fallow followed by winter crop. The barley next to the	In the unlikely event of an intense late spring or summer rain bordering on flooding, a	Low rainfall was the only reason why this cover crop did not perform as well as intended. Chris is interested in dryland cover crop, however he

			demo site was cut for hay due to lack of harvest potential from low rainfall.	summer cover or cash crop, like corn or sorghum, would be successful.	questions the investment cost versus the unquantifiable gain in subsequent crop yields. Chris believes that seed needs to be cheap and conditions need to be right to justify the use of soil moisture and cost of establishment and management. He is keen to do other demos on his farm, but is unsure of what he would like. He is also keen to know more about what other farmers are doing with their cover crop management.
NC	Smeaton	Steve Rieniets	The site will be mulched and mould board ploughed for the following crop.	Great potential to trial and demonstrate summer cover crop in cool HRZ.	This cover crop demonstration was planted prior to full cultivation for potato growing. Steve was very interested in the role of cover crops for soil health. He is keen to try more cover crops but is unsure of what to do, and he is interested in what other farmers are learning from them.
NC	Corack	Mark Brennan	Direct drilling winter crop seed into this site would be more beneficial than cultivating the established roots from species diversity.	Next year's winter crop may benefit from tillage radish loosening the cultivation hard pan.	This demonstration was planted on cultivated soil in very dry and cloddy conditions. The faba bean crop in the same paddock had been terminated due to the failed season.
GH	Telangatuk East (Sth)	Warren Blake	Summer fallow followed by winter crop.	Soil is moist to the surface. It would be ideal planted to sorghum or corn if early summer rainfall was forecast. Grazing opportunities in future.	Warren is on the cusp of full zero till CTF. The site endured some chemical drift as it was planted next to a barley crop. Covers could be a good way for Warren to improve his soil health and graze his stock rather than using stubble as a feed source.
GH	Stockyard Hill	Simon Tayler	Terminated and crash grazed, prior to summer fallow for winter crop.	Soil health mechanism followed by crash grazing. Introduction to summer crops in HRZ.	Simon is interested in grain and graze systems and he is keen to trial more covers but is unsure what will work. He would like to know more about what others are doing with cover crops but will return his site to winter crop in 2016.
GH	Streatham	Scott Blurton	The demo is located in the centre of a hay production paddock. The plants will be cut and baled.	Harvest seed for cover crop seed mix. Terminate and plant to summer cash crop if intense late Spring or early summer	Scott has been experimenting with mixed cover species for a few years. He is very interested in value of covers for weed control and soil health. He will continue refining his system by talking with and sharing ideas with other leading growers,

GH	Willaura	Stephen Heard	Summer fallow followed by winter crop. The site is not fenced for grazing purposes.	rain.	locally and internationally.
GH	Lake Bolac	Neil Valance	The cover demonstration planting shared the paddock with the SFS trials, together with Neil's wheat crop between the projects	With intense late Spring or Summer rainfall, a summer cover crop or cash crop could be successful.	Stephen was disappointed with his cover and called on Tom Dunstan for advice about his suspected herbicide carry over. Stephen's priority is to generate income therefore the role of covers versus income from investment is what he would like more information about.
Wim	Rupanyup	Paul Oxbrow	Terminate, summer chemical fallow for winter crop.	Given this demonstration is shared with other trials, inter-row planting a warm season mixed cover or a summer cash crop for demonstration purposes would be interesting.	Neil is a great participant in the grains industry as he hosts the SFS trial plots on his farm. He attended the Vic No-Till luncheon with Steve Groff in February 2015. Neil would be interested in learning more about grain and graze systems, cover cropping and to know what others are doing in this area.
Wim	Rupanyup	Ben Cordes	Terminate, summer chemical fallow for winter crop.	If intense late Spring or early summer rainfall, plant to millet* for deep rooting benefits and potential harvest or brown manure benefits.	Paul loved his winter cover crop demonstration and he is participating in a large-scale summer cover crop trial. Paul is also keen to know what other farmers are learning from their cover crop trials and experiences.
Wim	Telangatuk East (Nth)	Tom Dunstan	Site to be sprayed, rolled and wait for opportunity to plant mungbeans in late spring/ early summer with rain. Extended demo to compare winter fallow, full TR and CC mix on 2016 crop.	If intense late Spring or early summer rainfall, plant to millet for deep rooting benefits and potential harvest or brown manure benefits.	At first, agronomist Ben Cordes was sceptical about the roles of cover crops but with some discussions with Tom Dunstan, Ben decided to host a demonstration on his own farm. Following his experience, Ben has been instrumental with the design of a broadacre cover crop in the Wimmera featured on Paul Oxbrow's farm.
Wim				Harvest seed for cover crop mix Hay production Summer crop	The Dunstans will look for opportunistic summer cash crops. They will use intense summer rainfall and La Nina as opportunities for double cropping. For Tom, it isn't the plant diversity that challenges his thinking, rather the amount of summer rainfall a summer cover crop may remove from winter crop potential. However, following the tour to visit Ted Langley, and seeing his moisture probe data, Tom is more confident that summer covers are

Wim	Murtoa	Craig Schodde	Terminate, summer chemical fallow for winter crop.	if intense late Spring or early summer rainfall, plant to millet for deep rooting benefits and potential harvest or brown manure benefits.	equivalent to summer chemical fallow for PAW. Craig is keen to continue the farmer R&D path but he is unsure of which direction to take. Craig is very interested in knowing what other farmers are doing with cover crops and the subsequent success from their endeavours.
Wim	Brim	Nathan Dart	Continued chemical fallow, winter crop to be planted	if intense late Spring or early summer rainfall, plant to millet for deep rooting benefits and potential harvest.	This demo site has remained in effective fallow all winter. The low rainfall means that it will not have stored much rain for any potential summer crop.
GB	Pine Lodge	David Cook	Planted to sunflowers	Planted to sorghum or corn Hay production	David is a cover crop advocate. He will continue to support the use of cover crops for excess soil moisture management.
GB	Pine Lodge	Peter Jeffery	This site was in the middle of a wheat crop. The cover will be terminated for summer chemical fallow for winter crop	Hay production Harvest and retain seed for on farm cover crops	

\* Millet is an affordable summer crop (\$1/kg seed sown at 4 kg/ha) hence the recommendation to grow this summer crop which can either be harvested if it reaches maturity or terminated as brown manure prior to winter sowing season.

### Feedback summary and commentary

After participating in the demonstration, hosts were asked how they perceived cover crops in their business. Given that the seed cost for this species mix was \$25/ha, and gratefully funded by their CMAs to support such learning, the hosts questioned the cost if they had to pay for it themselves. The cool season cover crop was highly regarded, as some of the hosts questioned how much potential soil moisture they could lose if they planted a warm season cover crop in October, prior to winter sowing.

It needs to be recognised that some of the participants have been successfully growing brown manure crops as part of their rotation for a number of years. For these growers, the term "cover crop" was inter-changeable with "brown manure"; it was just the concept of mixing species and the companion planting relationships that was relatively new. These hosts growing brown manures had a high aptitude about soil moisture conservation and using plant production for risk management. Interestingly they criticised the cost of this mix and identified the composition of the species as equally important. These growers

identified that a successful cover crop mix should out-compete existing weed populations, effectively break disease cycles, provide top soil protection post termination, conserve moisture and be relatively low cost in comparison with a winter crop.

Every host farmer recognised that the following crops were intended to yield better to compensate the cost of growing a cover. They were all interested in the role of covers and acknowledged that plant diversity is important for soil health and agronomic benefits. However the predicament of “seen to be believed” was shared by a few hosts. This project will be successful in assisting these hosts to make better informed decisions about the role of cover crops for their business however it may take a few seasons for the yield data to be quantified. The only recommendation following this project is that future cover crop demonstrations include moisture probes to quantify soil moisture usage, moisture availability post termination and soil moisture utilisation from deeper in the profile.

Despite the current discussion about this popular cropping system it was unanimous amongst the host farmers that they were not ready to pay for any information about growing covers. All of the hosts were interested in what other growers were doing with brown manures and cover crop mixes, and their results. There is great scope for more farmer-led extension about cover crops, relative to each rainfall zone and cropping system.

There are many opportunities to continue with this state-wide demonstration project. Vic No-Till has formalised relationships with leading host farmers across six catchments in Victoria. There is evidence to support new projects comparing surface manuring with existing sub-surface manuring techniques. Following the mantra of “roots not iron” in the zero-tillage networks, there are new discussions around the role of macro-organisms cycling surface manure instead of disturbing the profile with deep ripping machinery to lay manure and compost. These state-wide cover crop sites have established mixed species plant diversity, creating new biological niches for micro-organisms and macro-organisms; ideal for new demonstrations to further assist farmer decision-making. The future of sustainable cropping systems is new and exciting; with farmers leading innovation and helping each other along their way.



