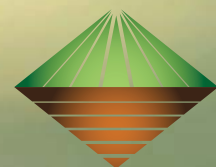


What is a cover crop worth?

Cover crops in Australian vegetable systems

This article outlines the economic considerations when using cover crops in vegetable production systems. It is based on lessons learned from several Soil Wealth — ICP demonstration sites, during the period 2014 to 2016.

Integrated
Crop Protection
PROTECTING CROPS



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Key messages:

- You have to be clear about the purpose of using cover crops in your system; it influences the way you may judge costs and benefits and the timing of these.
- **Overall benefits depend on each situation** including previous crop, crop sequence, soil condition, soil fertility, fertiliser management, disease pressure, yield and packout; they can also vary over time. Therefore, you need to consider the costs and benefits for your own farm in the short and long term.
- **To figure out what works for you on your farm and a specific purpose**, talk to others who have used cover crops for a similar purpose/situation; trial cover crops or include a test strip if possible.
- **In the short-term cover crops can be profitable.** The economic benefits from potential increased marketable yield will depend on market specs and prices, and how your produce is priced e.g. per kg or per item. If crop quality and packout are improved, you may save on post-harvest and handling costs.
- **Consider the longer-term benefits** such as improved soil health, better water and nutrient holding capacity, less disease pressure and reduced erosion which are more difficult to quantify — but are important.
- Improved soil condition and **resilience will reduce risks** such as impacts of drought, floods and pests and diseases or nutrient imbalances. Water infiltration, drainage and holding capacity will be better in a well-structured soil compared to a compacted one. This will mean that you can access paddocks more quickly after a heavy rainfall without causing damage to the soil and/or beds.
- **A well-structured soil will require less tillage.** This can mean less passes are required or smaller sized tractors can be utilised because less power/draft is required due to reduced soil resistance.
- **Monitor soil nitrogen (N) to determine if nitrogen inputs need to be adjusted.** Following legume cover crops, N fertiliser rates may need to be decreased. N benefits for the next cash crop will depend on the cover crop species, conditions (soil temperature, moisture), and timing relative to crop N demand of the next crop. Some crop residues can tie up soil N as they decompose. Therefore, N dynamics need to be considered when selecting cover crops and managing crop nutrition so that you can realise the full economic benefits of the cover crop.
- Cover crops can be used as a non-host plant for **soil-borne diseases**. Cover crops can also increase soil microbial activity and diversity, which helps to suppress soilborne diseases in cash crops. Under high disease pressure, cover crops will not provide short-term disease suppression — but can provide preventive and longer-term benefits.
- **Biofumigation is the use of specialised cover crops**, which are grown, mulched and incorporated into the soil prior to cropping. High biomass, especially roots, can provide the traditional benefits of green manure crops, and if done right, naturally occurring compounds from the biofumigant plants can suppress soil-borne pests, diseases and weeds. Refer to the resources on the SW-ICP website (www.soilwealth.com.au) for more information about biofumigants.

“Practices like cover cropping, using compost and using reduced tillage can increase or maintain soil organic matter. This builds long term resilience. In the long term you can’t add that out of a bag. There is no substitute for long term resilience.”
Marc Hinderager, Agronomist.



► **COVER** crops, such as ryegrass, is effective for building soil structure.

- **Selecting the right cover crop for the situation** and purpose, will maximise the economic benefits e.g. ryegrass is effective for building soil structure; biofumigants can be effective for suppressing weeds and diseases.
- **Consider how to transition from the cover crop to the cash crop.** Consider when it will need to be macerated, sprayed off or mulched and how you will manage residues. Your machinery may need to be adjusted to plant through trash.
- **Consider any risks** (e.g. which cover crop species could host pests and diseases).
- **The nature and extent of economic benefits will vary depending on what the most important reasons to use a cover crop are on your farm** — and how that is matched with the cover crop species selected as well as its management.

There is usually an economic benefit in the short term, but the full economic benefits of cover cropping can take several seasons.



Cover crop benefits

Benefits of cover crops can include:

- Improved soil health, which in turn provides improved water storage and infiltration capacity
- Improved soil structure which can reduce tillage costs (through reduced number of passes required or reduced power required for tillage)
- Reduced soil erosion
- Improved nutrient cycling (nutrients captured for use by the next crop) especially nitrogen (and therefore potential decrease in fertiliser inputs)
- Suppression of weeds, pests and diseases (and therefore reduced chemical input costs — so long as you adjust your chemical inputs)
- Increase in quality/pack-out percentage
- Yield increase (potentially; not always).

Disadvantages of using cover crops, especially in the trial phase can include:

- Insect or slug pressure
- Clubroot if brassica cover crops are used in brassica production
- Not being able to get rid of the cover crop in time for planting due to weather
- The need for new machinery or adjustments
- Additional costs for cover crop including: seed, sowing, inputs (irrigation, fertiliser), termination of the cover crop, extra time for management
- Opportunity cost (decreased income if it replaces a cash crop)
- Risk that there is a decrease in marketable yield or quality.



FIGURE 1 Forcett demo site — mulching and spraying early enough to allow sufficient time for the cover crop to break down before preparing beds for the following cash crop. TOP, mulching a cover crop; ABOVE, cover crop breaking down.

TIP: Consider timing of cover crops, how to transition to cash crop and how to deal with stubble. One option, if it fits the cropping schedule, can be to spray the cover crop off early and allow it to decompose without the need for cultivation.



What have we learnt from the SW-ICP demo sites?

Table 1 shows some of the main benefits and costs of cover crops. As mentioned above, the overall benefits depend on each situation.

The benefits and costs at one site does not necessarily show what is achievable at other sites.

Manjimup, Western Australia

Benefits observed at Manjimup were as follows. Weed control:

- Caliente™ gave good control of the brassica weeds, particularly wild radish
- It did not work very well to suppress other weeds such as doublegee and clover after incorporation
- There was a weed suppression affect from the very dense canopy of the Caliente™ while it was growing, which helps to smother out weeds.

Improved soil condition, reduced erosion and improved water infiltration:

- The Caliente™ held the soil together and helped to prevent wash aways when heavy rainfall occurred
- Rainfall tends to infiltrate more easily into the soil, rather than running off the top of the soil
- The Caliente™ has opened up the ground and made the soil more friable
- The soil is easier to work when preparing for planting crops
- Less tractor passes are required when preparing the ground for cropping after growing Caliente™.

At Manjimup a biofumigant cover crop was grown mainly for disease suppression. However, the grower noticed other benefits of reduced requirement for tillage and reduced erosion in heavy rainfall.



FIGURE 2 Lettuce from control (top) and following Caliente™ (middle). Lettuce yield and quality was substantially better, following Caliente™. Caliente™ improved soil structure (bottom)

TABLE 1 Potential benefits and costs of using cover crops

	Potential benefits/ advantages	Potential costs/ disadvantages	Changes required and things to consider	What data (or estimates) to keep for each paddock and crop
Soil condition, resilience, risk management	Y	-		<ul style="list-style-type: none"> • Soil condition scores, observations, photographs
Yield	Y	Y	<ul style="list-style-type: none"> • There can be yield benefits but not always • Select the right cover crop for the situation and manage it well 	<ul style="list-style-type: none"> • Gross and marketable yield
Quality (packout, shelf life, post- harvest costs)	Y	Y	<ul style="list-style-type: none"> • If quality is increased there can be increased income and/or decreased post-harvest handling costs 	<ul style="list-style-type: none"> • Post-harvest costs including labour by crop/paddock • % packout or grading data
Pest, disease and weed management costs	Y	Y	<ul style="list-style-type: none"> • Monitor pests and diseases • Consider an integrated crop protection approach • Adjust inputs if required • Consider biofumigant cover crops 	<ul style="list-style-type: none"> • Pest, disease and weed pressure • Costs of management
Tillage costs (for cash crop)	Y	-	<ul style="list-style-type: none"> • Consider if 'softer' tillage equipment can be used, or less passes or smaller tractors 	<ul style="list-style-type: none"> • Number of passes and type of equipment
Nutrients (for cash crop)	Y	Y	<ul style="list-style-type: none"> • Adjust fertiliser inputs especially consider N fertiliser 	<ul style="list-style-type: none"> • Monitor soil fertility especially N • Amount of fertiliser used
Water holding capacity (for cash crop)	Y	-	<ul style="list-style-type: none"> • Adjust irrigation scheduling 	<ul style="list-style-type: none"> • Monitor soil moisture
Opportunity costs (if cover crop replaces cash crop)	-	Y	<ul style="list-style-type: none"> • Consider which cover crops fit your cropping schedule and rotation • Consider frequency of cover crops e.g. annually or every 2-3 years • Consider any trends in cash crop marketable yield, quality, inputs, and returns 	<ul style="list-style-type: none"> • Long-term records of cash crop marketable yields, quality and inputs
Cost of cover crop management	-	Y	<ul style="list-style-type: none"> • Talk to others who have used cover crops for a similar situation 	<ul style="list-style-type: none"> • Record cover crop costs including termination costs

Source: Soilwealth Project

TABLE 2 Seed cost and characteristic of some common cover crops. Cultivation, irrigation and fertiliser requirements are unique to each scenario so these costs are not considered here

	Tillage radish™ (<i>Daikon radish</i>)	RootMax™ (<i>Lolium rigidum</i>)	Sorghum (<i>Sorghum bicolor</i>)	Rye corn (<i>Secale cereale</i>)	Morgan field peas (<i>Pisum sativum</i>)	Caliente 199™ (<i>Brassica juncea</i>)
Cost of seed (\$/ha)	\$50–\$70	\$65	\$100–\$130	\$144	\$140–\$150	\$210–\$250
Fertiliser required	Not essential	Not essential	Recommended	Not essential	Not essential	Recommended
Cultivation	2 passes	2 passes	2 passes	2 passes	2 passes	2 passes
Builds organic matter	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓
Reduces erosion	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓
Recovers nutrients	✓✓✓	✓✓✓	✓✓	✓✓	✓	✓✓✓
Fixes nitrogen	X	X	X	X	✓✓✓	X
Biofumigant	✓	X	X	X	X	✓✓✓
Soil Compaction	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Broadleaf weed control	✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓✓
Grass weed control	✓✓✓	✓	✓✓	✓	✓✓✓	✓✓✓
Specialised equipment?	X	X	X	X	X	✓

Source: Soilwealth Project

The cost of cover crops

Each cover crop has its own set of unique benefits and costs. Table 2 shows the expected seed cost of a range of common cover crops.

Most cover crops will require some cultivation and irrigation, and a soil test will determine if fertiliser is required.

In fact, deep rooted cover crops can recover nutrients from deep within your soil, recycling your lost fertiliser. A pricier option such as Caliente 199™ should be treated with more care to reap the full benefits of the cover crop. Finally, you must also consider the opportunity cost of planting a cash crop, which is the profit of selling a cash crop instead of growing a cover crop, however, your soil needs a break sometime and a cover crop is healthier than bare fallow. (🌱🌱)

MORE INFORMATION ►

Contact Dr Doris Blaesing (RMCG) on mobile 0438 546 487, email dorisb@rmcg.com.au or go to www.rmcg.com.au



The economic loss of bare fallow is represented by the loss of organic matter to the atmosphere and the erosion of topsoil. This could be calculated by the cost of compost required to replace lost organic matter, or the topsoil required to compensate for erosion. Planting any variation of ground cover will slow or even reverse the loss of organic matter and control the erosion of bare fallow. However, the cost of irrigation should be also considered.

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