What is compost worth?

Using compost in Australian vegetable systems

Integrated Crop Protection
PROTECTING CROPS

Soil Wealth
NURTURING CROPS

This fact sheet outlines the economic considerations when using compost in vegetable production systems. It is based on lessons learned from several Soil Wealth – Integrated Crop Protection (ICP) demonstration sites, during the period 2014 to 2016.

Typical costs

Indicative costs for compost are shown in Table 1. Costs depend on the type and quality of the compost; freight costs depends on distance; and spreading/incorporation costs depend on application rates, type of compost, machinery required, travelling time and the scale of the work.

Table 1 - Indicative compost costs

ITEM	INDICATIVE COSTS# (EXCLUDING GST)
Compost	\$50 to \$80 / m^3 \$45 to \$70 / m^3 (with a volume discount)
Freight to site	Depends on your location
Spreading	\$140/ha

#Disclaimer: These costs are indicative and are intended as a guide only.

Figure 1: Inspecting compost

Key messages

- The main benefits of using compost are:
  - Increased organic matter and therefore improved soil structure and health
  - Adding nutrients to the soil
  - Increased water holding capacity of soils, and
  - Disease suppression.
- Remember to consider the longer term benefits.
- Consider other practices to change when using compost:
  - Tillage, irrigation and crop protection requirements
  - Soil nutrient monitoring, crop nutrition planning and inputs.
- Compost can add nutrients to the soil but you need to adjust your fertiliser inputs to realise the full economic benefit of this. Therefore, it is important to monitor soil fertility and nutrient availability.
- Compost can be a slow-release source of nutrients. Therefore, the benefits may continue into subsequent crops.
- Consider the C:N ratio of the compost. This will influence the timing of nitrogen available for the crop.
- Remember costs, risks and benefits will vary with each situation, due to:
  - Different quality compost
  - Different conditions, practices, systems and challenges
  - Different cost structures (scale, cost of compost, transport costs, machinery costs, costs of other inputs).
- When evaluating the benefits from using compost, think about the reason for using it e.g. is it to increase organic matter in the soil, prevent bed collapse, add nutrients to the soil, increase water and nutrient holding capacity or a combination of these?

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Baldivis, Western Australia

Sam Calameri, Baldivis Farms, has found the following benefits of using compost:

- Organic matter in the soil has doubled
- Improved soil structure
- No fumigant used on composted areas
- Reduction in fertiliser use by 10%
- Increase in yield of carrots by 30%
- Increase in yield in potatoes
- Reduction in sandblasting of young seedlings
- More uniform crops in cauliflower, carrot and potatoes
- Growing beds are more stable and don't erode
- Easier to drive tractors on compost treated areas.

The value of compost at Baldivis Farms

It costs about $84 per m^3 for compost to be delivered to Baldivis Farms. At an application rate of $20m^3$ per hectare, this costs $1,680 per hectare. The fumigants, metham sodium or Telone® were not applied to the composted area. Not using Telone® saved $1,640 per hectare and not using metham sodium saved $920 per hectare. The compost supplies some nutrients to the crop, which has allowed Sam to reduce the amount of fertiliser applied by 10%. Table 2 shows the value of the major nutrients that are in compost, based on a typical analysis of the compost used on Baldivis Farms. There is additional value gained from the micronutrients that are also contained in the compost.

Table 2 - Value of nutrients based on a typical analysis of compost used at Baldivis Farms. Compost is applied at $20m^3$/ha

NUTRIENT	NUTRIENT APPLIED (KG/HA)	NUTRIENT AVAILABLE TO THE CROP FROM THE COMPOST (%)	FERTILISER EQUIVALENT IN $20M^3$ OF COMPOST (KG/HA)	VALUE ($/HA)
Nitrogen (N)	128	10	28kg urea	$16
Phosphorus (P)	24	40	109kg superphosphate	$51
Potassium (K)	64	80	138kg potassium nitrate	$251
Calcium (Ca)	210	20	221kg calcium nitrate	$146
Magnesium (Mg)	12	20	25kg magnesium sulphate	$13
Total				$477

Composted beds held together (Figure 2), with no slippage of the sides of the beds. There was less greening on carrots as they were not exposed to the sun and they were easier to harvest as the tops were less brittle. Sam noticed an increase in the yield in the carrots of about 30% in the composted area.

Not using fumigant, improving fertiliser use efficiency, adding carbon to the soil and improvement in crop yield and quality all contributed to off-setting the cost of the compost. Additional benefits, that are difficult to value, such as improved environmental and social sustainability also need to be considered.

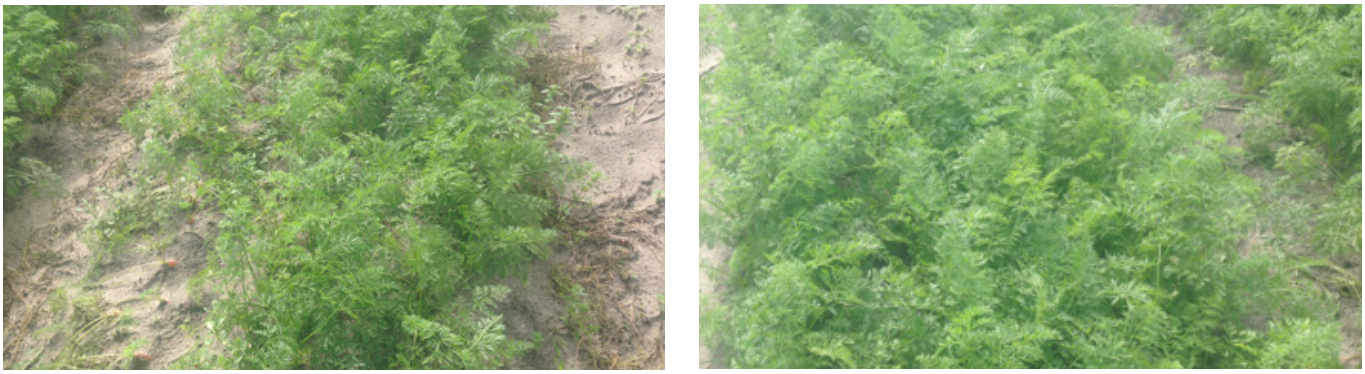

Figure 2: The shoulders of non-composted beds (left) collapsed after heavy rainfall. The composted beds (right) did not collapse. Photo supplied by Justin Wolfgang, C-WISE. (Site: Baldivis Farms, WA)

Centre West Exports, Gingin, Western Australia

The Soil Wealth and Integrated Crop Protection team have been working with the Tedesco's to demonstrate the benefit of compost and other soil amendments in improving soil health and enhancing crop protection from diseases. Our partners at this site are C-Wise who are developing a custom compost product to suit the production system.

The demonstration site is a 10ha area on the main farm with 0.5ha lots to trial the custom product at variable rates.

The results for 2016 can be summarised as follows:

- Compost reduced Pythium and Rhizoctonia levels in the soil
- Compost increased phosphorus availability in the soil
- Compost had no effect on soil pH
- Nitrogen (N) levels in carrot roots were lower in composted areas while levels of available N in the soil were higher
- In composted areas, carrots had higher potassium levels, up to double that of the control
- The total concentration of nutrients in the carrot roots increase with increasing compost rates and compost quality.

Costs

Compost costs, including freight and application ranged from $1,997 to $4,537 depending on the type of compost and also the application rate (Table 3).

Table 3: Compost application rates and costs at Gingin

COMPOST	APPLICATION RATE	COMPOST, FREEIGHT, APPLICATION COSTS ($/HA)
Premium compost	30m³/ha	$2,777
Premium compost	50m³/ha	$4,537
Humicarb compost	30m³/ha	$1,997
Humicarb compost	50m³/ha	$3,237
No compost	Nil (control)	Nil

Benefits

While there were no noticeable benefits in marketable yield (t/ha) there were potential benefits from improved carrot size distribution with more carrots within the target size range.

Soil DNA assays for carrot pathogens found lower incidence of pathogens in the compost treatments compared to the control. Therefore, there may be longer term benefits from disease suppression.

What are the long term benefits at this site?

The net benefits at this site may take longer to realise. Some questions remain, including:

- How long do beneficial effects last?
- What are the risk management benefits of disease inoculaum reduction?
- How can transport costs be reduced?
- Is it possible to get benefits with lower rates or band placement?

Bowen, North Queensland

Cover crops, compost and beneficial bacteria (QST 713) have been trialled at this site. The aim is to improve soil health, weed and disease control and profitability. Compost alone or combined with cover crops and beneficial bacteria improved capsicum shelf-life, in addition to increased yields (Figure 3 and Table 4). The following table summarises the yield and net economic result.

Table 4: Capsicum yield and economic results, Bowen, Qld, July 2016

	COMBINED HARVESTS			
	MEAN NUMBER FRUIT PER PLANT	AVERAGE FRUIT WEIGHT (G)	APPROX YIELD IN T/HA	ECONOMIC BENEFIT OF SOIL WEALTH PRACTICE $/HA (OVER CONVENTIONAL)
Conventional	9.40	254	34.0	-
Compost	9.87	272	36.4	$5,360
Compost + Cover crop	10.17	278	37.1	$7,200
Compost + Cover crop + Beneficial Bacteria (strain QST 713)	10.20	286	38.1	$9495

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Figure 3: Post-harvest assessments (Bowen, QLD)

Using compost increased yield by about 7% which resulted in an economic benefit of $5,360/ha compared to conventional practice. Using compost combined with other treatments (cover crops and beneficial bacteria) resulted in even greater benefits.

When assessing the benefits of compost (or other practices), in addition to any yield benefits, consider the benefits from improved packout %, crop quality and shelf life.

Cowra, New South Wales

Compost and cover crops have been examined at Cowra. A spinach crop was grown in 2015. Yield was 22% greater in the compost treatment compared to the control (fallow).

Treatment	**Yield (bedtop)**
Fallow + compost	13.89 t/ha
Fallow	11.31 t/ha

All treatments received 80 kg/ha N (liquid fertiliser). We are not sure how much of the response to compost was due to nutrition (nutrients applied with the compost). This highlights the value of monitoring soil nutrients, to help decision-making about fertiliser (rates and timing) and therefore to make the most of the economic benefits of using compost.

Figure 4: Compost at 20t/ha (75% moisture). Cowra, NSW, 4 August 2015

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

The following table shows some of the main benefits and costs of using compost. 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.

	POTENTIAL BENEFITS/ ADVANTAGES OF USING COMPOST	POTENTIAL COSTS/ DISADVANTAGES OF USING COMPOST	CHANGES REQUIRED AND THINGS TO CONSIDER WHEN USING COMPOST	WHAT DATA (OR ESTIMATES) TO KEEP FOR EACH PADDOCK AND CROP
Soil condition, resilience, risk management	Y	-		Soil condition scores, observations, photographs
Yield	Y	Y	There can be yield benefits but not always	Gross and marketable yield
Quality (packout, shelf life, post-harvest costs)	Y	Y	If quality is increased there can be increased income and/or decreased post-harvest handling costs	Post-harvest costs including labour by crop/paddock % packout or grading data
Pest and disease management costs	Y	Y	Monitor pests, diseases and weeds Consider an Integrated Crop Protection approach Adjust inputs (e.g. fungicides) if required	Pest, disease and weed pressure Costs of management
Weed management costs	Y	Y		
Nutrients	Y	Y	Adjust fertiliser inputs especially consider N fertiliser	Monitor soil fertility especially N Amount of fertiliser used
Water holding capacity of soil	Y	-	Adjust irrigation scheduling	Monitor soil moisture
Tillage costs (for cash crops)	Y	-	Consider if 'softer' tillage equipment can be used, or less passes or smaller tractors	Number of passes and type of equipment
Cost of compost and application / incorporation	-	Y	Talk to others who have used composts in a similar situation	Record compost costs including application rates; and cost of spreading and incorporation

Further information

Further information is available on the Soil Wealth and Integrated Crop Protection website (www.soilwealth.com.au) including:

- **Information about Soil Wealth and ICP demonstration sites**
- **Soil and plant health benefits from using compost: A long-term case study on Baldivis Farms**
- **Using compost safely: A guide for the use of recycled organics in horticulture**
- **Safe compost for fruit and vegetables: A guide for the supply of recycled organics to fresh produce growers**
- **Compost for Vegetable Growers: Why Use Compost?**