australian organics recycling association

COMPOST IN VEGETABLE PRODUCTION FACT SHEET

Using compost in vegetable production

Compost is a nutrient rich, soil like product derived from organic materials through controlled decomposition harnessing biological processes to break down the organic matter into simpler substances The organic matter is transformed into a valuable resource that can be used in many applications across agriculture, horticulture, landscaping and environmental management.

Vegetable production generally involves high levels of cultivation with short rotations across a diverse range of crops, with minimal plant material cycled back into the soil in between production cycles. This high-intensity cropping schedule can significantly deplete the health and structure of soils, therefore impacting the quality and productivity of the cash crop.

To improve soil health, recycled organics such as compost can be applied to help build organic matter and carbon within the soil. The compost acts as a feedstock for soil microbes, including fungi, bacteria and earthworms.

Types of Organic Amendments used as Compost

Mature composts

The maturity and stability of composted products impact the performance of the compost once it is incorporated into the soil. Mature compost exhibits lower levels of phytotoxicity and is more stable, with a low nitrogen drawdown index (NDI). This means low nitrogen immobilisation potential, ensuring minimal nitrogen competition with plants.

Mature compost provides organic matter to improve physical soil characteristics as well as a good source of bacteria and micro-flora to stimulate invertebrate activity, which can improve plant uptake of nutrients.

Pelletised compost

Pelletised compost can be customised based on the nutrient content of the pellets. A pelletised compost provides an alternative option for compost application as each pellet is a consistent size with consistent chemistry. Pelletised composts also provide ease of application through the use of spreaders or seeders.

Key Considerations Before Applying Compost in Vegetable Production

In short-rotation vegetable production systems, compost applications should align with soil preparation activities. Labour and equipment requirements to apply compost must also be cost-effective.

It is essential that a mature compost product is applied to prevent food safety risks in the harvested crop and ensure a low nitrogen drawdown index (NDI), therefore allowing nitrogen to be more readily available for plant uptake.

AS4454: Composts, soil conditioners and mulches

The Australian Standard AS4454 Composts, soil conditioners and mulches provides a framework for defining and classifying compost, soil conditioners and mulches based on their composition, processing and intended use. While voluntary, it is referenced in most regulatory composting guidelines to establish minimum requirements for production, characterisation and quality testing.

Benefits of Compost In vegetable production

Compost can improve your soil's physical, biological and chemical properties and, as a result, improve the productivity and quality of your vegetable crops. Key benefits include:

- Improved soil organic carbon
- Improved soil structure increasing soil porosity
- Improved water holding capacity
- Improved pH buffering capacity
- Increased cation exchange capacity
- Enhanced root growth
- Weed suppression
- Enhanced soil biology.

Compost specifications

It is highly recommended to use products that meet AS4454 requirements. AS4454 classified compost, soil conditioners and mulches based on their composition, processing and intended use. It sets the minimum requirements for the quality and safety of products.

The general product characteristics for composts used for horticultural applications as set out by AS4454 are captured in the table below.

Characteristic	Unit	Target/typical range	Advice
pH	pH units	Range 5.5-8.0	If >8.0 determine total $CaCO_3$ content
Electrical Conductivity (EC)	dS/m	<6	High EC may limit application rates
Organic Carbon	% dry matter	15-25	Generally higher organic carbon is preferable for compost of equivalent maturity
Carbon:Nitrogen Ratio	C:N	Typically 10:1-25:1 The recommended C:N ratio for good microbial metabolism to retain desirable amounts of carbon and nitrogen as feedstock for microbes is 20:1 (C:N).	C:N is typically higher for mulches used in orchards, lower for composts incorporated into soil in vegetable production

Food safety requirements

Adhering to the Freshcare Food Safety and Quality Edition 4.2 (FSQ4.2) standard is important to avoid risks to human health following the application of compost in a vegetable crop. Freshcare restricts the use of unpasteurised products including manures, regarding timing of application prior to harvest. To satisfy Freshcare provisions, verified evidence of pasteurisation needs to be provided by the producer.

For more information, refer to “A guide for use of recycled organics in horticulture”
https://www.freshcare.com.au/wp-content/uploads/2023/05/Compost-Factsheet-Growers.pdf

Other considerations

The application of compost can provide nutritional balance and uniform water infiltration for a vegetable crop, leading to more even crop yield and marketable pack-out. While it is often difficult to see yield increases in a high-intensity vegetable production system, growers may find that compost allows them to reduce the rates of synthetic fertilisers by as much as one-third to one-half and still produce a comparable yield whilst also reducing water inputs.

Regular soil testing and monitoring is necessary to ensure that the use of compost is effectively supporting the production of the vegetable crop.

The diverse impact of compost on soil

Important factors that contribute to soil health and an improvement in overall vegetable production through the application of compost are described below. These can be measured through soil testing.
Soil organic carbon/labile carbon: Australian soils are generally low in organic matter and fertility. One indicator of soil fertility is soil organic carbon. The application of compost can increase soil organic carbon over time.

- **Bulk density:** Bulk density is a measure of soil porosity (the number of airspaces between particles). Compost reduces bulk density by increasing the soil's porosity, which can allow for increased water infiltration and storage, allowing plant roots to grow and extract more nutrients.

- **Cation exchange capacity:** Cation exchange capacity (CEC) is a general indicator of soil storage capacity for available, positively charged plant nutrients including calcium, magnesium, potassium and sodium. Composting increases the ability of the soil to hold on to vital plant nutrients. The degree of nutrient stabilisation depends on the specific nutrient and its balance with other nutrients. It is important to note that nitrogen is generally less available to the plant after composting.

- **Nutrient levels:**
  - Nitrogen – Compared to nutrients in synthetic fertilisers, nutrients in composts are less water soluble, especially nitrogen, and are therefore less likely to be lost through leaching and runoff. The carbon to nitrogen (C:N) ratio influences the immobilisation and availability of nitrogen to the plant. A low nitrogen drawdown index (NDI) is desirable.
  - Phosphorus – Composts contain phosphorus, which can contribute over time to the soil phosphorus pool. Using composts may also increase the availability of phosphorus in the soil.
  - Potassium – The improvements in the cation exchange capacity of the soil when composts are applied increase the availability of potassium.
  - Trace elements – Composts contain organic compounds that bind trace nutrients, making them more available to the plant.

Applying composts in vegetable production systems

Compost can be applied as a broadcast throughout the entire field and then incorporated with discs, plough or tillage equipment; however, it is more efficiently used when incorporated into the planting bed.

The amount of compost applied depends on what is being targeted in the vegetable production system, whether it be rehabilitating or maintaining the existing system.

Applying a small amount of compost more regularly is recommended as it keeps the soil biology progressing over time. Compost should be applied to the top 10cm of the soil

Case study: Compost boosts productivity in the Northern Adelaide Plains

A trial applying composts to a vegetable production system in the Northern Adelaide Plains was found to improve soil health and marketable yield while better managing salinity issues and reducing inputs.

Low soil organic carbon is a key constraint to the longer-term productivity for growers in this region, and the incorporation of composts was found to increase soil organic carbon levels to about 3% (within the target range). As soil organic carbon reduces over time, regular applications of compost will help to maintain the levels required for strong vegetable production.

The application of compost produced the following benefits during the trial:

- Heavily reduced fertiliser use
- Reduced irrigation requirements and improved drainage
- Better management of salinity issues
- Healthier root growth and better uptake of nutrients
- More even crop growth and quality, leading to an increased marketable yield
- Improved crop longevity and longer harvesting period.

FURTHER INFORMATION

- The 'breakdown' on composts (Soil Wealth ICP): https://soilwealth.com.au/2019/09/the-breakdown-on-composts/
- Cool Compost for Vegetable Growers (Circular Ag): https://circularag.com.au/compost/vegetable-grower/
- Compost fact sheets (Freshcare): https://www.freshcare.com.au/factsheets/
- Recycled organics compost for vegetable growers (NSW Environment Protection Authority): https://soilwealth.com.au/2020/10/recycled-organics-compost-for-vegetable-growers/
- How and why to use recycled organics compost in vegetable production (NSW Government): https://soilwealth.com.au/2020/08/how-and-why-to-use-recycled-organics-compost-in-vegetable-production/
- How FOGO compost is made and why it's safe to use in horticulture (NSW Environment Protection Authority): https://soilwealth.com.au/2021/05/how-fogo-compost-is-made-and-why-it-is-safe-to-use-in-horticulture/
- Recycled organics compost: Drought tolerance benefits (NSW Environment Protection Authority): https://soilwealth.com.au/2020/10/recycled-organics-compost-drought-tolerance-benefits/
- Compost boosts soil health on the Adelaide Plains, South Australia (Soil Wealth ICP): https://soilwealth.com.au/2023/02/compost-boosts-soil-health-on-the-adelaide-plains-south-australia/

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compost for soils

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