

Compost and nutrients - calculating the nutrient input of compost application

All compost contributes nutrients to your system and it is important to account for these additional nutrients. Compost amendments not only have fertiliser benefits but can also increase soil organic matter, improve water-use efficiency and suppress disease.

Calculating the nutrient input of compost application is beneficial for several reasons:

- getting value for money! Account for the additional nutrients that compost supplies and spend less money on inorganic fertilisers, while spreading the risk of fertiliser application throughout the season.
- increasing soil nutrient holding capacity.
- protecting the environment. Excess nutrients may leach into waterways and cause water pollution problems like algal blooms.

Compost called 'soil conditioner' has a finer texture (<16 mm particles) and is used for its fertiliser properties. It has a higher nutrient content than coarse-textured compost called 'mulch' (>16 mm). For more information on compost specifications see the Compost Characteristics fact sheet.

Composted mulch achieves other significant goals like water saving, soil temperature moderation and weed control. It can also contribute some plant nutrients, but generally at much slower rate than soil conditioner.



Dramatic changes to soil health plus increased plant growth may be seen when compost soil conditioner is applied to soil. This is especially evident in poor or highly degraded soils. The benefits of compost often increase over time and the benefits may be observed over a 3-5 year period.

Composted mulch

Orchards and vineyards
The Recycled Organics Unit (ROU) has developed a nutrient calculator to give you an indication of the nutrient contribution of composted mulch. This contribution will depend upon many factors which are beyond the scope of this fact sheet. You can find the calculator and more information here: <http://www.recycledorganics.com/product/agriculture/mulchnutcalc/mulchnutcalc.htm>

Total and available nutrients

Nutrient levels can either be described as total nutrients or plant available nutrients and both forms should be reported.

Not all of the nutrients in compost are immediately available for use by plants and microorganisms - this is also the case in synthetic fertilisers. The available nutrient levels in the compost will depend on compost type and its chemical properties, the rate and method of application as well as crop and soil type. Available nutrient levels and total nutrient levels, give a much better indication of the nutrients that compost is likely to contribute to your plants over the crop cycle.

For more information, check out the Compost Characteristics fact sheet on www.compostforsoils.com.au

To use the calculator you need to know:

- the amount of nitrogen (N), phosphorus (P) and potassium (K) that is applied via traditional fertiliser practices (total nutrient application not total fertiliser application rate).
- compost characteristics such as moisture (%), bulk density (kg m³) and total N, P and K. You can find this information on the product specification sheet from your compost supplier. If you don't have this information, you can use the averages (default values) in the calculator.
- mulch application height and width (cm), number of trees/vines per hectare and the distance between the trees/vines OR the total volume or weight of mulch applied per hectare.

The calculator then shows the estimated nutrient contribution from composted mulch over three years and deficit or excess of nutrients. A deficit means that additional nutrients are needed to complement compost application, while an excess means that nutrients available from mulch may be surplus to requirements.

This calculator, and the nutrient figures it is based on, was developed after an extensive review of the international literature. These figures give the best estimate on the basis of current data and the rate of nutrient release from composted mulch application will vary depending on the climate, soil type and management practices on each property.

Compost soil conditioner

The Recycled Organics Unit (ROU) has also developed a nutrient calculator to give you an indication of the nutrient contribution of compost soil conditioner. This contribution will depend upon many factors which are beyond the scope of this fact sheet. You can find the calculator and more information here: <http://www.recycledorganics.com/product/agriculture/mulchnutcalc/mulchnutcalc.htm>

There are three basic pieces of information you will need to use compost effectively as a fertiliser:

1. Baseline soil analysis from your property. A standard soil analysis from an appropriate laboratory will give you the current nutrient levels in your soil (total and available).
2. Analysis of the compost you are planning to apply. Your compost supplier will be able to provide you with a current analysis of the product and this will include available and total N, P and K levels as well as a range of other measures such as moisture content, bulk density and cation exchange capacity (CEC).
3. Crop nutrient requirements (kg/ha). Different crops or production systems will have different nutrient demands. Check with your local agronomist to find out the requirements of your crop.

Calculate the amount of compost required (t/ha) so that the crop nutrient demand for the first primary nutrient is met and then calculate the additional fertiliser quantities that may be needed to meet crop demand for primary nutrients. A 'top-up' with traditional fertilisers will generally be needed for nitrogen for example, in the first year depending on your crop.



Phosphorus

Look at the phosphorus retention index on your soil tests - this gives an indication of the amount of phosphorus that is locked up in the soil and not available to your plants. Adding compost to your soil may make this phosphorus more plant available. In addition, around 30-40% of the phosphorus in compost will be crop available after the first application and up to 100% will be available after the third year. The 'Colwell P' test (or other relevant available P tests) will tell you how much phosphorus is plant available in your compost and can be used to estimate additional crop phosphorus needs.

Applying compost can significantly replace inorganic fertiliser phosphorus requirements not only through the phosphorus in compost, but the subsequent increase in plant available phosphorus in the soil due to increased soil carbon and microbial activity. This may vary considerably with crop and soil type, soil moisture or the amount of irrigation applied.

Nitrogen

In a similar way to phosphorus, compost may stimulate mineralisation of soil nitrogen and increase the availability of nitrogen within the soil. Quick growing crops like lettuce may not see the benefits of increased nitrogen applied via compost in the first few crops: phosphorus and potassium will generally have more of an immediate impact. Other benefits of compost such as disease suppression may be more important in short term crops like lettuce than increased nitrogen levels. Longer growing crops such as tomatoes, capsicum, potatoes and cereals may demonstrate a greater response from nitrogen in the first season after application.



In some cases, up to 200 kg/ha less nitrogen has been applied as inorganic fertiliser when compost has been used in vegetable crops. An equivalent or better crop yield response was seen, in this case with broccoli and carrots. With compost costs approximately 70-80% less than fertiliser costs, applying compost for its fertiliser potential can pay significant dividends. It is also important to remember that only a fraction (20-50%) of the nitrogen in traditional fertilisers applied to crops will be used by the plant. The rest will often be lost by leaching through the soil and gas emissions. The nitrogen in compost is much more likely to be actually taken up by the plant, rather than lost through leaching or gas emission. While it is NOT suggested that compost be applied in quantities to deliver the entire nitrogen requirement of your crop, applying compost will help to build soil organic nitrogen and stimulate nitrogen mineralisation.

Potassium

The application of compost soil conditioner will generally result in a significant contribution of potassium in the short-term. Not all of the potassium in the soil is available for uptake, which means that the amount of potassium in the soil does not always correlate with the amount that is used by the plant; this will depend on your soil type and its

chemical properties. Again, monitoring plant and soil potassium levels is crucial to achieving a good balance, and fertiliser applications may need to be adjusted to account for an increased nutrient supply.

Potassium is an important nutrient for plant nutrition and health. Compost applied to potassium deficient soils in vineyards has been shown to increase levels from deficient (0.046 mg/kg) to sufficient (0.061 mg/kg) within a relatively short period of time. Vines suffering from potassium deficiency improve almost immediately with the application of composted mulches.

Following up.....

The nutrient benefits and impacts of compost will vary with the type of compost used, crop type, crop rotations, soil type, climate, temperature and soil moisture or the amount of irrigation applied. It is important to monitor your soil to highlight changes in soil properties and nutrient management after compost application. This will help you to get the maximum benefit out of compost and you can adjust compost and traditional fertiliser applications to suit your specific needs. As soil properties change over time with compost incorporation, other soil management factors such as irrigation, cultivation and spray programs may have to be adjusted. Good soil monitoring practices will help you to identify and manage any necessary changes.



References

- ¹ *Blaesing, D. (2003) Controlling nitrogen losses - can we learn from the European experience? CDROM Proceedings of the 11th Australian Agronomy Conference, Geelong, Victoria.*



An initiative of Compost Australia

For more information and a list of quality suppliers, go to

www.compostforsoils.com.au

the resource for compost users