

# Are your base dressings doing more harm than good?

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- Traditionally, base dressings of manure or fertiliser that are high nitrogen, are used so new strawberry plantings have immediate access to nutrients.
- Now there is widespread use of fertigation, this practice has become redundant, yet it is still popular.
- Apart from the cost, use of nutrient-rich base dressings could also harm profits by damaging the roots of young plants and runners and reducing crop yield and fruit quality.

Base dressings of products like quality humified compost, which are naturally lower in nitrogen, offer an alternative way to boost soil and crop performance by helping to protect young plants from water stress and regulating the supply of nutrients throughout the season.



**High quality mature compost being spread on a vegetable farm; rates of 15 t/ha achieve a good effect.**

Photo credit: Andy Gulliver, C-Wise

## Typical Base Dressings

### Pre-plant fertilisers

Fertilisers such as superphosphate or potassium nitrate are often used as base dressings prior to planting. This is probably a carry-over from vegetable production practices but is not useful for strawberry production, especially on sandy soils.

### Chicken manure

The use of untreated chicken manure was the traditional way of building sandy soils but is not permitted on agricultural land and over a large part of the Perth region due to its ability to breed stable fly. Stable fly (*Stomoxys calcitrans*) is a declared pest under section 22 of the Biosecurity and Agriculture Management Act 2007 (BAM Act) in many strawberry-growing areas.

### Conditioned poultry manure

This is poultry manure which has undergone a composting process for at least six weeks to reduce the breeding of stable fly by at least 90%. These products generally contain excess nitrogen and due to the short composting process, are not stable.

### Mature compost

Mature or humified compost is made from a mixture of organic materials, blended to achieve the correct carbon to nitrogen ratio. They are aerobically decomposed over a long period to produce a stable, biologically active, dark brown product with an earthy appearance and smell. A mature compost contains less nitrogen than manure and helps plants to overcome transplant shock by increasing the water holding capacity of the soil which provides a buffer against heat stress and irregular watering. Mature compost also has a high cation exchange capacity which improves the soil's ability to store and release nutrients. Many lower-cost composts are immature (young) and contain excess nitrogen which is damaging to plants and the environment.

## Strawberry nutrition and how it's at odds with the concept of pre-plant nutrient application

The strawberry plant behaves somewhat differently to a vegetable crop. The addition of too much nutrient early in the season produces large, highly vegetative plants. Cropping is delayed and yield depressed. It is important to program nutrient application to achieve a good balance between vegetative growth and fruiting, and this is especially relevant early in the life of the plants.

In the first few weeks after planting, the total fertiliser requirement of a crop may be less than 1% of its full requirement. At this stage, the crop has only a shallow, confined root system. Placing fertiliser in the root zone, and having it stay at that shallow depth long enough for the crop to get its requirements, presents a challenge.

Later, the crop may be doubling its weight weekly, and large amounts of fertiliser will be required to meet these needs. By this time, the crop's root system is much more extensive, and it can take up nutrients for a longer time and from greater depth.

The application of products such as conditioned poultry manure can double the amount of nitrogen and triple the amount of phosphorus supplied to a crop over the season.

**Repeated trials at the Medina Research Station and in the Wanneroo area, have shown that nitrogen rates beyond 450kg/ha decrease fruit quality.**

The addition of modest rates of conditioned poultry manure will result in a total nitrogen load for the season of around 1000 kg/ha.

During plant establishment, overhead irrigation water applied to cool the plants and prevent wilting while new roots form enters the soil through the planting holes and leaches nutrients from the mound. Then, once trickle irrigation is started, the relatively large area of unexplored soil around the plants will also be a source of leaching until the roots grow and are able to explore that area.

Table 1 shows real data from a demonstration site in Wanneroo. The site had conditioned poultry manure applied at about 50 tonnes per hectare. Fertigation started four weeks after planting.

In the first few weeks after planting, the leachate collected in lysimeters beneath the trial indicated very high nitrogen content with the quantity of nitrogen leached in the first two weeks being triple that of subsequent weeks (Figure 1). This period overlapped almost entirely with the duration of overhead irrigation for crop establishment (18 April to 3 May). Since no fertigation was applied during this time, the leaching must have been generated largely by the base dressing, however since the total amount of nitrogen leached was far more than what was theoretically applied, there must be other sources of nitrogen not accounted for. The amount or composition of the composted chicken manure applied may have been quoted incorrectly. Crop residues and nitrogen released due to soil fumigation are other possible sources of variation.

EC levels also were a concern in those early weeks (Figure 2). Cultivars such as 'Fortuna' are particularly sensitive to EC and any root damage will likely impact adversely on plant establishment.

**Table 1. Major nutrients applied by source to demonstration site for the season.**

	Kg/ha				
	N	P	K	Mg	Ca
<b>Base dressing of conditioned poultry manure</b>	554.7	264.2	264.2	na*	na*
<b>Fertigation (from four weeks post-plant)</b>	518.3	129.9	744.4	73.5	312.2
<b>Total nutrient applied</b>	1073.0	394.1	1008.6	na*	na*

na\* - data not available

## NITROGEN LEACHED IN FIRST THREE WEEKS AFTER PLANTING

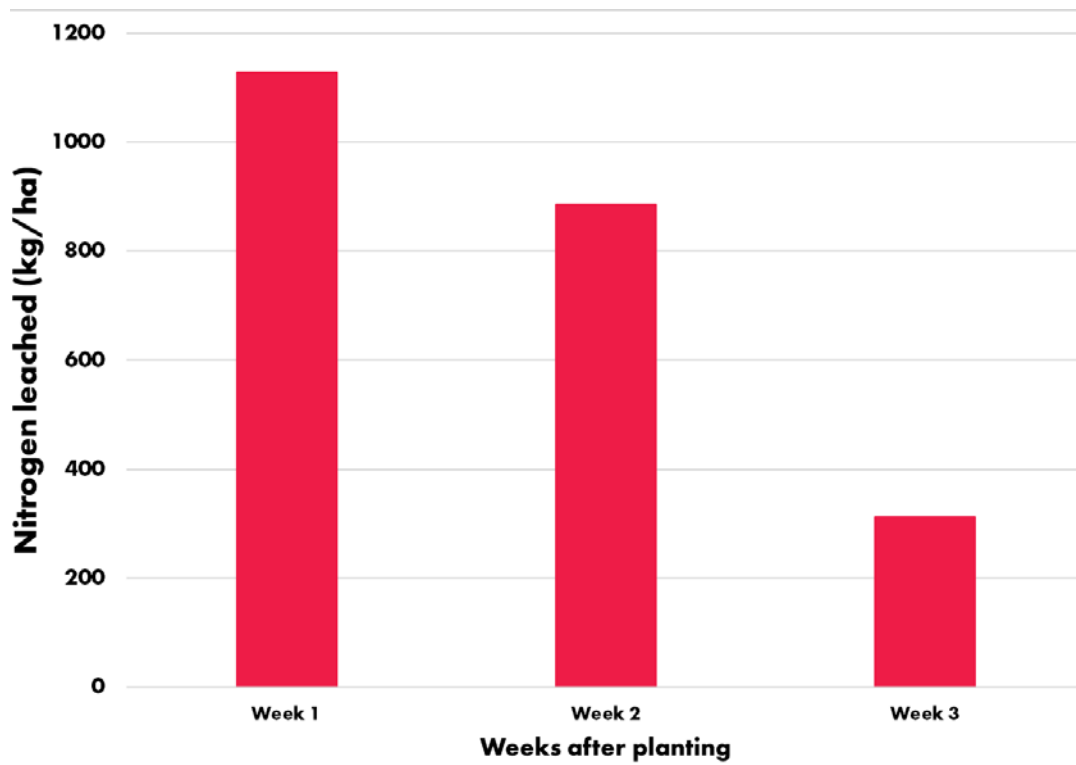


Figure 1. Nitrogen leached under the demonstration site (kg/ha) in the first three weeks after planting.

## EC READINGS IN FIRST FOUR WEEKS AFTER PLANTING

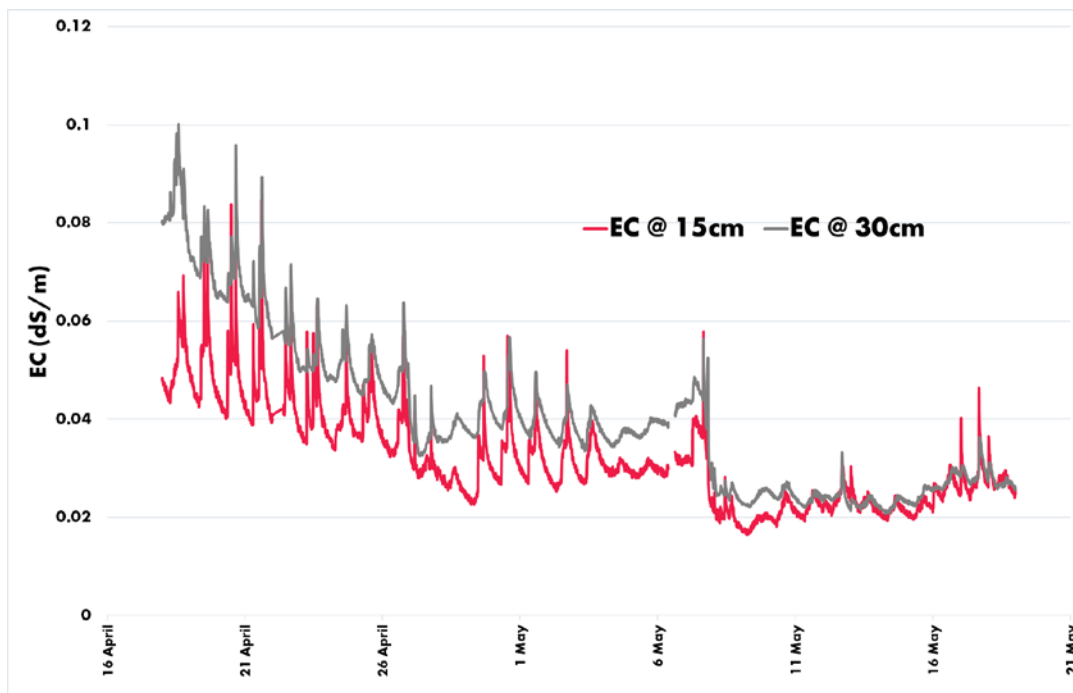


Figure 2: Trend in EC at the demonstration site for the first month.

## Improving soil performance with clay and mature compost

In the main strawberry growing areas of Wanneroo in WA, both clay and organic matter levels are low. Clay levels typically range from 1.5 – 2.0% and organic carbon from 0.37 to 1.2% in the top 0-15cm soil layer. This impacts a range of factors such as lateral spread of water, non-wetting, nutrient retention and availability (Cation Exchange Capacity or CEC) and leaching.

Trials in Western Australia, on vegetable crops have shown that gradual improvements to soil carbon, water holding capacity and CEC are possible with repeated applications of mature compost. Intensive cultivation between crops will reduce accumulated soil carbon. To maximise benefits to soil quality, mature (humified) compost in which the carbon is more stable and persists for longer should be applied. As composts become more mature their CEC increases which helps the soil to hold more nutrients and better regulates the supply of nutrients to the plant. Low rates of mature compost (15 t/ha) are required to achieve a good effect.

Conditioned poultry manure and young (immature) composts come with soluble nutrients, unlike mature or humified composts which go through a much longer process. When soil CEC is low (as it is in sandy soils) using immature products inevitably results in leaching. Strawberries are also sensitive to a high Electrical Conductivity (EC) which is also associated with high nutrient levels.

### Selecting a quality compost is important

If you plan to use compost, make sure that your supplier manufactures a mature product under a recognised quality assurance system. Members of the Australian Organics Recycling Association is a good place to start ([www.aora.org.au](http://www.aora.org.au)).



### Reports Referenced

Paulin, O'Malley, Wilkinson, Flavel (2004) Identifying the benefits of composted soil amendments to vegetable production. Report to Horticulture Australia Ltd, Project VG 990016  
Reid (2015) A focus on irrigation and fertiliser practices to improve production efficiency for LOTE strawberry growers. Report to Horticulture Innovation Australia, Project BS12025

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A few growers have trialled additions of clay. Adding clay is an expensive process when it has to be brought in. In the south-west of Western Australia, a process called delving is practiced where clay is brought up from the subsoil below. This is not an option on the Swan Coastal Plain. Then the question is what sort of clay – sodium or calcium bentonite or kaolinite?

Finally, there is the risk of bringing in disease with clay unless the source is known, and the material tested beforehand.

There is some evidence that a combination of compost and clay works well. Some of the compost manufacturers offer this now as a pre-blended alternative.

Note, once clay and/or mature compost are added (depending on the rate used) many soil parameters are changed so irrigation and nutrition programs need to be reformulated.

## Conclusion

Any base dressings should be used with the aim of improving soil quality rather than as a source of early nutrition.

It is important to ask questions about any product being offered to ensure it is fit for purpose since on sandy soils, any nutrients applied in base dressings to a strawberry crop may be leached in their entirety during the period of overhead irrigation for plant establishment.

This represents an economic loss and potentially generates elevated levels of nitrogen (and possibly other nutrients) in groundwater.

During the early period of plant establishment, high EC levels in the soil can also cause damage to young emerging roots, delaying growth and allowing entry of any pathogens present.