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Using SMRC Compost on Your Farm

Contents

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Information was collated from the latest scientific information. Individual situations vary considerably and farmers should seek advice from their own advisors prior to implementing their own programs based on this information.

1. Introduction

For many years farmers have exported the nutrients in their farm soil off the property in the form of harvested crops and our focus in the farming community has, in the most part, been to replace these nutrients using chemical fertilizers.

The introduction of compost based on MSW (municipal solid waste) provides an exciting opportunity for the farming community. This opportunity has two main aspects:

- An opportunity for farmers to increase organic matter in soils with a cost-effective off farm source.
- Recycling organic matter from waste food to complete the cycle of organic matter from farm to city to farm;

The aim of this booklet is to provide practical information on use of compost for farmers of all types. Background information is also presented on the role of organic matter in soils and how soils and crops may benefit from compost use.

2. What is Compost?

2.1 Types of compost

Composts can be divided into two basic categories:

A) Fine compost

This has generally been composted for an extended period and screened to remove larger particles and/or physical contaminants.

This compost can be used as a soil amendment in all types of agriculture, such as fruit, vines, turf and cereal crops.

It is used at indicative rates of 3-40 cubic metres per hectare, which is a 0.3 to 4mm layer across the soil. This is not thick mulch.

Fine compost works best when it is incorporated into the soil to provide a source of organic matter and microbial inoculation for soils and crops.

Compost can be produced from a variety of plant and animal wastes and composition can be largely dependant on the availability of materials. In the case of the SMRC compost it is produced from municipal solid waste (MSW) from homes in the southern suburbs of Perth. For more details on compost quality and a description of the SMRC/Waste Compost Facility see Section 4.

Many of the nutrients in fine compost are generally available during the life of the crop or season ie over a 3-4 month period.

B) Composted mulch

Mulch is generally based on pulverized wood, straw and/or green waste. It is used as thick (50-75mm) layer on top of the soil to retain moisture and suppress weeds and is normally used under trees and vines.

The woody material is more resistant to decomposition than fine compost and provides a longer surface cover in the field.

Mulches cannot be considered nutrient sources and as such is not suitable as a soil amendment or replacement for fertiliser.

You should avoid uncomposted mulches as they may introduce weed seeds and pathogens to your soil.

2.2 Benefits of using SMRC compost

Table 1. Advantages/Disadvantages of using SMRC compost

ADVANTAGES	DISADVANTAGES
Low cost	Bulky to handle
Good source of organic carbon	May require new spreading equipment
Retains extra moisture in soil	Cost of freight
Retain more nutrients from applied fertilizers	Breaks down over time
Source of microbes to inoculate soils	Low nutrient levels in compost
Source of microbial food to improve nutrient cycling in soil	
No nitrogen draw down compared to straw, sawdust, etc	
Increases soil cation exchange capacity	
Available all year round	
SMRC compost is screened to remove physical contaminants	
SMRC compost is closely monitored to ensure compliance with chemical contaminant standards	

3. Using SMRC Compost in Farming

3.1 Role of Organic Matter (carbon) in Farming

In a natural system, there is ongoing addition of organic matter to soil due to animal activity and/or the demise of animals, whole plants, branches, leaves and fruit. In this way, nutrients are continuously cycled within the ecosystem.

Farming practices such as the type of plants grown, the use of synthetic fertiliser and/or compost, tillage practices, and crop rotations all affect the amount of soil organic matter in a farm's soil. Much of the organic matter that would naturally return to the soil is removed during harvesting and pruning. Consequently, agricultural soils become low in organic matter and nutrients without some form of external replenishment such as compost. The use of synthetic fertilisers generally increases the breakdown rate of soil organic matter.

The role of organic matter varies depending on soil type:

- In a clay soil, organic matter reduces the soil density, increasing porosity, resulting in improved aeration and drainage
- In a sandy soil, organic matter provides structure through the formation of aggregates allowing better retention of water and nutrients.

3.2 What is Humus?

Humus is the largely stable fraction of organic matter that remains following decomposition of plant and animal materials by soil microorganisms. About 65% of the non-living part of soil organic matter is humus. It is known to be an important buffer, slowing down changes in soil acidity and nutrient availability (Handreck, 1979).

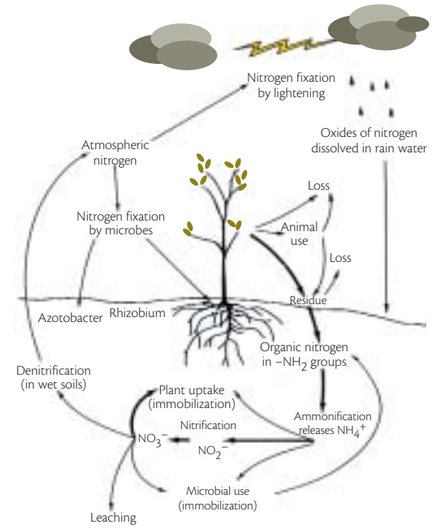
Humus is a dark colour and contains significant amounts of nitrogen and sulphur, as well as other plant nutrients.

Humus has an electrical charge (negative) that allows it to hold onto positively charged soil nutrients (such as calcium, magnesium, potassium) and in this respect has a similar role to clay in the soil.

Humus can be divided into two basic categories:

- The first which readily decomposes and can provide a short term nutrient supply to plants; generally within the life of an annual crop or season (ie 3-4 months)
- The second which is a more stable fraction that is resistant to decomposition for tens to hundreds of years.

Well made compost can be a good source of humus.



From Soils An outline of their properties and management CSRIO Soil Series 1992. p19

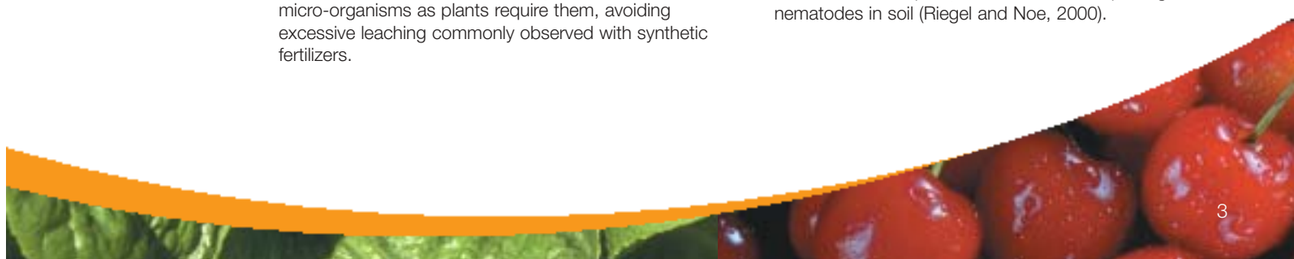
3.3 Microbial Activity with Compost

The addition of compost to farmland supplies nutrients, energy and a habitat for soil organisms as well as introducing new populations of beneficial microbes to the soil.

The benefits associated with high soil microbial activity are reported to occur in a number of ways.

Nutrient availability - In compost amended soils, decomposing micro-organisms form part of a balanced system. Nutrients are continuously mineralized by micro-organisms as plants require them, avoiding excessive leaching commonly observed with synthetic fertilizers.

- Disease suppression - It has also been shown that soil microbes can help control plant diseases (Akhtar and Malik, 2000). They concluded that organic soil amendments such as compost stimulate the activities of micro-organisms that are antagonistic to plant parasitic nematodes and other soil borne diseases. This was supported by other researchers who found that high microbial activity was linked to a reduction of P. cinnamomi infection in an avocado plantation (Sivasithamparam, 1994) and attributed increasing numbers of bacteria and fungi, associated with chicken litter compost, to the decrease of pathogenic nematodes in soil (Riegel and Noe, 2000).



3.4 Compost as a Source of Crop Nutrients

The starting materials for composts are generally derived from plants and animal waste and as a result they tend to contain many, if not all, of the different macro-nutrients and trace elements that are essential for plant growth.

Soil organic matter serves as a useful reservoir of plant nutrients and as it decomposes significant amounts of nutrients are released in a form needed by plants. In this way, compost functions as a “slow release fertilizer” providing a steady supply of inorganic nitrogen, phosphorous and other nutrients (Chaney et. al. 1992).

This also means that large amounts of plant nutrients are not leached away and wasted before the crop is fully established.

Farming with compost is potentially a more efficient strategy for supplying plants with nutrients.

It has been shown in wheat production that a fertilizer-compost blend, in which 1/3 of the total N was supplied by compost, produced greater yields than those produced when the total N was supplied by synthetic N alone (Sikora and Azam; 1993). This was attributed to an increase in plant available N due to increased compost decomposition stimulated by the presence of synthetic fertilizer.

3.5 Applying SMRC Compost

Unlike synthetic fertilizers and immature compost, SMRC compost that has been matured, should be able to be used at very high rates without any adverse affects on the crop.

Compost is applied with spreading equipment that has a moving belt system and is, depending on the crop, either broadcast by spinning discs or banded into a row (useful in orchard industries).

There are a number of different ways of using compost and Table 2 gives a guide to rates and methods of application for a range of crops when using SMRC compost. The rates will be investigated more during the demonstration program being conducted in 2004 and 2005

Table 2. Indicative SMRC Compost application rates for a range of crops

CROP	APPLICATION RATE (M^3/HA)	METHOD OF APPLICATION
Cereal	5 - 20	Broadcast prior to seeding
Pasture	5 - 20	Broadcast after break of season
Avocado’s	50-75mm thick	Used as a mulch around trees
Wine Grapes	10 - 40	Broadcast or banded
Table Grapes	10 - 40	Broadcast or banded
Fruit Trees	10 - 40	Broadcast or banded
Olives and Nut Trees	10 - 40	Broadcast or banded

If you are uncertain about your specific situation, we suggest that you seek advice from your advisors for application quantities and methods for your situation. You may also contact Organic Farming Systems on 9384 3789 (www.organicfarming.com.au) or your local SMRC compost sales agent.

A range of compost spreading machinery is currently produced locally by two Western Australian companies, Nufab Industries of Dongara (Tel 08 9927 1297; www.nufab.com.au) and Roesner Pty Ltd manufacturer of the Marshall Multi-spreaders in Harvey (1800 651 288; www.roesner.com.au). These spreaders are designed for the application of soil amendments such as composts, manures and lime. Spreaders hold up to 20 cubic metres of compost for larger situations.

Compost can be spread using contractors. Details of contractors in your area are available on the Australian Fertiliser Services Association web site www.afsa.net.au.



4. Compost production

The aerobic composting process has many benefits and it is the preferred system employed to manufacture compost for agriculture. Composting can transform materials that are unsuitable for direct application to agricultural land into a valuable soil amendment (Van Horn, 1995).

In aerobic composting a wide range of oxygen requiring microbes decompose most of the original organic matter and synthesize new organic compounds (humus). High temperatures are usually generated for an extended time, and an amount of carbon is lost as carbon dioxide.

During the early stages of composting, microbial metabolism generates heat which causes the temperature of the compost to rise. Pathogens and weed seeds cannot withstand these temperatures and this effectively kills them (Coyne, 1999).

4.1 Ingredients

Compost from the Southern Metropolitan Regional Council is produced from a number of ingredients. These will vary from time-to-time but include:

- Municipal solid waste
- Biosolids - human waste
- Various quantities of food, vegetable and animal waste collected from selected commercial operations.

4.2 Compost Equipment

The SMRC compost facility is the largest in-vessel compost facility in Western Australia and the largest of its' type in the world. It is capable of producing 60,000t of compost per year.

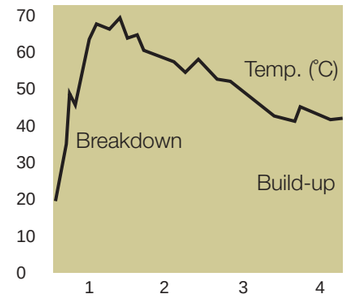
4.3 Managing the composting process and quality

The SMRC quality control program is aimed at achieving the highest possible standards; standards that exceed those accepted in the Australian Standards.

The SMRC closely monitors the raw materials and the finished compost to ensure the production of consistent valuable product and to provide re-assurance that the compost is fit for use on farms.

The SMRC facility is an in-vessel system where the compost process is monitored closely every day. An overview of monitoring is as follows:

- Raw materials are measured for their ability to be composted; including contaminants in every batch.
- The process has real-time monitoring for temperature, moisture and compost gases via computer managed probes into the compost piles. Weekly laboratory tests ensure the compost is developing properly.
- Finished compost is analysed in modern laboratory facilities (on site and in contract laboratories) to ensure compliance with Australian Standards including:
  - o Plant nutrients
  - o Heavy metals
  - o Glass, plastic and etc
  - o Pesticide contaminants
  - o Human pathogens



There are many misconceptions concerning the application of composted wastes to farmland. Commonly the use of compost is thought that it may contaminate soil with heavy metals and plant pathogens. However, it is the nature of the starting material and the management of the process that determines the quality of the end product.

Information is available for farmers on each batch of compost received.

SMRC compost will possess a number of important characteristic. Table 3 highlights some of these.

Table 3. SMRC Compost Characteristics

CHARACTERISTIC	STANDARD
Ingredients	Municipal solid waste (MSW), biosolids
pH	Neutral pH (6.5 - 7.5)
C/N ratio	< 20
Carbon content	High
Maturity	No re-heating after delivery
Odour	No anaerobic (ammonia or sulphide) odours
Colour	Dark brown
Australian Standard - AS4454-1999	Complies
Contaminant levels	As for fertilizers has low levels of
	- Heavy metals
	- Physical contaminants
	- Pesticide residue
Temperature	Reaches 55 - 65 ˚C for extended periods to kill weed seeds, plant and human pathogens.

5. Sources of Information

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