Sustainable Recycled Organics Usage

ON-FARM FACTSHEET SERIES

Fact Sheet: M2.1 Updated: 14/2/2007

MANAGEMENT – Metals in recycled organics

Recycled organic products contain a range of metals, usually at relatively low levels. Some of these metals are beneficial in small amounts, while others can be harmful if levels build up in the soil following multiple applications.

Not all metals present in animal by-products are a problem. Some metals, including copper (Cu), zinc (Zn) and iron (Fe) are essential plant nutrients and are required at low levels in agricultural soils. Other elements, including arsenic (As) for example, are toxic to humans and animals and must be maintained at low levels in the food chain.

Metals from recycled organics may accumulate in soil and can affect plant growth and soil organisms when toxic levels are reached. Metals can become mobile in the soil and potentially pollute surface and ground water systems. They may also be taken up into grass or crops where they can enter the food chain. However, with management these risks can be minimised to ensure that soil, the environment and agricultural produce are not contaminated.

Metals in recycled organics originally come from the animal feed (and bedding). While some metals fed in the diet are taken up by the animals, some will always pass through into the manure. The concentration of different metals will vary between recycled organics because management, feed and bedding materials differ between livestock operators.

What is the risk?

Most recycled organics have a relatively low level of metal contamination. As there are different acceptable concentrations depending on the metal, some levels may appear high but still be in the acceptable range.

High levels of copper and zinc may be found in piggery and poultry litter because they are common feed additives. However, these levels are not likely to exceed the ARMCANZ guidelines for land application (see Table 1 and Table 2).

Cadmium (Cd) and lead are metals of concern to fresh produce growers, though lead is generally considered less of a risk than cadmium. When cadmium is mobilised, plant uptake can occur. Plant uptake of cadmium increases where soils are very sandy, saline or acidic, low in zinc or organic matter, and if irrigation water is salty. Cadmium levels in animal by-products are generally below guideline limits, however, testing of soils and the recycled organic product being applied is useful to ensure levels are acceptable.

Table 1. Limits for contaminants in compost, soil conditioners and mulches for land application (concentrations in mg/kg)

Contaminant	ARMCANZ
Arsenic	60
Cadmium	20
Chromium (total)	500-3000
Copper	2500
Lead	420
Nickel	270
Selenium	50
Zinc	2500

[5] ARMCANZ 2004

Table 2. Example metal concentrations in some recycled organics (concentration in mg/kg)

Contaminant	Layer hen manure (caged hen)	Piggery spent bedding (fresh)[2]	Feedlot manure (stockpiled)[3]
Arsenic	30	-	-
Cadmium	-	1	-
Chromium	-	-	-
Copper	20	200	300
Lead	-	-	-
Nickel	-	-	-
Selenium	-	-	-
Zinc	350	350	1500

[1] Environmental Code of Practice for Poultry farms in Western Australia – units converted from parts per thousand to mg/kg.[2] Nicholas et al. 2006 [3] Watts et al. 1994

Management options

Metals do not need to become a problem if they are well managed. It is suggested that farmers using recycled organics carry out the following steps to minimise the risk of metal toxicity or contamination of produce.

- Request a representative analysis of the product from the by-products producer prior to purchase.
- Ensure that excessive levels of metals are not being applied by calculating the

rate of metals being put on with animal by-products (i.e. concentration of metal x by-product application rate / ha).

- Undertake soil tests regularly to ensure the metal concentrations in the soil are below acceptable levels for plant growth, animal health and toxicity in plant material (particularly for horticulturists).
- Do not apply by-products if rain is forecast to minimise runoff into surface waters.

If recycled organics are going to be used on horticultural farms, it is recommended that producers monitor soils and crops closely, and seek professional advice to minimise the risk of contaminating produce.

Some other fact sheets in this series:
Typical Composition – Layer hen manure
Typical Composition – Piggery spent bedding
Typical Composition – Feedlot manure
Land Application – How much is manure worth?
Land Application – How much should I apply?
Management – Weed seeds in recycled organics
Management – Health risks with recycled organic usage

References and further reading:

[1] Nicholas, PJ, Redding, M, Devereux, J, Kelsey, G, McGahan, EJ, Tucker, RW, Heinrich, NA 2006, 'Developing Guidelines for Use of Spent Deep Litter Bedding – Final Report. Project No. 1969, Australian Pork Limited, Canberra, Australia, June 2006.

[2] Nicholas, P.J., Hewitt, S., Blackall, P.J., Chinivasagam, H.N, Runge, G.A., Klepper, K., & McGahan, E.J., 2005, *Literature Review and Risk Assessment for the Safe and Sustainable Utilisation of Spent Litter from Meat Chicken sheds*. Rural Industries Research and Development Corporation, Barton, ACT.

[3] Tucker, RW & McGahan, EJ 2004, *National environmental guidelines for piggeries: first edition*, project no. 1832, Australian Pork Limited, Canberra, Australia.

[4] Watts, PJ, Tucker RW, Gardner, EA, Casey, KD & Lott, SC 1994, 'Characteristics of feedlot waste', In PJ Watts & RW Tucker (eds), *Designing better feedlots*, Publications no. QC94002, Department of Primary Industries, Queensland.

[5] ARMCANZ 2004, Guidelines for Sewerage Systems Biosolids Management, Natural Resource management Ministerial Council, Australian Water Association, Artarmon, NSW.

[6] AFFA 2001, 'Guidelines for on-farm food safety for fresh produce, Department of Agriculture, Fisheries and Forestry Australia, Canberra.

Produced by FSA Consulting as part of the "Implementation of Sustainable Management Practices for Recycled Organic Reuse for High-Risk Industries and End-use Farmers" project, Funded by the Condamine Alliance. Condamine Alliance is the regional body with lead responsibility for enabling the community to achieve sustainable natural resource management in the Condamine River catchment, at the head of Australia's largest river system, the Murray-Darling Basin.