The User Method Statement

This User Statement complements the Department of Environment and Heritage Protection document "General Approval of a resource for beneficial use—Sugar Mill By-Products (Filter Mud, Filter Mud/Ash Blends and Boiler Ash from Sugar Mill Boilers)"

Introduction

The Queensland Sugar Industry has for many years recognised the agricultural value of by-products produced in raw sugar milling. The ameliorative and soil conditioning qualities available from filter mud and boiler ash have provided productivity benefits within a cropping and manufacturing system which are economically and environmentally sustainable. This is a prominent example of the “reuse recycle” principle adopted within the industry and which extends to green cane harvesting/trash blanket agronomy and the use of biomass fuel for steam and electricity generation.

Filter Mud is the residual mud and fibre removed from the raw juice stream by clarification and rotary vacuum filters. It is comprised mainly of water, fibre, mud solids (from soil) and natural impurities in the sugar cane. Filter mud % cane is approximately 5.0%

Boiler Ash is a by-product produced by the mill boiler as predominantly bagasse fuel is burnt to power the manufacturing process. Varying amounts of soil and other residues are separated out as boiler ash. Some of the nutrients in mill mud/ash are in a form which allows them to be released slowly and remain available for a number of years. Adding mill mud/ash will increase the organic matter content of soils and also supply lime, which is often not considered in the value determination of this product. The lime in mud/ash can help ameliorate sodic soils and improve soil structure and the entry of irrigation water.

Why use mill by-products

Mill by-products are regarded by farmers as products which confer a range of benefits to their soils. There are no other products available that are capable of improving the physical, chemical and biological properties of their soils.

Uses of mill mud and mud/ash mixtures

These products are used for improving soil conditions when replanting cane with no fallow or rest period between cane cycles. At reasonably high application rates they are capable of rejuvenating soils which have been used for continuous sugarcane cropping for at least 5 years and are thought to be capable of ameliorating the build up of unfavourable pathogens under sugarcane monoculture. They also provide a useful source of moisture to soils which are becoming too dry for replanting.

They are used to improve germination with fallow plant cane with their friability, moisture content, organic matter and nutrient content contributing to an ideal environment for promoting rapid germination of cane setts. In countries like Brazil and South Africa where cane is planted by hand into an open drill, mud and mud/ash mixture is commonly applied to the open furrow and the cane setts are placed on top of this.

These products are widely used on ratoon crops, particularly older ratoons, and are thought to improve ratoon growth and assist in obtaining an additional ratoon crop. When used in this way they provide an improved environment for the growth of legume fallow crops following ploughout of the final ratoon crop. Legumes do not generally grow well in acid soils and the lime in mud and mud/ash is effective in ameliorating soil acidity. They also assist in accelerating the breakdown of cane trash, grass and weeds when incorporated into soil.

Despite containing a wide range of nutrients, farmers may not regard these products as fertilizer substitutes and whilst appreciating that the products contain substantial amounts of
N, P, K, S, Ca, Mg and small amounts of trace elements, farmers may be reluctant to make allowance for these nutrients because of perceived variability in nutrient content.

**Uses of mill ash**

Mill ash when not combined with mud is usually applied at reasonably high rates to problem areas within cane blocks where cane growth is poor. The area of application is relatively small but high application rates are required to ameliorate unfavourable soil properties, usually physical ones. Ash improves soil tilth in heavy clay soils where soil structure is poor and lumps are difficult to break down. It improves infiltration of water into hard setting soils and internal drainage. It also improves water holding capacity in both heavy and lighter soils.

Ash is generally regarded as being longer lasting than mud although this may be related to the high application rates. Like mud, ash is regarded as a soil conditioner rather than a fertiliser substitute. Ash contains substantial amounts of P, K, Ca, Mg and small amounts of trace elements. It is recommended as a source of silicon for the treatment of silica deficient soils.

**Typical analysis range of mill mud**

<table>
<thead>
<tr>
<th>Content</th>
<th>% as dry product</th>
<th>% as wet product</th>
<th>Indicative tonnes/hectare - mud mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>N*</td>
<td>1.0 – 1.7</td>
<td>0.22 – 0.37</td>
<td>35</td>
</tr>
<tr>
<td>P</td>
<td>1.0 – 1.9</td>
<td>0.22 – 0.41</td>
<td>36</td>
</tr>
<tr>
<td>K</td>
<td>0.16 – 0.59</td>
<td>0.03 – 0.13</td>
<td>10</td>
</tr>
<tr>
<td>S</td>
<td>0.13 – 0.15</td>
<td>0.03</td>
<td>3.5</td>
</tr>
<tr>
<td>Ca</td>
<td>2.1 – 3.7</td>
<td>0.46 – 0.81</td>
<td>72</td>
</tr>
<tr>
<td>Mg</td>
<td>0.39 – 0.68</td>
<td>0.09 – 0.15</td>
<td>13</td>
</tr>
</tbody>
</table>

Analysis for content of a typical mill mud sample.  *Not all the nutrients become available and remain in organic form

**Typical analysis range of mill ash**

<table>
<thead>
<tr>
<th>Content</th>
<th>% as dry product</th>
<th>Indicative tonnes per hectare - boiler ash</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>N*</td>
<td>0.04 – 0.15</td>
<td>2</td>
</tr>
<tr>
<td>P</td>
<td>0.09 – 0.41</td>
<td>6</td>
</tr>
<tr>
<td>K</td>
<td>0.50 – 1.4</td>
<td>20</td>
</tr>
<tr>
<td>S</td>
<td>0.01 – 0.19</td>
<td>2.5</td>
</tr>
<tr>
<td>Ca</td>
<td>0.36 – 1.22</td>
<td>20</td>
</tr>
<tr>
<td>Mg</td>
<td>0.24 – 0.72</td>
<td>12</td>
</tr>
</tbody>
</table>

Analysis for content of a typical boiler ash sample.  *Not all the nutrients become available and remain in organic form

**Transportation of the resource**

These resources should be handled and transferred in a manner that prevents any release during transport.
Resource storage (general)

Any storage of the resource must be in a quantity that meets the operational demand of the generator and it must be stored in a way that prevents or minimizes contact with stormwater or runoff.

Any pond used for the storage of the resource must be constructed, installed and maintained:

- so as to minimise the likelihood of any release of effluent through the bed or banks of the pond to any waters;
- so that a freeboard of not less than 0.5m is maintained at all times, except in emergencies; and
- so as to ensure the stability of the ponds’ construction.

On-farm storage requirements

The resource must not be deposited or stored within 350m of waters (except ground waters, secure irrigation and confined storm-water systems) unless the following applies:

- Resource is in a solid form; and
- The stockpile size does not exceed 1000m³

Preparation for use

Growers need to take into account the nutrient levels in their soils and ensure that the use of these products does not result in excessive build up of certain nutrients. Ideally a soil sample should be taken for analysis prior to application of these products. The best time for soil sampling is straight after harvest of the last ratoon crop prior to ploughout if the products are to be applied prior to planting. If the analysis shows that soil available P is >50ppm P then mill by-products should only be applied at low rates (<100 wet tones/ha) to avoid excessive accumulation of phosphorus.

The ideal situation is to apply all mill by-products at rates of <100 wet tones/ha so that the risk of nutrient accumulation is greatly reduced. This can be done by applying products only on cane rows using mud and ash trucks. To achieve these low rates, trucks will need to travel fairly quickly within a paddock, currently this is only possible on uncultivated trafficable soils in freshly harvested blocks. If the products are to be applied to cultivated soils it will probably be necessary to stockpile products on-farm and use a special infield applicator capable of delivering low application rates to the paddock.

Considerations prior to application

Regardless of the application method of the resource there are some general environmental considerations to be taken into account when applying the resource. These include:

- Noise and dust generation near sensitive areas (eg. Residential areas) during application
- Avoidance of run-off from the resource by considering weather conditions prior to and during application
- Management of irrigation to avoid run-off of the applied resource

Protection of water bodies such as creeks and rivers from farm runoff is an essential part of the sustainability of the sugar industry. Should mill mud or mill mud/ash mixtures enter a water body then the organic materials in these products can cause oxygen depletion in the affected water body.
**Application Methods**

There are two common methods of applying the resource – broadcast and targeted applications.

Broadcast application refers to the process of spreading the resource behind a moving truck and the application distance is approximately the width of the truck. The benefit of this form of application is the low cost of applicators. The disadvantages of this form of application are:

- Generally uncontrolled and high application rates
- Application to the compacted inter-space

Targeted application refers to the process of spreading the resource behind a moving applicator (truck or tractor driven) and the application distance is the row. The benefits of such an application method include:

- Application will be more uniform down the row and across the block
- Resource is applied to the growth zone enabling the plant more rapid access to nutrients
- As the resource is applied at a lower rate and not in the inter-space, the chance of off-site movement (via runoff) is minimized
- Good value for money

The disadvantage of such an application method is the higher cost of applicators.

**Record keeping**

The resource generator (sugar milling company) will keep the following records when the resource is distributed:

- a. Origin of the resource;
- b. Quantity of the resource;
- c. Quality characteristics of the resource;
- d. The date of the dispatch of the resource;
- e. The quantity of the resource dispatched;
- f. The name of the transporter of the resource; and
- g. The destination of the resource.

The relevant person shall maintain a record of all applications of the resource to land as an ameliorant or soil conditioner as follows:

- h. Location of land application;
- i. Time and date of application;
- j. Actual application rate for this location (expressed as the quantity e.g. loads, metres, tonnes per hectare per application) for each application;
- k. Application method

**Spills and emergencies**

Any spillage or uncontrolled or unintended release of the resources must be cleaned up as soon as practicable and any material adhering to the truck body after loading must be cleaned off and returned to the load or storage, or disposed of to a suitable treatment or disposal system.

**Material Safety**

Material Safety Data Sheets are available for mill mud and mill ash.
Contacts

- Document queries - ASMC on (07) 3231 5001
- Deliveries and application queries – Local contract supplier