



March 2010

NRM Plan

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Clay Spreading on Sandy Soils

Sustainable Agriculture in the Northern and Yorke NRM Region

Spreading clay on sandy soils is being increasingly used by landholders within the Northern and Yorke NRM region to reduce the risk of wind erosion and overcome water repellent sands.

Sandy soils that have moderate to extreme susceptibility to wind erosion occur mostly west of the Hummocks – Barunga Ranges, on the Yorke Peninsula and in scattered areas in the Lower to Upper North. These soils generally have a low soil fertility and poor water holding capacity. Spreading clay on these soils will help to increase soil moisture, retain nutrients, overcome water repellence and reduce groundwater recharge that can cause and increase saline areas.

Issues to consider before spreading clay

Before spreading clay the characteristics of the target sand should be considered such as depth, pH and presence of carbonate (free lime) as this will determine if there will be any potential problems with the addition of clay. The next step is to determine if there is clay available on site and if there is, then the suitability of the clay needs to be assessed. Several backhoe pits may be required to determine the depth of the clay and the type of clay. Characteristics of the clay to be assessed include clay percentage, pH, carbonate level and dispersion.



The clay used for clay spreading can vary significantly in the percentage of the amount of clay it contains. Some claying material may contain low amounts of actual clay while heavier clays may contain more than 50% of actual clay. If clay percentages are higher then lower rates of clay can be applied.

It is best to avoid clay with a high pH particularly when the target sand has a high or very high soil pH as this can increase the soil pH and cause nutritional problems in crops and pastures.

Clay with a high level of carbonate should also be avoided as this can affect nutrient availability and plant root growth. Carbonate can reduce the availability of essential plant nutrients including phosphorus, manganese, zinc and iron. The amount of carbonate can be tested using hydrochloric acid diluted with water (1:10 dilution). If the clay fizzes with the acid then carbonate is present and the greater the fizz the greater the carbonate level.





Where carbonate layers occur down the soil profile remove and stockpile this layer as there may be good clay below this.

The most effective clays are those that break down to fine particles during the action of rain. Clays that slake or disperse are ideal as they breakdown and spread quickly on the soil surface. Generally clays that are yellow, orange or brown and mottled are more likely to be dispersive than red or black clays. The red clays are often better structured and require more effort to incorporate.

Transporting clay to the site greatly increases costs so it is more economic to use the most suitable clay as close to the site as possible.

How much clay to apply?

The amount of clay to apply will vary depending on the average annual rainfall, actual percentage of clay, carbonate levels and depth of incorporation. Rates may vary from 100 tonnes per hectare when using a high percentage of actual clay or up to 200 tonnes per hectare when using sub-soil with a low rate of actual clay or where the sand is deep and loose such as on top of sand hills.

The rates used in the Northern and Yorke NRM region have been about 150 tonnes per hectare using sub-soil with greater than 30% actual clay.

In the lower rainfall areas (<350 mm rainfall) less clay should be used as it will tend to hold water in the top-soil rather than allowing water to move deeper into the soil profile. In these areas about 80-100 tonnes of clay should be applied per hectare.

It is best to start with a mid rate of clay per hectare and then if more clay is needed then this can be applied at a later date. Over claying will be expensive and the clay could create a seal on the soil surface causing problems with crop emergence and water infiltration as well as problems with incorporation.

Clay with a high carbonate level (Figure 1) should be spread no more than 80 tonnes per hectare.

Figure 1: Carbonate percentage determined by a fizz test.



Slight reaction (low carbonate)

High reaction (high carbonate)



Spreading and incorporation

Clay is normally spread by a contractor using specialised machinery that scrapes the clay from excavated soil pits and then spreads the clay at an even rate on the surface. The clay is best spread in late summer/early autumn period as then allows the clay on the surface a longer time to breakdown before seeding.

Good incorporation is necessary to thoroughly mix the clay with the sand. This prevents the clay on the surface from sealing and allows more even water infiltration.

The clay can be incorporated on the surface with normal tillage machinery. Some farmers use wide points and others use off-set disc machines. Specialised machinery such as a spader has the ability to mix the clay within the sand with fewer passes. The clay should be incorporated to a depth of 10-15 cm.

With clay spreading mechanical incorporation is necessary to mix the clay with the sand but once the clay has been incorporated then farmers can return to using a one-pass sowing system with narrow points or disc seeders.

Nutrition following clay spreading

Clay spreading can alter both the nutrient status of the soil and the ability of the plants to take up nutrients. Nitrogen demand may increase with higher crop or pasture growth. Phosphorus levels may decrease slightly as the phosphorus levels in the clays are much lower than the top-soil. Where clays have a high pH or are calcareous, manganese and possibly zinc could be an issue on sensitive crops. Soil and/or tissue testing is recommended to determine plant nutrient levels.

Figure 2: Spreading clay in the Northern and Yorke region





Cost: Benefit

The cost of clay spreading is expensive and many landholders choose only to do a small area per year. Experience from the south-east of the State has shown that once an area has been spread with clay the benefits have lasted for more than thirty years.

Further information

Help and assistance

