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Sources of lime in the South West

By I. M. Brown, Geologist, Geological Survey of Western Australia

Many Western Australian farmers topdress or incorporate lime into their acid soils to neutralise them and to improve crop or pasture yields. Most use pulverised limestone or limesand which is cheap and relatively easy to spread.

Agricultural lime is defined as “any fertiliser used principally for the purpose of reducing soil acidity and having calcium carbonate or magnesium carbonate, or both, as its main ingredients”.

Most of the developed and undeveloped sources of lime in the South-West occur within extensive deposits of limestone and limesand present around the coastline. There are much smaller deposits inland.

Less extensive sources of liming material are found in scattered inland areas where deposits of calcrite have been formed by the weathering of calcium-rich rock and also in association with internal drainage systems. Magnesite, generally formed by the weathering of ultrabasic rock (an igneous rock relatively poor in silica and rich in iron and magnesium minerals), also forms a potential source of agricultural lime.

Limestone

Most of the limestone produced in the South-West is from the Tamala Limestone, also known as Coastal Limestone, which is exposed along the western and southern coasts of Western Australia.

The Tamala Limestone consists of ancient sand dunes formed of shell fragments and quartz grains cemented together by calcium carbonate. The calcium carbonate content varies considerably. Although there are large quantities of this limestone, only limited amounts of material of a sufficiently high grade for agricultural lime production are known.

Limestone containing some material possibly suitable for agricultural use is found north of Perth around Bringo Siding east of Geraldton (the Newmarracarra Limestone), around Gingin (the Gingin Chalk and the Muchea Limestone) and between Kalbarri and Carnarvon (the Toolonga Calcilutite). Little information regarding quality and quantity of material is available.

South of Perth the Nanarup Limestone Member of the Werriup Formation, exposed at Nanarup about 20 kilometres east-north-east of Albany, contains material with a high calcium carbonate content.

Further east, along the south coast, the Nullarbor, Abrakurrie and Toolinna Limestone of the Eucla Basin is relatively pure and large quantities are available.

Inland, sandy limestone is present in the Eundynie Group at Lake Cowan near Norseman and possibly in nearby Lake Lefroy.

Limesand

Limesand, called Safety Bay Sand, is found in many Western Australian coastal areas where it is intermingled with Tamala Limestone. The sand is composed of shell fragments with quartz as an impurity.

Unlike limestone, limesand is largely loose and uncemented. It is more easily extracted and may not need crushing to produce material suitable for agricultural liming purposes. A further advantage is that it commonly has a higher magnesium carbonate content than the Tamala Limestone.

Limesand is relatively abundant in coastal areas north of Perth. Moderate to high-grade material is known to occur between Dongara and Denison, along the coast near Jurien, Cervantes, Lancelin and Mullaloo and at Mount Moke on Garden Island off Fremantle.

South of Perth limesand is less extensive, although a deposit 15 km north of Augusta, the Boranup Sand Patch, contains a considerable quantity of high-grade material.
**Calcrite**

Calcrite is formed from the weathering of calcium-rich rock and is found in scattered inland areas. It is a potential source of liming material. Deposits however are usually thin and cover a limited area.

Production has been reported in the past from Southern Cross, Marvel Loch, Wiluna and Moyagee. Calcrite deposits are also known to occur in association with systems of internal drainage, for example around Lake Magenta 45 km south-west of Newdegate and in an area 100 km east-north-east of Hyden.

**Magnesite**

Magnesite is a magnesium carbonate mineral. In Western Australia it is generally derived from the weathering of magnesium rich ultrabasic rock. Intermittent production has been recorded, mostly from Ravensthorpe, Coolgardie and Bulong. Numerous other small deposits of magnesite have been reported.

**Other sources**

Flue dust, produced as a waste product during cement and quick lime manufacture, has potential as a liming material. When derived from lime manufacture, flue dust has a high neutralising value and also contains magnesium, sodium and potassium. Flue dust is also particularly reactive because of its fine particle size, but may require granulation to make its spreading easier.

**Developed sources of lime**

Agricultural lime is produced from a number of deposits in the South-West. Material is supplied by more than 10 companies, as shown in the Department of Agriculture’s List of Registered Fertilisers (Bulletin No. 4072). Other suppliers produce material of a grade not necessarily meeting the quality requirements of the Fertiliser Act for agricultural liming purposes.

The map shows the location of agricultural lime production centres relative to areas affected by soil acidity and potentially acid soil areas.

Most of the current production of lime is based on deposits of coastal limestone and limesand. Liming material is also produced from limestone deposits 265 and 530 km east of Kalgoorlie at Kitchener and Loongana respectively, adjacent to the Trans Australian Railway, and from a deposit of calcrite near Lake Magenta.

**Conclusion**

Despite the general abundance of limestone and limesand in the coastal zone of the South-West, material suitable for agricultural liming purposes is restricted. It tends to be concentrated in areas somewhat remote from regions of potential use.

Information regarding the grade and extent of inland sources of lime is limited, but some potential appears to exist for their development.

Several sources of lime are being exploited and development of others is likely. However, the viability of extractive operations depends upon the nature of a deposit (especially size and grade) and its proximity to users.

Many suitable sources of lime cannot be mined because of industrial and urban development or the creation of conservation reserves.

People involved in land-use planning need to be aware of the importance of protecting valuable deposits of natural raw material for future use by the community. Failure to observe this basic principle can cause costly inconvenience to both producers and consumers whose activities depend on this mining.

**References**


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**Lime quality**

The value of agricultural lime lies mostly in its ability to neutralise acid. In some situations the presence of plant nutrients, particularly calcium and magnesium, can be important.

The quality of lime is measured in terms of the amount of acidity the lime can neutralise (its neutralising value) and the speed at which it works. This depends mainly upon the fineness of the lime particles.

The neutralising value of a liming material is determined by its chemical composition and purity (see Table). Measurements of the neutralising value are expressed as a percentage of the neutralising value of pure calcium carbonate.

When buying agricultural lime it is important to know its neutralising value. If alternative lime materials are fine enough then their relative value for money can be compared simply by multiplying each one’s price on farm with its neutralising value and comparing the result for each type of lime.

Under the Fertiliser Act (1977) agricultural lime can be registered as First Grade if it has a neutralising value of 75 per cent or more and consists of 80 per cent or more of fine material (less than 0.6 mm diameter). This level of fineness is probably a suitable minimum quality to demand when buying lime.

When other nutrients are needed as a component of lime, a minimum concentration of the nutrient should be guaranteed.

Stricter limits of fineness and neutralising value of lime are necessary for pelleting legume seeds.

**Neutralising values (%) for a range of liming materials**

<table>
<thead>
<tr>
<th>Material</th>
<th>Neutralising Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure calcium carbonate</td>
<td>100</td>
</tr>
<tr>
<td>Crushed limestone</td>
<td>20-99</td>
</tr>
<tr>
<td>Limesand</td>
<td>20-99</td>
</tr>
<tr>
<td>Burnt lime (quick lime, builders lime)</td>
<td>178</td>
</tr>
<tr>
<td>Hydrated lime (slaked lime)</td>
<td>134</td>
</tr>
<tr>
<td>Cement</td>
<td>105</td>
</tr>
<tr>
<td>Cement works flue dust</td>
<td>100</td>
</tr>
</tbody>
</table>