THE LIME INDUSTRY IN SOUTH AFRICA

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This paper will deal mainly with the production and distribution of agricultural liming materials.

What is Agricultural Lime?

Agricultural lime is the term used for limestone which is used in agriculture for pH control of acid soils. It is a misnomer in that by far the most commonly used material is a grade of limestone somewhat lower in quality than that used to produce burnt lime.

Chemically, it is basically a mixture of calcium and magnesium carbonates with silica in the form of sand and silicates of various metals, and alumina in the form of aluminates constituting the rest. These various metals (mainly iron, aluminium and manganese) are bound in forms which render them virtually insoluble and thus they do not constitute a danger to plants. Some use is also made of hydrated lime (calcium hydroxide) and unslaked lime (calcium oxide). These types have to be applied with care as it is possible to increase the soil pH to unacceptably high values with them. Also, particularly in the case of the unslaked lime, they are irritants to the skin and eyes, and have thus to be handled with caution.

Where this lime has a distinct advantage, though, is that the transport cost per unit of lime available for alkalising purposes is less than for limestone. Where material has to be transported over long distances this can be an important factor.

Regulations

As with limestone used in the formulation of stock feed supplements, agricultural limestones must be registered with the Department of Agricultural Technical Services according to Act 36 of 1947. Agricultural limestone is classed as a Group 2 fertiliser and is designated either as a calcitic or as a dolomitic type dependent upon the content of calcium and magnesium carbonate.

To conform with the specification both the calcitic and the dolomitic material must have a content of calcium plus magnesium carbonate of more than 70 per cent. To be classed as a calcitic limestone the magnesium carbonate content must be less than 15 per cent, and more than 15 per cent to be classed as a dolomitic material. 30 per cent of the material must be fine enough to pass a 0,250 mm screen and 100 per cent must past a 1,68 mm screen.

In order to ensure that the material sold meets the specification continual quality control checks are done.

Limestone deposits in South Africa

Large quantities of limestone occur in South Africa. The primary limestone consist of beds and masses of limestone, often metamorphosed, and belong to geological formations of former eras. Secondary limestones were formed in comparatively recent times as a result of the weathering of limestone and dolomite and other lime bearing rocks. Many deposits are not viable because of their distance from rail or from potential markets. The primary limestones of sedimentary origin are usually low in silica, iron and alumina but may be high in magnesia. Natal has only one deposit of any size. This is the so-called 'Marble Delta' situated near Port Shepstone and is a mixture of high grade calcitic stone and dolomitic stone.

In the Cape there are primary limestone deposits in the Malmesbury and Cango formations but exploitation is confined to a few deposits which are favourably situated, viz near Vanrhynsdorp; at de Hoek near Piketberg; near Riebeek West; near Port Elizabeth, in the Humansdorp district; and just outside Moorreesburg. There is a dolomitic deposit which is being exploited near Robertson. There are also deposits which are being exploited in the North Western Cape but only to a limited extent due to their situation.

There is a large deposit of high grade calcitic stone which runs northwards from Silver Streams, (about 160 km west of Kimberley) and stretches for some 200 km. It is this deposit which has been worked for some 20 years by the Northern Lime Co Ltd at Lime Acres and where a new plant is due to commence operation by the Union Lime Co Ltd. The deposit is mined to a depth of about 15–20 metres. The overburden/stone ratio is about 1:1.

Another source of primary calcitic limestone which is being worked by The Northern Lime Co Ltd is that at Marble Hall, some 200 km north-east of Pretoria. Dolomite is being quarried near Lyttleton in the Transvaal.

A major deposit of secondary limestone is being exploited along the edge of the Kaap Plateau in a sector extending from just west of Taung (where the Northern Lime Co. Ltd has a lime plant) southwards to Ulco where Union Lime Co Ltd has a lime and cement plant. The area around Lichtenburg, Ottoshoop, Slurry and Kapsteel has large deposits of secondary limestone, derived from Dolomite, which are being exploited.

Shelly limestone of the Alexandria and Bredasdorp Beds occur as outliers in the coastal region between Saldanha Bay and East London. These deposits are economically

viable only in very limited areas. In the Transvaal, on the Springbok Flats, there are large deposits of secondary dolomite stone which are being worked in the Warmbaths area.

In the Immerpan area it is estimated that there are reserves of not less than 100 000 000 tons of dolomitic material which are readily available. The depth of the deposit being worked varies from 1,5 to 6 metres, with up to 1 metre of overburden. Working can be extended to a depth of 15 metres but this involves blasting and makes the cost prohibitive at this stage.

In the Orange Free State there are deposits of secondary limestone which are being worked in the Henneman area.

Recovery

The recovery of agricultural limestone is a relatively simple process and it varies mainly in the scale of operation from place to place. In the case of the large calcitic limestone producers, agricultural limestone is produced along with other stone in a variety of sizes and it may be of interest to describe such a large scale operation. The example taken here is the Northern Lime plant at Lime Acres.

Although the term 'quarrying' is used, it would be more accurate to describe the operation as an opencast mine. In the first step of the process the overburden is stripped by blasting and then using mechanical shovels with capacities of up to 7 cu m and off-highway dump trucks with capacities of up to 85 metric tons each to dump the material. Next the limestone is recovered by a similar technique of blasting, shovelling and removal of the stone to a crushing and screening plant. Care is taken in drilling and blasting to ensure that the stone is not contaminated with dolomitic material.

On reaching the treatment plant, the stone passes through a primary crusher which, at this plant, is a 1 370 x 1 880 mm gyratory type with a capacity of 1 500 tons per hour and which reduces the stone to minus 180 mm in size. Following this the stone passes through a series of screens and secondary crushers and the stone of various sizes, ranging from dust to 125 mm, is stored on stockpiles or in silos for subsequent despatch or for use as kiln feed in the lime plant. The total throughput of this plant is of the order of 12 000 tons per day. The Northern Lime plant at Taung is far smaller and simpler.

The capacities of these two plants to produce agricultural limestone is estimated to be of the order of 20 000 tons per month. The problem is not with production, but with despatch as will be discussed later.

The same type of operation as that at Lime Acres is to be found at the Union Lime plant at Ulco and at their Dudfield operation near Lichtenburg. The dolomitic stone is relatively readily worked by using front end loaders. Processing is done by passing the material through hammer mills and the product is screened using trommels, the oversize being returned for recrushing.

The capacity of the Immerpan operations is such that about 6 000 tons of materials per day can be produced. Here, too, a bottleneck with despatch is caused by the erratic availability of railway trucks.

Packing and despatch

Agricultural limestone is either despatched in bulk or in plastic bags. Although the handling of bulk supplies by farmers may cause some problems to them, the high and rapidly increasing cost of bags and bagging favours the use of bulk supplies. As an example, the latest available delivered price of bags at the Northern Lime Taung works amounts to R4,50 per ton. A serious problem for a number of producers has been the irregular supply of railway trucks. In the case of the producers of burnt lime and graded limestone they have to give preference to despatch of unslaked lime because kilns cannot be stopped at will. Also, they are suppliers of graded stone and lime to basic industries and utilities which cannot operate without lime and/or limestone. These include the steel plants, gold and uranium mines, carbide manufacturers, paper and sugar mills and large scale water purification plants such as those operated by the Rand Water Board.

The Immerpan operations are such that they could easily produce and despatch about 6 000 tons of dolomitic material per day, ie over 1,5 million tons per annum. (In 1974 they sold about 600 000 tons).

One of the problems with agricultural lime is that it is usually ordered for despatch at a time of the year when trucks are in short supply (ie during the winter months). It would be to the users' advantage to order material for despatch throughout the year for this reason.

There is no harm in storing the material as it cannot deteriorate. It tends to form a crust on the outer surface of a pile but this is easily broken.

Producers do not hold large stocks of agricultural limestone as rate of production is seldom a problem.

About 80 per cent of the material is sold in bulk and the balance in plastic bags. Paper bags cannot be used because the moisture content varies between 5 and 13 per cent (the latter in the rainy season). The bags are wire-tied because they cannot be heat-sealed because of the dust.

Marketing and market growth

The limitations which face the producers of calcitic limestone have already been discussed briefly. In the case of dolomitic stone, the overall position is that less than half the material which can readily be produced is sold. As with

the calcitic producers, marketing is done through agents, including fertilizer companies and it is felt that more active selling of liming materials by the fertilizer companies is necessary. This would increase the effectiveness of inorganic fertilizers, something particularly necessary in times of shortage of food and fertilizers and also in view of the increasing prices of these commodities.

It is difficult to estimate the future market for agricultural liming materials. It is said that a ratio of fertilizer/lime of 1:1 should be used. Statistics published over the past few years show that from 1971 to 1973, the ratio of agricultural liming materials to Group 1 fertilizers has dropped from 50 per cent to 30 per cent. (See Figure 1.) The predicted rate of growth for the sale of Group 1 fertilizers, assuming a straight line growth from 1965, is about 115 000 tons per year, whereas the total dolomitic and calcitic limestone, on the same basis as the Group 1 fertilizers, is growing at a rate of about 72 000 tons per annum.

In other words, the gap is widening, and there is an increasing scope for the sale of agricultural lime.

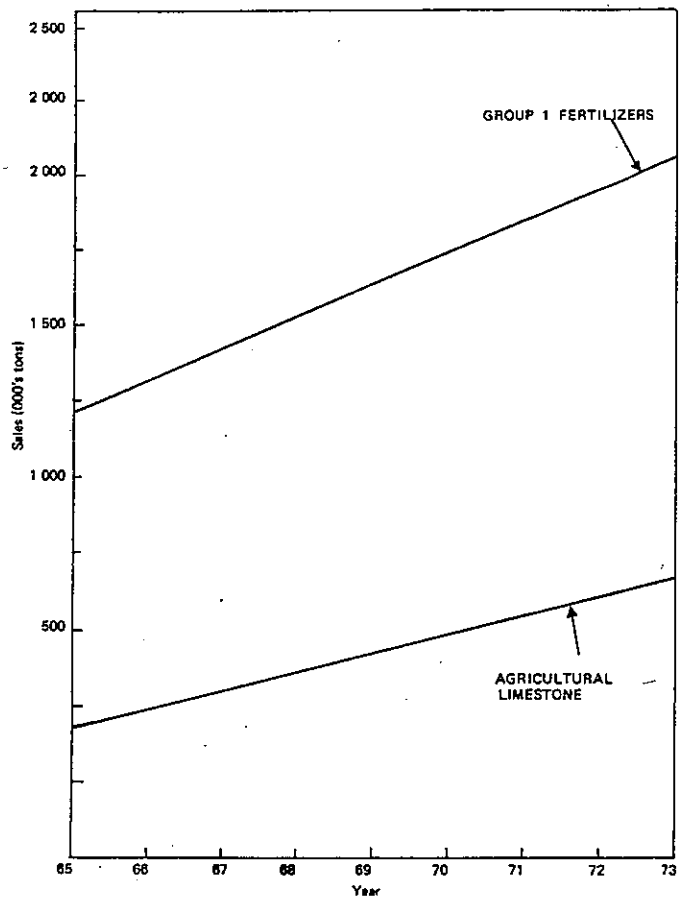

FIG 1 Tons fertilizer and agricultural lime sold