MECHANICAL ASPECTS OF APPLYING FERTILIZER AND LIME

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This paper briefly reviews the mechanical aspects of applying fertilizer and lime in the Corn Belt of the United States. Many of the aspects reviewed can be used in improving the handling of fertilizer in South Africa.

It is my observation that in South Africa, fertilizer is for the most part sold in bags and large quantities are applied at planting time. Nitrogen is also commonly side dressed after planting.

Applying fertilizer with the planting operation decreases the rate of planting. I would like to relate the significance of decreased planting rate with the following story which applies to the U S Corn Belt. Assume it is late April when two farmers on neighbouring land are about to fertilize, till, spread herbicide and plant 400 acres of maize. It is a good-sized job for both of them.

The first farmer chooses to spread his own fertilizer with a conventional dry applicator, then spray on the herbicide, till and finally plant maize. This farmer finished planting his maize the third week in May. Because he was spreading fertilizer when he should have been planting maize, his loss due to late planting of maize cut his yield nine bushels per acre for a total of 3 600 bushels of maize. At $2,40 per bushel this amount to a delay penalty of $8 640.

The second farmer had a different plan. He called his agricultural chemicals dealer and asked him to spread the fertilizer and herbicide. This made it possible for the farmer to spend every available day tilling and planting maize. He was finished planting by May 10th. He did not have a loss due to delayed planting. The second farmer's decision to have fertilizer custom spread saved him more than $ 8 000.

In 1973 fertilizer usage in Illionois was

	Tons
Dry bays	163 000
Dry Bulk	1 890 999
Liquid	1 306 000 (includes 420 000 NH_3)

Only 5 per cent of the fertilizer used in Illinois is bagged. I'm sure the figure for South Africa is much higher.

In the U S dry bulk fertilizer is supplied by 5000 dealers in the country. The local fertilizer dealer handling dry fertilizer operates a bulk blender.

Bulk blending caught on rapidly in the 1950's. Factors contributing to the growth of bulk blending include :

1 Rapid expansion of plant nutrient use

2 Technological developments

3 Convenience of a system based on bulk blending

4 Favourable economics

5 Strong dealer service orientation

Nutrient Use

Fertilizer use in the U S Corn Belt, which later became the main consuming area, was in its infancy when bulk blending was getting started. Between 1945 and 1955, nutrient use in the Corn Belt increased sevenfold. The market was wide open for introduction of any effective system. Fertilizer manufacturing facilities, however, had not been built in the Corn Belt. Bulk blending by local blender-retailers of materials produced at large manufacturing complexes proved to be a good way to meet the growing demand.

Technological Developments

Developments on two main fronts — granulation and high analysis material — greatly accelerated acceptance of bulk blending. Granulation requires large plants to achieve production efficiency. Plants are therefore a considerable distance from ultimate markets. The bulk blender can purchase granular material from different suppliers at different locations and produce and market whatever blends farmers in his area need.

Convenience

The development of bulk blending coincided with other significant changes in American agriculture.

1 Larger farms

2 Greater reliance on machinery

3 Diminishing dependence on manpower

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The bulk blender, who deals in small batches, can produce a large number of nutrient ratio, the goal being to supply the most economical combination of materials that will supply specified quantities of nutrients to the land. Local blending of fertilizer made this convenient.

Economics

Bulk blending led the trend away from bags. Bags and bagging add 10 per cent to 20 per cent to the cost of product delivered to the retail dealer. Costs are also greater to handle and store bagged material.

Dealer Services

Foremost among dealer services is that of custom spreading of the blended fertilizer on farm fields. In a typical setup, component materials are taken from bulk storage, weighed and dumped into the blender. After a couple of minutes, blended materials are discharged direct into a spreader truck, taken to the farm and applied to the soil. In this case the effort necessary on the part of the farmer to get his land fertilized is that required in using the telephone to place the order.

If a farmer desires, the dealer delivers fertilizer in pull-type spreaders and the farmer makes the application using his own tractor.

The ease with which the farmer can get fertilizer on the land is the attractive part of bulk handling at a time when labour has become expensive and difficult to hire.

Dealers help farmers obtain soil samples, arrange for analysis, and interpret results. Farm planning assistance of many types, including the development of comprehensive soil fertility plans also has been made available by dealers. Many dealers establish field and plot demonstrations as part of an educational effort to promote the use of sound fertilization practices.

Timeliness of application

The importance of time during the planting season cannot be over emphasized. Our agronomists have shown that yields of most crops are maximized by getting the crop planted within certain dates. With the larger crop areas being planted by individual farmers due to increased farm size and decreased labour supply, timeliness of the planting operation is often as critical to maximizing profits as is fertilizer application.

For this reason, much research has been conducted to determine when fertilizer can be applied to soils in different parts of the country and not unduly affect crop utilization of the fertilizer applied and yet not complete the planting operation for time and labour.

Fall application of phosphorus and potassium is especially encouraged by agronomists as a means of saving time during the planting season. Nitrogen is sometimes applied in the fall with a 10 percent expected loss. Application of nitrogen after planting is risky. Excessive rain can delay this operation until the maize plants are too tall to get through the fields with equipment.

Placement

Information on the placement of fertilizer is available. In general the question in the U S Corn Belt is whether fertilizer must be incorporated into the tillage layer. Fertilizer is broadcast on the soil surface and not incorporated in no-till corn. From 9 years of fertilizer studies on 3 soils under such conditions it has been reported that fertilizer efficiency was higher from surface application than from surface applied and disked-in applications on conventionally tilled fields.

In Illinois differences in fertilizer distribution due to tillage methods show high concentrations of phosphorus and potassium at the soil surface with the no-plow systems. Moldboard plowing results in a uniform distribution with depth to the plow layer. However, we have not found a correlation between poor fertilizer distribution with depth and crop yield. However, our agronomists recommend that fields be plowed every 4 or 5 years for maize production.

Very seldom is the question raised on whether fertilizer should be banded in the vicinity of the row or broadcast.

Suggestions for South Africa

An evaluation of the mechanical aspects of applying fertilizer and lime in South Africa is needed including:

1 Time of application. Effects of fertilizer application at various times of the year on crop production.

2 Comparison of bagged and bulk handling of fertilizer. This evaluation should include not only a comparison of the marketing aspects but also the effects on crop production-conveniences, improved timeliness of planting that so greatly effects the planting rate.

3 Fertilizer placement. Effects of band placement and broadcasting with and without incorporation on crop yields.

References

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