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Rates of superphosphate for cereal grain production in the under 20 inch rainfall areas

Walter Jacob Cox

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EVERY year farmers use large quantities of superphosphate with cereal crops to overcome the inherent phosphate deficiency of West Australian soils. The increase in the average rate used by farmers reflects the increasing amount of new land being cropped. Good seasons and favourable economic conditions may also have influenced super rates.

### Superphosphate usage on crops and average rates, 1959-1967

<table>
<thead>
<tr>
<th>Year ended March 31</th>
<th>Area fertilised acres</th>
<th>Superphosphate Total</th>
<th>Rate of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959 ...</td>
<td>5,998,823</td>
<td>276,209</td>
<td>103</td>
</tr>
<tr>
<td>1961 ...</td>
<td>6,740,128</td>
<td>317,591</td>
<td>106</td>
</tr>
<tr>
<td>1963 ...</td>
<td>7,307,688</td>
<td>348,693</td>
<td>107</td>
</tr>
<tr>
<td>1965 ...</td>
<td>7,271,208</td>
<td>357,513</td>
<td>110</td>
</tr>
<tr>
<td>1967 ...</td>
<td>8,531,382</td>
<td>436,834</td>
<td>115</td>
</tr>
</tbody>
</table>

The ideal rate for each situation depends primarily on—

- soil type
- previous super applications.

### Influence of soil type

Although the soils of Western Australia are extremely variable they can be placed in five broad groups as a basis for superphosphate recommendations.

#### A. RED-BROWN SANDY LOAMS (YORK GUM, JAM VEGETATION)—FIG. 1

The red-brown sandy loams with red brown sandy clay subsoils are typical of the Avon and Chapman Valleys as well as areas near Gnowangerup and Three Springs and Coorow. In the virgin state these soils respond to 180 lb. per acre but after more than 1,250 lb. per acre of superphosphate has been applied the rate can be reduced to about 60 lb. per acre.

#### B. LIGHT LAND (SCRUBPLAIN)—FIG. 2

Large areas of scrubplain soil have been released during the last ten years. Although in individual experiments yields

The results of 102 “Rate of Superphosphate on Wheat” trials in the 12 to 20 inch rainfall areas of the West Australian wheatbelt were analysed to determine the best rates of super application for the different soil types, rainfall zones and previous super histories. The trials were done between 1952 and 1966.

The ideal rates are highest for the mallee soils, then scrubplain, white-gum, red-brown sandy loams and salmon gum/gimlet soils. Rates can be lowered as the total previously applied super increases. No difference in requirement was found for the 12 to 16 inch and 16 to 20 inch rainfall areas. It is believed that the same rates would be suited to oats and barley.
have continued to increase with increasing rates up to 300 lb. per acre of superphosphate the recommend rate on the average is 210 lb. per acre for virgin soils of this type. The rates can be gradually reduced as shown in Fig. 2.

C. LIGHT LAND (MALLEE)—FIG. 3

Mallee light land soils generally have sand or gravelly sand over clay at 3 to 24 inches below the surface. As for the previous soil group individual responses have been obtained up to 300 lb. per acre on virgin soils. Rates should be reduced gradually as shown in Fig. 3 until "maintenance" is reached around a total application of 2,000 lb. per acre.

D. HEAVY LAND (SALMON GUM/GIMLET)—FIG. 4

The heavy red-brown clay-loams and clays are generally found in the central and Eastern wheatbelt. On virgin soils responses have been obtained to 180 lb. per...
acre in seasons with a wet finish. Because dry conditions in spring can limit yields on these soils the average recommended rate is 150 lb. per acre. Rates can be reduced with increasing super history as shown in Fig. 4.

**E. MEDIUM LAND (WHITE GUM)—FIG. 5**

The white gum soils are generally found on the wetter margins of the wheatbelt. They are usually gritty or gravelly sandy loams with tough sandy clay subsoils. These soils have a high phosphate fixing capacity. On virgin soils at least 220 lb. per acre should be applied, and the best rate drops slowly to 70 lb. per acre of superphosphate when 2,000 lb. of super has been applied previously.

**Effect of superphosphate history**

Phosphorus has a substantial residual value on many of the soils used for cropping and for this reason responses to
phosphorus decline after some years of super application. It follows from this that it is economic for the farmer to reduce the rate of superphosphate applied on paddocks of high previous superphosphate application, to the rates indicated in Figures 1 to 5 for each of the major soil types. Where the maintenance rate is the superphosphate required to cover the decline in availability, loss by erosion and the uptake by the crop.

Each farmer should adjust his superphosphate rates to fit in with the soil types and previous super history of the farm. In this way the highest net return from crops can be achieved.

The results presented in this article are averages from experimental sites and should be modified when applied to particular situations. If high rates of super have been applied to land in recent years, lower rates would be recommended than indicated by these results. If lower rates or less frequent applications have been given, higher rates of super might be needed.

More detailed information of superphosphate rates for the above soil types, and other soils not mentioned here, should be obtained from the nearest district office of the Department of Agriculture.

Acknowledgment

The 102 "Rate of Superphosphate on Wheat" trials which formed the basis of this article were carried out by officers of the Plant Research Division and the Wheat and Sheep Division working separately or in collaboration. The author acknowledges the work of these officers which was reviewed at the outset of a further programme of research on phosphorus in wheatbelt areas.

Reference


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