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THE REGENERATION AND MAINTENANCE
OF WIMMERA RYEGRASS PASTURES
UNDER SALINE SOIL CONDITIONS

By F. L. SHIER, Assistant Superintendent of Wheat Farming

OVER the past ten years, Wimmera ryegrass pastures at the Salmon Gums Research Station have been improved and maintained by periodic cultivation of the soil even without applications of superphosphate. On heavy crab-holey soil affected by high salt content and unsatisfactory for wheat growing, cultivation treatments have produced remarkably uniform stands of Wimmera ryegrass as shown in the accompanying pictures. The bare patches due to salt, have been largely eliminated. If the interval between cultivations is more than three years Wimmera pastures deteriorate badly.

The Salmon Gums Research Station was established in 1926 in association with the expansion of wheat growing to the belt of mallee country in the outlying south-eastern portion of the wheatbelt of W.A. It is approximately 400 miles E.S.E. of Perth and 60 miles north of the port of Esperance.

A number of soil types encountered in the region proved difficult and unsatisfactory for wheat growing especially when combined with the rather uncertain rainfall distribution of the area. Further, one of the major soil groups of the region is a heavy, crab-holey, clay type with naturally high salinity under virgin conditions and a pronounced tendency for bare patches to develop after clearing, due to surface concentration of the salt. The soils have approximately neutral reaction in the surface layer but are alkaline in the subsoil where free lime occurs.

ABANDONED HOLDINGS

The general experience was that the first crop on such soils was reasonably satisfactory (provided the rainfall was sufficient) and sometimes the second, but thereafter wheat yields tended to fall to unprofitable levels. As a consequence, large areas of these types which had been cleared and fenced, and in some cases provided with water supplies, were abandoned for further agriculture.

Scattered sowings of Wimmera ryegrass in a number of instances indicated that this plant was more tolerant to the saline conditions and provided prospects for making some form of agriculture possible on the basis of sheep grazing on these partially developed areas. This idea was tried out on a number of farms including the Salmon Gums Research Station in the period 1932 to about 1938.

However, over the years the results were variable and in many cases far from satisfactory. The general experience of farmers was that while the ryegrass grew satisfactorily for a year or two after planting or "scratching in" with a small seeding of oats or wheat, thereafter the plants gradually became smaller and the population less till finally there was no worthwhile quantity of this pasture plant on the paddocks. On the other hand, odd field observations indicated a markedly beneficial effect of cultivation, with or without cropping and superphosphate, on "stalled" or deteriorated pasture.
Fig. 1.—The effect of length of time between cultivation. Two views taken from opposite directions, illustrating the deterioration of fourth-year Wimmera ryegrass after a "scratched in" crop of oats. The better plot was renovated every third year (including 1950) and the oats were fed out during the winter. The photograph was taken in November, 1950.

EXPERIMENTS

In consequence two experiments were commenced at the Research Station in 1941 to determine the effect of a number of cultural and superphosphate treatments for the regeneration of "stalled" Wimmera ryegrass pasture and on the maintenance of newly sown pasture on land typical of that under discussion. The main soil type on the experimental area is named Kumarl clay loam.

The treatments in the two experiments were as follows:

Regeneration of Stalled Wimmera Ryegrass

Plot 1.—Control, untreated.
Plot 2.—Scarified annually.
Plot 3.—Scarified annually and top-dressed with 1 cwt. super./acre.
Plot 4.—Scarified annually and topdressed with 1 cwt. of superphosphate.

Burr trefoil and Barrel clover (medic to be sown 1940).

Plot 5.—Scarified and oats sown every third year (superphosphate 1 cwt./acre), commencing in 1940.

Plot 6.—Four Course Rotation. 1940 fallow, 1941 oats (superphosphate 1 cwt./acre). 1942 pasture, 1943 pasture.

Plots 7 to 12.—Replication of above.

Maintenance of Wimmera Ryegrass

The experimental area was scarified in June, 1940, following rain and the ryegrass sown at 2 lb. per acre with 1 cwt. of superphosphate. Although the rainfall was below average a good cover of the grass was obtained.

Plot 1.—Control, untreated.
Plot 2.—Four Course Rotation. 1941 fallow, 1942 oats. 1943 pasture, 1944 pasture.
Plot 3.—Six Course Rotation. 1941 fallow, 1942 oats, 1943 pasture, 1944 pasture, 1945 pasture, 1946 pasture.

Plot 4.—Three Course Rotation. 1941 oats, 1942 pasture, 1943 pasture.

Plot 5.—Five Course Rotation. 1941 oats, 1942 pasture, 1943 pasture, 1944 pasture, 1945 pasture.

Plot 6.—Scarified every third year commencing 1941.

Plot 7.—Scarified and topdressed every third year commencing 1941.

Plot 8.—Topdressed every third year commencing 1941.

Plot 9.—Six Course Rotation. 1941 clean fallow, 1942 oats, 1943 Wimmera ryegrass, 1944/46 pasture.

Plots 10 to 18.—Replication of above.

This paddock had previously been cropped in 1930, 1932 and 1934 in each case following fallow with a dressing of 1 cwt. of superphosphate on each occasion. The actual yield in the first year is not definitely known but the crop was quite a fair one and the Station average was 16.9 bushels; in 1932 and 1934 the yields were 9.7 and 4.6 bushels respectively for the wheat crop. These are typical of the general experience with such soils in the Salmon Gums area.

**VALUE OF CULTIVATION**

It has not been possible to arrange for a regular accurate assessment of the yields of pasture from the different treatments but in a number of years quadrat samples have been taken from all plots. These have confirmed two important visual observations—firstly, the improvement in the pasture by cultivation and secondly, that cultivation every third year, either alone or per medium of a scratched in crop is equally effective as annual treatment, in maintaining the Wimmera pasture.

Where cultivation was only carried out every fifth year, there was a marked
deterioration of the pasture towards the end of the ley, with the development of bare salty patches.

Superphosphate in addition to annual cultivation has not given any marked or regular increase in pasture yield compared with the scarified annually treatment although the former tends to mature a little earlier than the latter. This absence of response to phosphate is not entirely unexpected in view of the marked residual effects on cereal yields from previous superphosphate applications demonstrated on other areas of the Station.

The main findings from the two experiments are amply demonstrated in the accompanying illustrations which were taken by Dr. T. C. Dunne in November, 1950. The whole experimental area was heavily fed off in July-August. The effect of cultivation in preventing the development of bare salty patches or encouraging the growth of pasture on such patches is self evident.