SYMPOSIUM ON TOTAL WEED DESTRUCTION

First Paper: F. B. THOMPSON, Rukuhia Soil Research Station,
Hamilton

In a paper in the symposium on "Total Weed Destruction" at the Weed Conference 1953 I outlined the composition and properties of three new proprietary non-selective weedkillers, namely CMU, Borascu, and Polybor-chlorate. Preliminary results were also given of two trials in which these three materials, borax, and Atlacide were each applied at three different rates.

In this paper the further results from these two trials, and the results from a third trial on similar lines but with a different type of vegetation will be given.

FOOTPATH TRIAL (FIRST TRIAL)

The interim results previously reported indicated that all treatments, with the exception of CMU and borax, gave very good kills of all vegetation for 3 or 4 months. The subsequent rate of regeneration of weeds varied according to the treatment. On many of the plots re-infestation commenced after about 4 months and after 12 months the infestation was practically as bad as before the treatments were applied. Other treatments, for example Borascu at 4360 and 2180lb. per acre (10 and 5lb. per 100 sq. ft.) gave almost complete control of all weeds for more than 12 months. Similar rates of borax were much less effective. Plots treated with Polybor-chlorate up to 2180lb. per acre and Atlacide up to 1090lb. per acre had too much regeneration of weeds after 12 months to be satisfactory. The CMU plots had many weeds on them at 6 months, but at 12 months one plot with 80lb. of CMU per acre was almost entirely clear of weeds except for odd plants of plantain (*Plantago major*), rib grass (*Plantago lanceolata*) and paspalum (*Paspalum dilatatum*). There was a very poor kill of weeds on the duplicate plot which was on a sloping portion and subject to excessive run-off during the heavy rain shortly after the treatments were applied.

TRIAL IN LIGHT SOIL (SECOND TRIAL)

The interim results from this trial were that all treatments gave good kills of the existing vegetation and the plots remained free of weeds for a few months.

The most outstanding feature of the subsequent developments was the lasting effect of the CMU. The plot which received 80lb. of CMU is still completely bare of vegetation 15 months after the treatment was applied. The plot with 40lb. per acre of CMU has about 95 per cent. bare ground and for all practical purposes control is still very good.

None of the other treatments gave complete soil sterilisation for more than a few months. The Atlacide plots were largely covered with a rank growth of grasses within 6 months, and the amount of bare ground was reduced to 30 per cent. even when 1090lb. per acre of Atlacide was applied. The plots treated with the three boron materials particularly at the heavy rates remained relatively free from grasses and herbaceous weeds for approximately 9 months, except for two species. After a few months land cress (*Coronopus didymus*) became established on the plots treated with borax and Borascu but not on the Polybor-chlorate plots, and *Chenopodium* on plots treated with all three materials. If it

were not for these two species the plots receiving the heavy rates of boron materials would have had 80 to 90 per cent. of bare ground 9 months after treatments were applied, but the growth of these two species reduced the bare ground to about 40 per cent. Fifteen months after treatments were applied grasses and herbaceous weeds had replaced the *Chenopodium* and the cress, and the plots had reached the stage at which re-treatments were required.

Borascu had to be applied at 4360lb. and 2180lb. per acre for satisfactory results. Borax was slightly less effective than an equal weight of Borascu, but the difference in results may not be sufficient to balance the higher cost of the Borascu. Polybor-chlorate at 2180lb. per acre was slightly better than an equal weight of Borascu.

TRIAL ON HEAVY SOIL WITH SCRUB WEEDS (THIRD TRIAL)

A third trial was commenced in September 1953 on a heavy soil (Te Kowhai clay loam). The vegetation varied from rank growth of blackberry, gorse, bracken fern, and convolvulus to a thick mat of perennial grasses. The tall growth of scrub weeds was cut and removed before the treatments were applied, leaving bare ground on some of the plots.

As in the previous trials, 3 rates of each of the 5 materials were applied, but the rates of all materials except CMU were half those in the other two trials. Duplicate plots, each 12ft. by 10ft., were treated at the rates shown in the following table:—

					LB./ACRE		
					Low	Medium	High
CMU	..	..	..	..	20	40	80
Borax	..	..	..	..	545	1090	2180
Borascu	..	..	..	..	545	1090	2180
Polybor-chlorate	..	..	..	..	273	545	1090
Atlacide	.	.	.	..	136	273	545

Again CMU gave the best results. Plots which had 80lb. per acre are now (11 months after treatments were applied) still 95 per cent. bare ground. The CMU has prevented re-infestation of gorse, blackberry, fern, convolvulus, grasses, and herbaceous weeds. However, there is some live but sickly blackberry on the plots and no doubt retreatment will be necessary to prevent re-infestation of blackberry and convolvulus from live roots before next summer. Lower rates of CMU have been ineffective on the vegetation in this trial. One plot treated with 40lb. per acre CMU is largely covered with blackberry and dead convolvulus stalks and the duplicate plot has live gorse and fern which survived the treatment.

The results from the other materials summarised below were somewhat similar to those on the second trial previously described, except that the rates of application were halved:—

- (1) Atlacide, even at the highest rate, 545lb. per acre, did not give satisfactory results. Grasses soon covered the plots.
- (2) Borascu was slightly better than an equal weight of borax. The degree of control and amount of bare ground on the plots depended largely on the original vegetation. An application of 2180lb. per acre of Borascu kept gorse, fern, convolvulus, and herbaceous weeds under control for 11 months. On one of the plots no live convolvulus roots could be found when the soil was dug, but live roots were found on the duplicate plot. The tolerant species *Chenopodium* and cress were not present on this area and the results are therefore

much better than those obtained in the second trial. The plots were still clear of grass at 6 months, but at 11 months re-infestation had commenced. Control of blackberry with 2180lb. per acre of Borascu was not satisfactory.

- (3) Polybor-chlorate at 1090lb. per acre was slightly better than an equal weight of Borascu.

SELECTIVITY OF THE NON-SELECTIVE WEEDICIDES

CMU, Borascu, and Polybor-chlorate are recommended by the manufacturers for use as soil sterilants on non-crop land when non-selective destruction of all weeds is desired. However, the results indicate that there is some selective tolerance to these materials. The most striking example was the rapid establishment of *Chenopodium* and cress on the plots treated with the boron materials in the second trial.

Blackberry was more tolerant to the boron materials than were gorse and fern. All these scrub weeds and convolvulus were tolerant to 40lb. of CMU, whereas grasses and herbaceous weeds were susceptible. Blackberry and convolvulus appear more susceptible and grasses possibly more tolerant to Atlacide than to an equal weight of the boron materials.

CONCLUSION

The most outstanding result was the clearance of weeds for at least 15 months on the CMU plots in the second trial. An application of 40lb. per acre was very effective and on present-day prices the cost of this treatment would be little more than half that of the next best treatments; that is, Borascu at 4360lb. and Polybor-chlorate at 2180lb.

In the third trial where there was a mixed vegetation of scrub weeds, grasses, and herbaceous weeds the position was somewhat reversed. To obtain good results with CMU the rate had to be increased to 80lb. per acre and this would cost more than twice as much as the 2180lb. of Borascu, which gave only slightly inferior results. It is considered that the difference in results between the two trials is due to the vegetation rather than soil type, because on the heavier soil 40lb. of CMU gave good control of weeds other than the scrub weeds and convolvulus.

On the footpath trial the position was more obscure owing to the differences in the results of the duplicate plots, but again Borascu and CMU were the most promising materials.

Although Borascu is more slow acting and less effective in the early stages than Polybor-chlorate, over a longer period it proved more effective than Polybor-chlorate applied at half the rate. Since Borascu is about half the price of Polybor-chlorate, the results obtained in these trials suggest that Borascu at a heavier rate would be more economical than Polybor-chlorate.

To conclude, it appears that the problem of total weed destruction is not as simple as might appear at first sight, and the choice of materials to be used and rates of application may depend on the type of vegetation to be killed. However, the results so far obtained indicate that CMU and Borascu in particular are very promising materials for total weed destruction.