RECENT WORK IN MANAGEMENT AND CONTROL OF GORSE

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WELL-SPRAYED gorse (*Ulex europaeus*) is still one of the best sights to anyone interested in weed control. Nothing looks better than effective gorse spraying, yet we still find the poorly sprayed and poor results in gorse spraying around the country. In this paper I intend to illustrate that even though the spraying of gorse has become commonplace, many people are finding new methods and techniques of application, not only to areas of what we call solid gorse but to that type of gorse which occurs in the arable/grassland country which is being developed under methods of intense farm management. This paper will cover the methods of gorse control originally employed by the land development section of the Department of Lands and Survey in North Auckland, but now quite commonly used by farmers, contractors, and persons breaking in country in all parts of New Zealand. The essential features remain the same—the rates of application, times of application, and the general technique. However, to develop this new method a lot of sound experimental or development work had to be done in conjunction with the management angle of the problem, and these I intend to illustrate. This is a classic example of good gorse spraying combined with very sound farm management, the net result being high-producing, highly fertile farming land.

GENERAL DEVELOPMENT

Land in scrub and brush weeds, gorse, manuka, and many others is to be found in abundance throughout New Zealand and the system employed in clearing this land and stages involved in taking it through to pasture will be described here. Scrub and other weeds are cut either by hand or with mechanical equipment. Scrub after being cleared is either burnt, where the season and other factors allow, or it is cut with a giant scrub-cutting roller of an all up weight of 3½ tons. This not only chops up the scrub suitable for further cultivation but also allows it to be disced in, with subsequent cultivation providing a good seed-bed. And in the particular instance being discussed in this paper, beginning with a block of 19,000 acres, where gorse was the main problem, the area was cultivated in large blocks, sown to pasture, and then subdivided by fencing. The main feature in which we are interested in this paper, of course, is the fact that the land has been in gorse for many years, and the seed load of gorse in the soil is very high. Good pasture is established and despite adequate fertilisation and seeding rates, because of this potentially high gorse seed germination in the soil, pastures after a few months become a solid mass of gorse seedlings—and this is the problem with which we have to deal chemically.

The application of 2,4,5-T for gorse control in solid areas gives us no great problem, but when the application of 2,4,5-T is required on pasture land we have a problem immediately, that of damage to clovers. This problem and others have been overcome by sound management techniques which we will describe. During the first season of the pasture it is grazed only lightly to allow suitable establishment of both grasses and clovers, and spraying of the gorse is delayed for nearly two seasons. That gives the gorse 2 years' growth, by which time it is 18in. to 2ft. high on an average and also allows the clover, which in this case is in the main the annual clover, subterranean clover, and red clover, to seed for 2 years. Now with spraying we realise the subterranean clover and red

clover will be decimated, but this is in part offset by the fact that we have 2 years' seed of this annual clover in the soil to regenerate and re-establish with the autumn rains, and for this reason spraying is not carried out until after February, when the majority of the clover has shed its seed. This means at the worst that pasture is without clover or low in clover for a period of only 6 to 8 weeks, the autumn rains bringing complete clover regeneration, as will be described later. The soil type with which we are dealing in this block is a highly fertile alluvium river silt.

The Waikato river swings round up the coast for a matter of a hundred miles or so and has over the years deposited this fine, rich silt on these flats. The clover growth in the first season of establishment has really to be seen to be believed and it is not uncommon to find in pastures that have been infested with gorse from seedling strike gorse 18in. high and clover equally as high.

SPRAYING TECHNIQUES

Before discussing the techniques of spraying let us first look at the other available methods of spraying for gorse control. The gun application, with high-volume equipment and high-volume rates of application, has become popular for no apparent reason other than the development of this type of equipment by commercial companies. While the control obtained is certainly quite successful, the method is quite wasteful of material and time consuming of labour. The trend away from this type of equipment has not been noticeable, but we feel sure when more developmental work along the lines discussed in this paper has been done we will find more efficient and more effective means of application. Contract rates for the high-volume treatment of gorse vary between £15 and £18 or £20 per acre and it is recognised that an experienced hand with one spray gun can cover about an acre every 1½ to 2 hours, the rates of application being approximately 3 to 4lb. of 2,4,5-T acid equivalent per acre in 200 to 300 gallons of water (based on gorse 3ft. to 4ft. high).

Much of the equipment used for this task is expensive and involves substantial capital cost and investment on the part of large contractors and large users. Whereas this method is perhaps the only practical method for patches of gorse in solid stands of gorse, when it comes to over-all pasture application it is both impractical and uneconomic. And there has been developed what is now termed the boom spraying of gorse (applicable on wheel tractor country only). It is somewhat similar in its main features to the boom spraying of weeds in pastures, with the exception that the boom is shorter, the pressure higher, and the rate of application much higher than that normally used for pasture weed application. The essential features of this treatment are the maximum coverage and retention of spray on the gorse and the accuracy of application. No matter how experienced the operator may be with the hand gun nor how meticulous he may be there are always portions of the bush which are missed or lightly sprayed and these regrowths or green tip misses require respraying at some later stage and the cost of labour and time involved in this treatment often renders the job quite costly. It will be realised automatically that when a tractor traverses an area (as in boom spraying) provided that traverse is accurate and the boom is operated correctly, there will be no misses and therefore no respraying. The often dreamed of 100 per cent. control is obtained in the one application. The factors of penetration, coverage, etc., being described as optimum.

Another factor is the time and labour involved with this tractor boom spraying method. Mentioned previously was the time taken to spray an acre with a hand gun and it is an acre every 1½ to 2 hours. With

this boom spraying method, employing a boom of 9ft. or 10ft., with the tractor travelling at $1\frac{1}{2}$ miles an hour the tractor covers $1\frac{1}{2}$ acres an hour. Here we have a large saving in time, which in the present costs of labour is a very significant factor.

Rates of application with this boom treatment on this particular block are higher than those generally recommended both by commercial organisations and the Department of Agriculture. Their rate of application varies between 5lb. and 6lb. of 2,4,5-T acid equivalent per acre and is applied at 150lb. to 200lb. nozzle pressure and with water at 200 gallons per acre. The season of spraying is only undertaken because of the feature of clover seed setting which we have already discussed. It is a familiar sight to find a 100- to 200-acre paddock, which has been sprayed, completely brown as far as the gorse is concerned, but the grass is growing healthily, and it is virtually impossible to find missed areas and regrowth areas on the gorse treated. Of course the type of gorse being treated could be described as an ideal type for spraying. It is virgin seedling gorse with 2 years of uninterrupted growth and is about 18in. to 2ft. in height. After a matter of 3 or 4 months the sprayed gorse plants are beginning to disintegrate and the system then employed is either to harrow the paddock or to use some other type of clean-up equipment. The gorse is all pulled into a heap and burnt. From that stage on judicious stocking and adequate fertilisation keep the pasture in tight condition, thereby preventing further ingress of gorse and other brush weeds. As the stocking is increased the control of any seedlings of gorse which do appear are adequately controlled by the grazing animal.

We have been dealing mainly with gorse up to 2ft. in height and in many other blocks gorse much higher than this has been treated. In fact gorse 3ft. and 4ft. high, even in full flower, has been successfully boom treated. This calls initially for equipment with higher boom attachments and mechanical or hydraulic lift to cater for the varying heights in the gorse sprayed. The rates of application in respect of water remain the same. From most blocks we find the rate of application of the active material is increased slightly. The results obtained on this large gorse are just as good as the results on the seedling gorse. The only feature of course is that as gorse grows higher it also spreads out to a greater extent and therefore precludes any grazing in the area and takes a longer breakdown period before it can be mechanically removed from the pasture to allow stocking. However, as far as the spraying and the gorse are concerned the results are most successful.

When we first looked at this problem of boom spraying of gorse the clover did appear to be an insurmountable problem. But we have found that with this careful eye to the management of the area more especially to the seeding times of clover, good control of gorse without any great damage to clover has been achieved. Where the clover population is known to be very high and where establishment of volunteer clovers particularly subterranean clover is almost automatic seedling gorse is sprayed in the first season of growth and here approximately 2lb. of 2,4,5-T acid equivalent is applied in slightly over 100 gallons of water per acre. It is surprising how little damage is sometimes done to the subterranean clover and, again, how quickly regeneration can fill in the gaps.

EARLIER DEVELOPMENTAL WORK

Prior to this system now employed of spraying after seed setting other methods were tried and initially we experimented with a form of 2,4,5-T mixed with superphosphate, applying 2lb. of 2,4,5-T per acre and 2cwt. of superphosphate. And here extremely good control of gorse was

obtained in the seedling stage and a fair residual effect was noticed. Gorse germinating up to 6 weeks or 2 months after application also succumbed to the 2,4,5-T. While this mix was particularly good on gorse it was also particularly good on clover and virtually complete clover elimination was obtained. Because of this, further work with the material was discontinued.

After spraying in January and February, even as early as March and April, the pastures are often embarrassed because of clover dominance. And once the gorse has been removed there is no more trouble from lack of clover in the pasture.

On most blocks, because of the light nature of the soil type which erodes easily when the vegetation has been removed, open faces are completely sown to grass and treated as described, but most gullies are left in either solid gorse or other brushweed to consolidate the area, preventing gully or flood erosion until such time as the pasture is sufficiently established. And this calls for treatment with 2,4,5-T over a number of years to these gullies following development, the system being to spray round the perimeter of each gully over four or five consecutive seasons. Therefore it is not unusual to see at a glance on any of these blocks three or four stages of development, the gorse-free pasture following spraying, the gullies, hedge lines, etc., being sprayed, and other areas being cultivated ready for sowing and subsequent spraying. After a matter of 4 to 4½ years from the time development was first undertaken this land is now carrying 3 ewes or ewe equivalents per acre and approximately ½ to ¾ cattle beast per acre.

SUMMARY

Though chemical application cannot take the credit for all or even a small part of this development, it illustrates how our weedkilling chemicals have become a part of our established farm practice and management control and when used wisely can bring land under development in a quicker time than would normally have been possible. Even as we realise with the limitations in the present forms of 2,4,5-T the fact that they are not translocated widely within the plant, the results obtained in the methods of the application involved, reflect credit on those who are using them in the field, particularly on the high standard of work attained by large operators.

DISCUSSION

Q.—Did white clover survive after spraying?

A.—White clover regeneration was not as good as for some of the other clovers and after spraying was sometimes eliminated, especially if sprayed at the wrong time.

Q.—What is the cost of boom spraying per acre?

A.—Boom spraying is £8 per acre. Lands and Survey use 4lb. to 4½lb. acid equivalent per acre.

Q.—What method is used in spraying gully gorse?

A.—Gun spraying. On the blocks ¾ is boom sprayed and ¼ gun sprayed.

Q.—Is spraying of gorse in full flower successful? If so, is it due to the high pressure?

A.—It was not recommended previously, but the high pressure is sufficient to shatter the flowers. The importance of pressure is overstressed. It could be lowered with more even results. In boom spraying pressure is important, but not in gun spraying.

Q.—What was the mixture dilution used and was it varied according to the circumstances?

A.—The dilutions vary:—

Boom spraying: 3.6lb. acid equivalent per acre for 2ft. high gorse, 4lb. to 4.5lb. acid equivalent for 4ft. high gorse (water constant).

Gun spraying: 1 : 300 mix October to March; 1 : 200 mix April.

Q.—What is the success with older (2- to 3-year old) gorse?

A.—Boom spraying applicable to virgin gorse only.

Q.—Is adequate fertiliser and seeding necessary for success?

A.—Yes.

Q.—Was the swamp plough used?

A.—No.