A FARMER'S EXPERIENCE IN GORSE CONTROL

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Gorse control in theory, especially since the introduction of selective weedkillers, sounds to be a relatively simple matter.

In this paper, I am giving the experiences of one farmer who has set out to clear gorse from his property, and will bring to light some of the problems which have arisen. In order that you may picture the problem better, I shall first give a brief outline of the position as it was before an attempt at control was begun in earnest in 1950.

The property consists of ploughable limestone downs and rougher tussock country in the proportion of 1 to 4, bordered on one side by a river flat. Gorse seems to have a habit of growing on riverbeds and this one is no exception. It has also spread from the original gorse and wire fences, bounding the blocks as they were cut up in early days of settlement, on the tussock country. Prior to 1939, 2 to 4 men employed each winter just held their own trimming fences and grubbing out plants inclined to wander. Nothing was attempted on the riverbed except burning. After 1939, labour for this work was unavailable and the gorse made the best of the opportunity. In 1946, several gangs were contracted to clear the infestation on the hill section at very high wages. Some lasted a few weeks, some a few days but the gorse remained after they had all gone. A swamp plough was purchased, and the tracklayer was used when it could be spared from agricultural work, to clear some areas. Most places were too steep to go straight up and down, and it rolled over when going round the faces. Giant discs were next and even when loaded with rocks they were not very effective. With both of these implements, only limited areas could be worked with safety. In 1949 the owner was able to take delivery of a new tracklayer, and the older one was equipped with a blade to test its possibilities for clearing the tussock country. It worked, and so in 1950 I was employed to operate it.

At this stage there was 5 miles of riverbed with an average width of 3 chains of solid gorse—120 acres—and there would be approximately the same amount on the rest of the property, if it were in a compact mass. Unfortunately, it is spread out over 2 or 3 times this area, and even a reasonably accurate estimate is impossible. On the river flat, the areas infested varied from good silt soil to plain boulders, and in height from an average of about 5ft. up to 10 and 12ft. on the better soils. Mobs of cattle have evaded the shepherds at times in the tall gorse, and it is not very dignified herding cattle on hands and knees in such country. On the tussock country, the gorse was mainly on steep broken faces, with a clay subsoil generally, and a topsoil varying from good soil to sandstone and limestone-clay mixtures. The biggest percentage on the sunny slopes was on both sides of a road fence, with a drop of 3 to 15ft. on to the road. On sunny faces the gorse spread but did not grow to any great size, 5ft. being about the limit but the shady faces put another foot or two into the plants, as well as producing denser areas. Also, an odd bush could be found well away from any thick patch, and it was these bushes which were considered to be the greatest menace in regards to further spread. The gorse weevil was present in all areas.

I intend to divide control work into three sections:—

- Initial clearance
- Spraying and other treatment, and
- The economic side.

By **initial clearance** I mean the removal of large gorse so that the amount of foliage to be sprayed is reduced to a minimum. Literature on gorse control using selective weed-killers advocates burning, cutting or otherwise clearing off large gorse and spraying seedlings and re-growths which appear later. In initial clearance our aim has been to not merely clear above the surface but to remove as many plants as possible complete with taproot so that re-growths would be much less, than, say, with burning. As you may know, gorse is not an easy plant to transplant and once the taproot has been pulled out, even although soil may be loosely around it, it will not very often survive. For this work we use the tracklayer, a 40 h.p. diesel equipped with a blade operated by a hand winch. The blade has fitted 8 removeable teeth, 1ft. apart, which project below the cutting edge approximately 8in. Normally the blade is tipped down on one side, and the plants are attacked one at a time. In theory, the teeth hold the blade down, the edge catches under the crown of the plant and out it comes. Once the plant has been pushed out, the branches under the edge of the blade tend to push it up and this allows some of the soil to filter back between the teeth.

However, it is not always as easy as that; when on broken country it is often difficult to get the blade under a particular bush without having to remove a foot or so of spoil from somewhere else at the same time, and not enough power is available for both. On the riverbed, either the points won't penetrate the boulders or a flood has silted up the area and the crowns are anything up to a foot under the surface, and again, a large amount of spoil has to be moved to get the roots out. Gorse under about 2ft. in height does not provide enough resistance and is merely run over. Usually the larger the plant, the easier it is to remove in one stroke. Large gorse in good soil or silt, with crowns on the surface, is the easiest to remove, and a much cleaner job results. Gorse which has been repeatedly burnt is the hardest of the lot to remove. A very dense network of roots means that either the plant is cut off where the burn has weakened it at surface level or it comes out and leaves a hole often up to 3ft. across and 18in. to 2ft. deep. Also, the soil will not shake out from the roots, no matter how far they are pushed or rolled about, unless the soil is particularly dry at the time. Without teeth on, the plants are usually cut off at the surface, leaving the taproot to grow again.

At first the gorse was left lying wherever it happened to be after enough soil had been shaken off to expose most of the taproots. At that stage it was anticipated that spraying would be done from a trailer, using a hand wand, and not that it would be necessary to go over the whole area with any vehicle. Now the gorse is pushed into heaps. Usually too much soil remains with the plants for the heaps to be burnt immediately, unless the gorse is all very tall and dense. Not much in the way of heaping can be attempted on the rougher or steeper sections.

In the best going it is possible to clear and push into heaps up to 600 square yards of dense gorse per hour or very nearly an acre in an 8-hour day. However, average going would be in the region of $\frac{1}{2}$ to $\frac{3}{4}$ acre per day down to $\frac{1}{4}$ to $\frac{1}{2}$ of an acre per day for that on heavy boulders, on very steep faces, and that which has been repeatedly burnt. Up to the present time, approximately 10 or 11 months has been spent clearing gorse off with the blade, this including some time spent removing old fences and building wire fences. Approximately half the hill country has been cleared and between one-third and one-half of the riverbed. This gives an average estimated clearance per working day in the region of half to five-eighths of an acre.

Spraying

Prior to my employment, the owner had conducted trials using several of the selective weedkillers at different strength, and had decided that 2,4,5-T at 1 : 100 was most effective. All subsequent spraying has been done with butoxy ethanol ester of 2,4,5-T. A 400 gallon tank was mounted on a heavy trailer equipped with brakes, and a 1 h.p. petrol engine used to power the pump. At first, 60ft. of plastic hose was used but this was soon increased to 120ft. The hand wand was fitted with 2 nozzles, one a fan, one a cone, at about 6in. apart. For hand spraying this arrangement proved satisfactory as far as applying the spray on to the plant. One difficulty found was that of keeping the engine rear level. A cradle had to be made so that the engine could be quickly adjusted at each shift.

Unfortunately owing to the weather, my tractor was required assisting with agricultural work from early November, 1950, to mid-February, 1951, so that only 3 weeks spraying was done, spraying ceasing on March 10th. At a rough guess I would say one-sixth of the area bulldozed the previous winter was covered. Other members of the staff, using a truck and the same gear, did some spraying around the road before this. The result in both cases was reasonably good. With hand spraying on a large area, it is very difficult to know just what has been done, and what has not, and some bushes were obviously missed. However, regrowth did occur from some of the larger bushes around the roadside.

In this last season, weather again took a hand and it was January 31st before I was able to begin spraying. During January one of the other men had made a start in the riverbed, using a hand wand, where re-growth on some burnt areas was fairly heavy. Several changes were made in equipment. First the engine and pump were mounted on a sledge with 2 44-gallon drums lying on their sides, because with the trailer, surge in the tank very nearly put the centre of gravity outside the wheelbase on rough going, even at a very slow speed. The trailer tank was still used as the main water supply. The sledge had a rigid drawbar fitted to prevent it catching up with the tractor on the down hill. Care had to be used even with the sledge, and it was always necessary to pump out the drum on the down hill side first. A "Y" joint was also made so that 2 leads of hose, each 120ft. long, could be used in 9 days, 6 with two spraying, the area sprayed the season before had been re-covered. Where the bulldozer had been, and on the other places also, the ground was thick with seedlings, and progress was slow. We worked at an indicated pressure of 55lb. p.s.i. but with the nozzles always downhill from the pump, the nozzle pressure would be much above that. At times it was so hot in the gullies that hoses would blow up like a balloon and burst, and it was necessary to reduce pressure considerably in the hotter parts of the day. We came to the conclusion that progress was so slow using hand wands that unless we could further mechanise the spraying, we were fighting a losing battle. Even although the hoses were fairly light the temperatures made the work strenuous and tiring and being always on the lookout for an easy way to do anything, we gave quite a bit of thought on this further mechanisation. There was a 12ft. boom in the shed which had been used for crop spraying but the big problem was how to get adequate control of it to stop it being "wiped off" while crossing rough country. Eventually we thought we had a workable design and so we put our proposition to the owner. He agreed that anything to speed up spraying would be a step in the right direction and gave me authority to get the outfit assembled. We are fortunate in having a competent blacksmith in business a few miles

away to do this class of work. Even so it was 8 days before the first trial was made.

The boom was of the type that hinges back and up at the ends. It was mounted on the front of the bulldozer radiator guard on 2 arms, and could be raised and lowered by a lever. Another lever raised or lowered one side relative to the master lever, enabling the boom to be tipped down either side. Cords were fitted out to the ends of the boom so that they could be pulled up to avoid obstructions or to do the side of a taller bush. Skids were fitted to the boom to stop the nozzles hitting the ground. The boom could be raised from ground level to approximately 4ft. Booster springs were fitted to the levers so that it was necessary to push the levers to lower the boom, not raise it. Two drums were mounted on a platform over the drawbar, yet leaving the drawbar clear to pull the trailer with the 400 gallon tank up from the river. The engine and pump were mounted on one side plate, no provision being made to tilt the engine because it would work on any particular angle for only a few minutes at a time. The delivery was led to a unit of 3 quick acting taps mounted between the gear lever and seat, and from this unit a separate hose led to each section of the boom. This unit was incorporated because it was considered that considerable quantities of spray mixture could be saved by shutting off a section when there was no gorse in its immediate path. This works reasonably well in practice, the drawback being that the nozzles continue to spray for some time after being shut off, due to the pressure in the length of hose between tap and nozzle, and that it is necessary to turn it on again well before the next plant is reached. To give better coverage, another nozzle was fitted between the original on the boom, making 21 in all, 7in. apart.

Other than 1 week when I was away, and several days assisting with aerial top-dressing, this machine was used from March 4th to April 18th. We carried on this late in an attempt to get over all the area which was in its second growing season after bulldozing, although our previous experience had shown that this was too late in the year for optimum results.

Ground speed during spraying is not constant. Most times it is difficult to keep the speed slow enough without getting engine revs too slow for the tractor and yet thoroughly wet the foliage. On very light growth or seedlings it is possible to speed up and still wet the foliage but on heavier areas it is necessary to go straight downhill with fully closed throttle, and govern speed with the brakes. As near as I can work it out, speed would vary from .8 m.p.h. to 1.3 m.p.h. with an average of about 1.1 m.p.h.

It takes nearly half an hour to empty the 2 drums, so that would give an average rate of application of approximately 100 gallons of mixture to .9 of an acre. Working pressure was approximately 45lb. p.s.i. and the petrol engine was very busy keeping that up. Nozzles were fan and cone alternated—No. 39 fans, No. 32 cones.

A few weeks ago I made a survey of areas sprayed, and some that had not been done. The results are variable. On hand sprayed areas, results are good, there being very little green growth, even on relatively large bushes that it was not possible to bulldoze. That sprayed with the boom shows a browning of the foliage varying from 40 per cent. to 90 per cent., some bushes being affected nearly all over, some, perhaps the next ones to them, being affected to a much lesser extent. Only a small percentage show no sign of being sprayed, and quite likely they weren't. Smaller bushes usually showed the greatest brownings.

I cannot trace any connection between weather and percentage affected. During hand spraying, the weather was mostly foggy or drizzly in the morning, coming out very hot later in the day. From March 4th to April 16th we had only one rain and that was at a week-end. There were a lot of gusty nor'westers and on several days it was impossible to spray at all, the tractor getting most of the mixture. At all times when spraying was in progress, the spray would dry on the plants in a few minutes.

We consider that the results do not indicate the relative effectiveness of the two methods of applying the spray. Seven plants sprayed in my house section by hand wand from the tractor mounted equipment on March 29th show results similar to that sprayed with the boom. That sprayed with the boom was often up to 3ft. in height, being 2 seasons growth, and it was sprayed much too late—we had the first frost on February 14th.

On the showing of a short trial with a temporary wooden structure last season, we intend to add a heavy timber bar to the tractor mounted equipment this next season. This will consist of a piece of railway rail, hinging up at the ends, and on 4 skids, in front of the boom, and a lighter bar to keep the bush down until the top has been sprayed, behind it. The boom will rest on this bar which will be mounted in the same way as the bulldozer blade. This arrangement will allow the boom to be nearer the ground, getting better penetration, and will also give me more time to attend to the control of the tractor. A cradle to level the engine for hand-spraying operations from the tractor, is also being made.

Other Treatment

Nothing has been attempted yet in the line of re-sowing after bulldozing. The dominant species in the surrounding areas very quickly appear, together with a thick coverage of thistles. One large area bulldozed last winter now has an excellent coverage of cocksfoot and wild white clover, just as good as any sown area would be. In this particular area, sheep have obviously given the seedlings and re-growth a thrashing. With the exception of the riverbed, all bulldozed areas have been included in aerial top-dressed blocks. It is intended to aerial sow clover on one section of the riverbed which has just been cleared, in a few weeks' time.

We are also intending to try another method of spraying some large faces which are too steep for mechanical spraying with the tractor, by using the irrigation pump and spray head, and applying a weaker mixture more in the nature of high volume spraying. The areas to be done will probably be burnt first, and allowed to shoot up again.

The Economic Side

This is a section which will interest those about to attempt gorse control. Those who have tried it will probably know about it only too well.

For the size of the property, and the amount of infestation on it, control measures are definitely not a "spare time" job. The agricultural tractors only get a few weeks' rest in the year, and that at a time when quite a lot of the area could not be bulldozed due to the ground conditions, while in the summer time they have to work overtime to keep up with the work if it is at all wet. To provide a separate unit entails firstly a high capital cost, and secondly, running costs which do not directly earn anything. In this case the bulldozer, spray equipment,

trailers and transport for travelling to work (at times I have to go up to 8 miles each way) amount to well over £3000 and there is also a house for the operator which at to-day's costs will be another £1500 to £2000 unless a single man is employed or other arrangements can be made.

In theory it is supposed to cost £5 for the materials to spray 1 acre of gorse. In our work so far, we have used more than that. The owner has estimated that the actual cost of bulldozing and the first spraying is approximately £24 per acre. To hire a machine to bulldoze would cost, at £2/10/- per hour for the size and type of machine we use, £20 per day or between £32 and £40 per acre on the average for initial clearance only. In this case, with the Government unimproved valuation around £10 per acre for the hill country, and £4 per acre for the riverbed, the cost up to the first spraying is approximately $2\frac{1}{2}$ times the unimproved value for hill country, and 6 times the value for riverbed. The final cost per acre, using our present methods, will be £30 per acre at least, because one spraying will not eliminate the gorse, and it is anticipated that spot spraying will be required for many years after the main infestation has been cleared.

Conclusion

We are satisfied that the methods used are effective but expensive, and that it is physically possible to eradicate gorse on most country on which it is possible to take a crawler tractor. The problem becomes, like most farming problems, an economic one, and must be decided not on the question of per acre costs of clearance but on whether or not a farmer can afford to neglect to take all possible steps to clear the gorse. As this farmer says—either he clears the gorse out or it “cleans” him out—in that his asset now would depreciate in value to be worthless to hand on in later years.