

ROAD RESEARCH LABORATORY

Ministry of Transport

RRL REPORT LR 351

**THE ESTABLISHMENT AND MAINTENANCE OF ROADSIDE
VEGETATION – A REVIEW OF METHODS AVAILABLE**

by

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Crowthorne, Berkshire

1970

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THE ESTABLISHMENT AND MAINTENANCE OF ROADSIDE VEGETATION – A REVIEW OF METHODS AVAILABLE

ABSTRACT

In this Report the methods that are available for establishing roadside vegetation are described and details are given of maintenance programmes for verges along different types of road. The various types of cutting equipment and chemicals that are available for the control of vegetation are reviewed and the relative merits of different methods of maintenance are discussed.

I. INTRODUCTION

There are about 500,000 acres of central reserve and roadside verge¹ (i.e. the unpaved areas between the boundary fences of the road) in Great Britain. The vegetation growing in these areas plays an important part in helping the roads to blend with their surroundings, in reducing monotony by providing features of visual attraction to users of the road and in providing protection from damage by erosion to the slopes of earthworks. The vegetation also serves as a reserve for plants and small animals many of which now survive only on roadside verges.

The establishment of vegetation on the central reserve and verges of new roads cannot be left entirely to nature and once established the vegetation has to be controlled to some extent. In recent years considerable changes have been made in methods of establishing and maintaining vegetation. This has been accompanied by a growing realisation of the biological importance of the verges and of their value as an attractive feature of the countryside. This Report reviews the methods of establishing and maintaining vegetation so that the numerous and sometimes conflicting functions that the verge has to fulfil can be reconciled as far as possible. Details of suppliers of seeds, fertilizers and equipment are included in the Appendix.

2. FUNCTIONS OF ROADSIDE VERGES

The main uses of the central reserve and verges are:-

- a) To provide a pathway and refuge for pedestrians
- b) To provide a safety margin between the carriageways of a dual-carriageway road and between the carriageway and adjoining property.
- c) To provide an area where the services connected with the road (such as road signs, drainage systems and lighting) can be installed.

In towns the area between the road and the boundary and between carriageways is often paved but it would clearly be uneconomic and undesirable to do this elsewhere. If these areas were left untreated some form of vegetation would soon grow but it is better to take positive action to ensure that a desirable type of vegetation is established. This vegetation serves three functions:-

- 1) It protects the verges and central reserve from damage by light traffic and from surface erosion; the latter function is particularly important on the slopes of cuttings and embankments.
- 2) It provides a means of relating the road to its surroundings and making it visually interesting to the road user.
- 3) It provides a habitat for many small plants and animals some of which no longer exist elsewhere in this country.

The fundamental purpose of the highway is to provide a means for the safe right-of-passage for all road users and Items (a) – (c) and Function (1) must therefore be the primary considerations in planning the planting and maintenance work. However, few would question that Functions (2) and (3) are worthwhile objectives and the policy for planting and maintenance should be aimed, as far as possible, at furthering all the functions of the verges and central reserve.

3. ESTABLISHMENT OF VEGETATION

Grasses are the principal components of the vegetation on most roadside verges and central reserves and this Section deals with the establishment of grass on these areas and on the slopes of cuttings and embankments. The question of planting trees and hedges is not covered because for major road construction the planting schemes are approved by the Ministry of Transport's Landscape Advisory Committee and the planting is done under the supervision of the Ministry's Horticultural Adviser. On roads where the Ministry of Transport does not assume responsibility for any planting a scheme for shrubs and trees will have to be specially drawn up to suit the particular site. Generally species should be chosen which blend well with the existing surroundings; useful guidance on this subject is given by Arbon².

3.1 Preparation of the site

When the road construction is completed the areas to be grassed require some special preparation. This usually means that topsoil has to be spread to a depth of about 150 mm over the area to be seeded. The topsoil has to be raked or harrowed to obtain a tilth which should be such that no stones or clods of soil with a dimension in any single direction greater than about 100 mm should be present and they should not protrude from the surface by more than about 35 mm.

Topsoil should be available on most sites, as Clause 601 of the Ministry of Transport Specification for Road and Bridge Works³ requires that all topsoil removed from excavated areas should be stockpiled for re-use for the soiling of slopes, verges and the central reserve. Where topsoil is not available it may be more economic to use hydraulic seeding (Section 3.4) rather than to import topsoil.

3.2 Fertiliser requirements

Ideally the fertiliser requirements should be established by tests made on samples of soil taken from the site. This is not always practicable and, as fertilisers are inexpensive in relation to other costs, a complete fertiliser is generally used. A compound with approximately 10 per cent nitrogen (as N), 10 per cent phosphorus (as P_2O_5) and 20 per cent potassium (as K_2O) is suitable for most situations and it should be spread at a rate of 50 kg per 1000 square metres (1 cwt per 1200 yd^2).

On acid soils (pH less than 5.5 when tested by Test 10 of BS 1377⁴), lime in the form of ground limestone or chalk should be spread before the fertiliser at a rate of 250 kg per 1000 square metres (4 cwt per 1000 yd^2) and incorporated into the soil by harrowing.

3.3 Grass seed

The main requirements of the seed mixture are that it should provide a grass that establishes itself rapidly and that it should be short-stalked to reduce maintenance costs. In agricultural areas there is a third factor that has to be considered – namely that grasses and clovers are easily cross-fertilised and therefore the roadside grasses and clovers may contaminate cultivated varieties in adjoining meadows. This is particularly important if the crop is to be saved for seed.

With these factors in mind the Ministry of Transport Specification³ for seed for verges and slopes (Clause 2616) is as follows:-

Perennial Rye Grass S23	54 kg	60 lb
Red Fescue S59	18 kg	20 lb
Smooth-stalked Meadow Grass	9 kg	10 lb
Crested Dogstail	10 kg	12 lb
White Clover S100	9 kg	10 lb
	<hr/>	<hr/>
	100 kg	112 lb

This specification has been criticised and it is not always used. The main point of criticism is the high proportion of tall-growing long-lived perennial rye grass in the mixture. Perring⁵ suggests that Italian Rye Grass (*Lolium Italicum*) can be established initially just as effectively but it is much shorter-lived and if sown in a mixture with other slow-growing fine-leaved species like Red Fescue (*Festuca Rubra*) or Creeping Bent (*Agrostis Stolonifera*) would be gradually replaced by them. This would mean that less frequent cutting would be required.

The seed may be sown by hand, seed fiddle or seed drill at a rate of not less than 1 kg per 200 square metres (1 lb/90 yd^2)³. After sowing the surface should be raked or harrowed and then lightly rolled. The sowing may be made at any time from March to October but the best times are from mid-March to late April and August-September. It is advisable to check that the seed supplied is that specified by sending a sample to the Official Seed Testing Station at Cambridge.

3.4 Hydraulic seeding

Hydraulic seeding involves spraying the mixture of seed, fertiliser and mulch on to the surface of the soil. This is done with a machine which consists of a tank equipped with a means of agitating the contents, a powerful pump and a spray gun. Seed, fertiliser and mulch are added to water in the tank and thoroughly mixed together; the resulting slurry is then sprayed on to the surface (Plate 1). The mulch holds the seeds in position and by keeping them warm and moist it assists germination. Several materials have been used for the mulch but wood cellulose fibre is now the most widely used material. When the operation is completed the soil has the appearance of being covered with wet blotting paper.

The main advantage of the method is in its application for the seeding of steep slopes where access is difficult for normal seeding procedures. In addition to this the fact that no topsoil is required is also an advantage on some sites although if the subsoil is infertile it may be necessary to apply fertiliser at regular intervals until the vegetation is well established. Hydraulic seeding can be carried out very quickly – up to 5 hectares (12 acres) per day can be seeded by a single unit of two men and one machine. It is more expensive than conventional seeding on flat or gently sloping ground but it is considerably cheaper than laying turf.

The machinery required for hydraulic seeding is not generally available and the operation of the spray gun requires considerable experience. The method is therefore best left to specialist firms (see Appendix).

3.5 Turfing

The need for turfing has been reduced by the introduction of hydraulic seeding and of the methods available for the establishment of grass it is by far the most expensive. Its main applications are for protecting steep slopes from surface erosion and in the lining of ditches where the establishment of grass by seeding would be too slow to give the necessary protection.

All turves should be used within one week of cutting during the period April – August inclusive or within two weeks of cutting during the remainder of the year. The turves should be laid in a diagonal manner on slopes and if the slope is steep it may be necessary to secure them with coarse-mesh galvanised wire netting pegged into the surface. If wire is used it must be removed before it rusts away as the loose ends may cause damage to the cutting machines.

4. MAINTENANCE OF NEWLY SOWN AREAS

During the first two years from the date of initial sowing, mowing should be carried out as regularly as possible to enable the development of a close sward, free from weeds. The first mowing should be carried out when the grass reaches a height of about 150 mm and it is important not to cut the grass down to below 25 mm in height. After the first cut further mowing depends on the time of year and weather conditions. Growth is most vigorous during late spring and early autumn; during the growing period the grass should be cut at intervals of 4 weeks on verges and central reserves and at intervals of 8 weeks on slopes.

5. MAINTENANCE OF ESTABLISHED VEGETATION

5.1 General considerations

In any well established verge a balance between those interests mentioned in Section 2 will have been achieved and the plant and animal community will have evolved to suit prevailing conditions. A sudden change in the methods of maintenance may upset the ecological balance and could cause the extinction of some species. There was therefore considerable anxiety when chemical control of the vegetation was first introduced in the early 1950's. However after consultation between the various interested parties two Circulars Nos 718 and 726 were issued which gives advice on when and where to use chemical sprays. The contents of these circulars are discussed in Section 5.3.

It is advised that the use of chemical control should be restricted to Trunk and Class 1 roads (see Section 5.3). Costs are similar to those with mechanical cutting but there is a saving in labour if chemical spraying is employed. Moreover weed spraying is normally done in the spring whereas cutting has to be done throughout the summer when labour is more likely to be required for other purposes. In the next two Sections the use of both methods will be considered in more detail.

5.2 Cutting

5.2.1 Frequency of cutting Once vegetation is established the aim should be to reduce maintenance to the minimum consistent with the safety of road users and the satisfactory visual appearance of the verges and central reserves. The frequency of cutting depends very largely on the type of verge or central reserve as the well-mown appearance of vegetation, attractive in an urban area, would be undesirable and would look out-of-place in a country lane. Similarly a higher standard of maintenance should be aimed at on level ground and central reserves than on the slopes of cuttings and embankments.

5.2.1.1 Heavily-trafficked roads in rural areas On these roads it is recommended⁶ that the vegetation in the first two metres of the verge or central reserve adjacent to the road or hard shoulder should be maintained at a maximum height of 150 mm. The remaining areas of vegetation can be allowed to grow up to a height of 300 mm except where it is necessary to maintain it at the lower level in areas where visibility would otherwise be impaired. A frequency of mowing of 6 – 8 weeks will probably be necessary to restrict growth to a height of 150 mm, and a frequency of mowing of 12 – 16 weeks to restrict growth to a height of 300 mm, but much will depend on weather conditions and the fertility of the soil.

5.2.1.2 Heavily-trafficked roads in urban areas In urban areas a greater amount of maintenance is required and it is recommended⁶ that the vegetation in the complete width of the verges and central reserves should be maintained at a maximum height of 75 mm.

5.2.1.3 Secondary roads On these roads the frequency of cutting can be very much less. Underwood⁷ suggests that for Class 2 roads and the more heavily trafficked unclassified roads the vegetation in the first two-metres width of verge should be cut twice per season unless additional cutting is necessary for safety purposes. The vegetation in the remaining part of the verge should be cut once every second year after the end of June. For all other minor roads he suggests that the vegetation in the first two-metres width of verge should be cut once per season unless additional

cutting is necessary for safety purposes and the vegetation in the remaining part of the verge should be cut once every third year. This agrees well with the cutting programme set out by Perring⁵ and designed to maintain a large variety of species of vegetation in the verge.

5.2.1.4 Slopes of embankments and cuttings The treatment of grass on slopes will vary according to their location. In urban areas the grass should be kept to 150 mm in height but in rural areas discretion should be used in deciding on the height to which vegetation should be maintained⁸. Although in some areas a height of 300 mm would be appropriate, in general it should not be necessary to cut the grass more than once or twice each year. Where the growth of grass is less vigorous one cut per year should be sufficient and where the road passes through woodland or moorland cuttings it should, in fact, be unnecessary to cut the grass. The timing of grass cutting is important if the greatest advantage is to be gained from the work. If a single cut is to be given each year this should be carried out in June whereas if the grass is to be cut twice per year the work should be carried out in May and July.

5.2.2 Equipment A list of manufacturers of cutting equipment is given in the Appendix. Three types of machine on the market are described in Sections 5.2.2.1–3.

5.2.2.1 Cylinder or reel cutters This type has from about 6 to 12 helical blades set about a horizontal axle at a radius of about 75 – 100 mm. They cut against a fixed straight blade which is mounted horizontally.

Cylinder or reel cutters are available in all sizes from the small hand lawn-mower to gang-mowers which comprise a set of cylinder cutters similar to but more robust than those fitted on the conventional type of lawn mower. The cylinder units are linked together with a small overlap behind a towing vehicle and the cutting blades are driven through the wheels of the cylinder units. As many as 9 units may be linked together giving a total cutting width of 6 metres.

Under average conditions tractor-drawn gang-mowers are towed at about 10 – 12 mile/hr but a reduced speed is necessary where the ground is uneven. They are most suitable for extensive flat areas where the grass and other vegetation is not excessively long and is free from woody growth. In wet conditions there is sometimes a tendency for the wheels to skid and hence not turn the cylinders. Considerable damage can be caused to the cutting blades by stones and other hard objects lying in the path of the mower.

5.2.2.2 Flail and rotary cutters These units comprise machines which employ a spinning disc (or knife blades) or a series of flails (chains) which are easily removed and replaced when worn or damaged. The machines in this group range from those designed primarily as grass-cutters to machines whose primary purpose is the clearance of dense undergrowth. There are models of both types designed specifically for use on roadside verges; the cutting widths are usually within the range 1 – 2 metres. The spinning disc or knife cutter is effective in fairly long coarse grass even when wet but is less effective than the flail machine for cutting tough woody growth. Both types reduce the grass to a mulch which makes collection unnecessary.

5.2.2.3 Sickle or scythe cutters These cutters have a cutter-bar about 2 metres in length which consists of a toothed blade which moves with a reciprocating action on a fixed toothed blade below.

They were originally designed for cutting hay but many are now specifically made for cutting verges. Models are also available in which the scythe blade can be set at an angle to cut sloping banks and verges. The machine can cut any length of grass and wet grass presents no problems. Its biggest draw-back is that it leaves the cut vegetation on the ground as a thick mulch which looks unpleasant and chokes new growth.

5.2.3 Grass cutting on sloping ground Grass cutting on the slopes of cuttings and embankments can be done with machines specially adapted for this purpose. As already mentioned machines are available where the cutter-bar can be set to an angle up to 60° above or below the horizontal. This allows a width of up to 2 metres of grass to be cut whilst the tractor itself stays on level ground. Self-propelled bank-mowers are also available which have low centres of gravity and which can operate on slopes with a gradient of up to 1 in 2.

5.3 Chemical control

Chemicals can be used to kill broad-leaved plants and to control the rate of growth of grasses. Their use for the control of roadside vegetation in this way is governed by two Ministry of Transport Circulars Nos 718 and 726 which give advice on when and where to use chemical sprays. The relevant sections of these two circulars read as follows:-

- (a) Spraying should be carried out only on Trunk and Class A (now known as Class 1) roads and on certain dangerous corners in Class B (Class 2) roads, and at the earliest susceptible stage of growth, which in the south of England is usually reached at the beginning of May.
- (b) On wide verges spraying should be limited to within 3 metres (this has since been reduced by Memorandum TS/68 to 2 metres) of the road edge except where stands of injurious weeds occur. On narrower roads care must be taken to avoid spraying the hedge in the immediate vicinity. It is emphasised that drift in windy weather is a serious hazard to adjacent hedgerows and to susceptible crops and garden plants.
- (c) In certain cases highway authorities may be asked to leave unsprayed sections on Class A (Class 1) roads where interesting species occur.
- (d) It is stressed that the misuse of chemicals can be detrimental to nearby crops and it is therefore most important that full instructions should be obtained from the suppliers of any such materials which are to be used on roadside verges. In particular because of the possibility of polluting water-courses it is essential that spraying machines should not be filled or emptied near, nor spray residues poured into, ditches or drains.

These restrictions have since been amplified by Ministry of Transport Technical Memorandum No TS/68. Para 5.2 of this states that, 'Selective weed killers and grass-growth inhibitors may be used on central reserves of standard width, on level verges up to 6 feet from the carriageway or hard-shoulder and where essential to preserve visibility. Neither of these materials may be used outside these limits without express authorisation in writing. This authorisation should be obtained from the Ministry of Transport's Horticultural Officer through the Divisional Road Engineer. Spraying over a wider area will be considered where large stands of injurious weeds occur'.

On roads where chemical control is permitted spraying has certain advantages over cutting. For example:-

- (a) Noxious weeds (defined under the Weeds Act of 1959 as spear thistle, creeping field thistle, curled dock, broad-leaved dock and ragwort) can be completely eliminated. The use of chemicals for this purpose is permitted on any road verge.
- (b) On verges where physical obstructions are frequently encountered spraying is much easier than cutting.
- (c) Spraying can be done in areas where it is difficult to manoeuvre cutting equipment.
- (d) It is relatively easy to control the growth of vegetation on slopes.
- (e) There is a saving of labour.

5.3.1. Chemicals used A large number of chemicals are now available for the selective control of vegetation but only four are used to any extent in the control of roadside vegetation.

2,4-D(2,4 Dichlorophenoxyacetic acid) and MCPA (4-Chloro-2-Methylphenoxyacetic acid) have similar properties and are able to kill many broad-leaved plants without causing any permanent harm to grasses. Both are quickly broken down in the soil and are non-toxic to animals. They produce some useful retardation of grass growth and prolonged treatment over a number of years leads to the elimination of the coarser grasses⁹.

Maleic Hydrazide (MH) does not kill the vegetation but it has the power of greatly reducing the rate of growth. Application of the chemical in the spring will normally retard the growth of grasses for 12 to 14 weeks. It is frequently used in association with 2,4-D so that the weeds are killed and the retardation period extended to 16 – 20 weeks.

2,4,5-T (2,4,5 Trichlorophenoxyacetic acid) is useful for killing the stumps of bushes and small trees after they have been cut down.

5.3.2 Time of application If conditions are not correct the effectiveness of the herbicide may be reduced and it is therefore important to pay attention to the weather conditions and the time of year when spraying is to be carried out. If rain falls within three hours of application the herbicide may be washed off the leaves before it has been absorbed by the plant. In addition if spraying is carried out before some weeds have emerged these weeds will be unaffected and may eventually grow more vigorously because of reduced competition from the plants that have been killed.

Spraying should therefore be carried out when the weeds and grass are beginning to grow actively, usually between mid-March and early May. Application is best carried out in calm dry weather and when rain is not expected. One spraying per year will usually be enough but it may be necessary to supplement this by cutting during late Summer.

5.3.3 Method of Application The manufacturers instructions concerning degree of dilution and rates of spray should be closely followed. Great care should be taken to ensure that there is no contamination of adjacent hedgerows and crops (Section 5.3). For these reasons the spraying equipment and the rates of dilution used in agriculture are not suitable for use on verges and central reserves. The most effective and safe method of applying the chemicals is to spray with high volumes of diluted herbicide (650 – 1000 litres/hectare) (60 – 100 gallons/acre) using low pressures to minimise the formation of fine spray which could be carried away by the wind.

The equipment required for spraying consists of a tank to contain the diluted herbicide which may be mounted in a trailer, lorry or Land-Rover, a pump, and spray-bar. The spray-bars are usually fitted with cone-type nozzles which ensure an even coverage. For a 2-metre width of verge sprayed at 800 litres/hectare (80 gal/acre) a 1100 litre (250 gal) tank allows 3 km of verge to be sprayed at each filling.

For spraying on slopes the spray-bar can be set at an angle; for very wide slopes carrier booms are available in 3- and 6-metre lengths which are carried by a man at each end of the boom while the trailer runs along on the hard-shoulder. A 1100-litre (250 gal.) tank supplying herbicide to a 6-metre boom is sufficient to treat a 2½-km length of slope.

6. ACKNOWLEDGEMENTS

In addition to the sources of information already referred to, material for this Report has been gathered from Ministry of Transport Circulars and Memoranda, Road Research Laboratory Notes¹⁰, the Weed Control Handbook¹¹ and from discussions with representatives of the many bodies with an interest in the subject. The Report was prepared in the Earthworks and Foundations Section (Section Leader: Mr W A Lewis) of the Construction Division of the Laboratory.

7. REFERENCES

1. WAY, J. M. Roads and the conservation of wild life. *J.Inst. Highw. Eng.* 1970 17 (In the press)
2. ARBON, A. A. Tree planting and the highway authority. *J. Inst. Highw. Eng.* 1967, 14(4), 7 – 18.
3. MINISTRY OF TRANSPORT. Specification for Road and Bridge Works, London 1969 (H.M.S.O.).
4. BRITISH STANDARDS INSTITUTION. British Standard 1377:1967. Methods of testing soils for civil engineering purposes. London 1967 (British Standards Institution).
5. PERRING, F. H. Verges are vital – A botanist looks at our roadsides. *J. Inst. Highw. Eng.* 1967, 14 (12), 13 – 16.
6. Report of the Ministry of Transport and Local Authorities Committee on Highway Maintenance

7. UNDERWOOD, C. V. Management of verges. *Symposium on Road Verges*, London 1969, 81. (Monks Wood Experimental Station, Abbots Ripton, Hunts.).
8. MINISTRY OF TRANSPORT. Instructions for the establishment and maintenance of grassed areas on trunk roads and motorways, use of chemical sprays and treatment of planted areas. *Ministry of Transport Technical Memorandum No T5/68*, London, 1968 (Unpublished).
9. WILLIS, A. J. and E. W. YEMM. Spraying of roadside verges: long-term effects of 2,4-D and maleic hydrazide. *Proc. 8th Brit. Weed Control Conf.* 1966, 2, 505 – 10.
10. TANNER, J. S. Grass cutting on airfields and roadside verges: A review of the machinery available. Department of Scientific and Industrial Research, *Road Research Laboratory, Research Note No. RN/4110/JST*, Harmondsworth, 1962 (Unpublished).
11. FRYER, J. D. and S. A. EVANS (Editors) *Weed Control Handbook* Oxford, 1968 (Blackwell Scientific Publications), 5th Edition.

Gartons Ltd., Warrington, Lancs.
 Goldsmith Brothers Ltd., Seed Merchants, Bury St. Edmunds, Suffolk.
 R. W. Gunson (Seeds) Ltd., 20 – 21 St. Dunstands Hill, London EC3.
 Hasler and Company Ltd., Dunmow, Essex.
 Hunters of Chester Ltd., Chester.
 Hurst Gunson Cooper Taber Ltd., Witham, Essex.
 Hutson and Son Ltd., North End, Wisbech, Lincs.
 J. B. Seeds Ltd., Bodenham, Hereford.
 W. W. Johnson and Son Ltd., Boston, Lincs.
 Johnston and Jeff Ltd., 63 High Street, Hull, HU1 1QP.
 A. C. Leighton, Whitchurch, Salop.
 Locks Seeds, Hendford, Yeovil, Somerset.
 C. W. Marsters Ltd., Kings Lynn, Norfolk.
 David Miln and Company (Seedsman) Ltd., Boughton, Cheshire.
 W. K. McNair)
 Austin and McAslan) 67 Hamilton Drive, Portobello, Edinburgh, EH15 1NP.
 S. McCausland Ltd., 36 – 38 Victoria Street, Belfast 1.
 Chas. Midwinter and Son Ltd., 7 Cheap Street, Newbury, Berks.
 Mommersteeg Seed Company Ltd., Irthlingborough, Northants, NN9 5QE.
 J. Morton Ltd., Commercial Road, Banbridge, N.Ireland.
 Nickersons Seeds, Field House, Grimsby, Lincs.
 Pope and Chapman Ltd., 13 – 19 Hockerill Street, Bishop's Stortford, Herts.
 J. Picard and Co. Ltd., 34/35 Corn Exchange Chambers, Seething Lane, London EC3.
 Charles Sharpe and Co. Ltd., Sleaford, Lincs.
 W. Sinclair Ltd., Marsh Lane, Boston, Lincs.
 Smith Bros. (Basingstoke) Ltd., North Waltham, Basingstoke, Hants.
 Sutton and Sons Ltd., Reading, Berkshire.
 Twyford Seeds Ltd., Adderbury, Banbury, Oxon.
 Underwood Seeds Ltd., 41 White Friars, Chester, CH1 1NZ.
 J. Vinnicombe and Son Ltd., Court Wick, Littlehampton, Sussex.
 Webbs Farm Seeds Ltd., P.O. Box 23, Ayr.
 K. Wilson Ltd., Sovereign House, 4 Queens Court, Seacroft Town Centre, Leeds, LS14 6NT.
 Wiltshire Farmers, Bath Road, Melksham, Wilts.
 Woodward's Seeds Ltd., Avenue Road, Witham, Essex.
 Wyatt and Bruce Ltd., Bovey Tracey, Devon.
 Samuel Yates Ltd., 75 Shudehill, Manchester, M4 4AP.

Hydraulic Seeding

The following firms undertake hydraulic-seeding contracts:-

B. W. D. Herbage Control Company Ltd., Gilwern, Abergavenny, Mon.
 E. F. G. (Landscapes) Ltd., Forestry House, Berkhamsted, Herts.
 E. T. S. Hydraulic Seeders Ltd., East Busk Lane Works, Otley, Yorkshire.
 V. E. B. Landscape Reclamation Ltd., 230 Tottenham Court Road, London W1.

Manufacturers of grass-cutting equipment

Many of the large number of manufacturers of grass-cutting equipment specialise in certain types of machine. The machine types have been listed by the following Code Numbers:-

- (1) Cylinder or reel cutters
- (2) Flail and rotary cutters
- (3) Sickle or scythe cutters (Cutter-bars)
- (4) Equipment for cutting on slopes

These numbers appear before the names of the appropriate manufacturers.

- | | |
|-----------|---|
| (1)(2) | John Allen and Sons (Oxford) Ltd., Cowley, Oxford, OX4 3LP |
| (1) | R. K. Allet, Tinwell Road Lane, Stamford, Lincs. |
| (3) | A. C. Bamlett Ltd., Station Road, Thirsk, Yorks, YO7 1QA. |
| (1) | E. P. Barrus (Concessionnaires) Ltd., 12 - 16 Brunel Road, London W3. |
| (1)(2)(3) | British Lely Ltd., Crudwell, Malmesbury, Wilts. |
| (2)(4) | Bomford and Evershed Ltd., Salford Priors, Evesham, Worcs. |
| (3) | David Brown Tractors Ltd., Meltham, Huddersfield, Yorks. |
| (2) | Colchester Tillage Ltd., Hythe Hill, Colchester, Essex. |
| (1) | Dennis Bros Ltd., Guildford, Surrey. |
| (3) | John Deere Ltd., Langar, Nottingham, NG13 9HT. |
| (2) | Flymo Ltd., Greycaine Road, Watford, Herts. WD2 4PT. |
| (1)(2) | Ginge-Raadvad (UK) Ltd., Irvine Industrial Estate, Irvine, Ayrshire. |
| (1) | Thomas Green and Son Ltd., North Street, Leeds LS1 1J2 |
| (1)(2)(4) | Hayters Ltd., Bishop Stortford, Herts. |
| (1) | Horwool (Manufacturing) Ltd., Lower Bedfords Road, Romford, Essex. |
| (1) | Howard Rotavator Co. Ltd., West Horndon, Essex. |
| (2) | Landmaster Ltd., Hucknall, Nottingham, NG15 7NF. |
| (1) | Lloyds and Co. Ltd., Letchworth, Herts. |
| (2)(4) | Lupat Ltd., Station Road, Thirsk, Yorks YO7 1QA. |
| (2)(3) | Massey-Ferguson Ltd., Banner Lane, Coventry. |
| (2) | MIL Ltd., Heathtown Works, Wolverhampton. |
| (2) | G. D. Mountfield Ltd., East Street, Maidenhead, Berks. |
| (3) | New Holland Division, Sperry Rand Ltd., Aylesbury, Bucks. |
| (2)(4) | Opico (UK) Ltd., Little Burstead House, Billericay, Essex. |
| (1) | H. Pattison and Co. Ltd., Stanmore Hill Works, Stanmore, Middlesex. |
| (1)(2) | Charles H. Pugh Ltd., Atco Works, Tilton Road, Birmingham 9. |
| (1) | Qualcast Ltd., Sunnyhill Avenue, Sunnyhill, Derby DE3 7JT. |
| (1) | Ransomes, Sims and Jefferies Ltd., Ipswich, Suffolk. |
| (2)(3) | Rolfes Mini-Tractors Ltd., Winchester Hill, Romsey, Hants. |
| (3) | Sheen (Nottingham) Ltd., Greasley Street, Bulwell, Nottingham NG6 8NH. |
| (1)(2) | Stemport Marketing Co. Ltd., Pembroke Road, Aylesbury, Bucks. |
| (3) | Tarpen Engineering Co. Ltd., Coronation Road, London NW10. |
| (2) | Edward Thomas and Co. (Oswestry) Ltd., Whittington Road, Oswestry, Salop. |
| (2)(4) | Turner Engineering Co. (Coughton) Ltd., Coughton, Alcester, Warwicks. |

- (2) Watveare Overseas Ltd., Cantrell Works, Ivybridge, Devon.
(1) Webb Lawnmowers Ltd., Tame Road, Witton, Birmingham 6.
(1)(2)(3) Wolesley Engineering Ltd., Electric Avenue, Witton, Birmingham 6.

Suppliers of herbicides for chemical control

Boots Pure Drug Co. Ltd., Station Street, Nottingham NG2 3AA.
Burt, Boulton and Haywood Ltd., Brettenham House, Lancaster Place, Strand, London WC2.
Bugges Insecticides Ltd., Sittingbourne, Kent.
J. D. Campbell and Sons Ltd., 4 Lund Street, Cornbrook, Manchester.
Chipman Chemical Co., 2 Caxton Street, London SW1
W. J. Craven and Co. Ltd., 20/30 Church Street, Evesham, Worcs.
Fisons Pest Control Ltd., Chesterford Park Research Station, Saffron Walden, Essex.
May and Baker Ltd., Dagenham, Essex.
Mechema Ltd., Talbot Wharf Chemical Works, Port Talbot, Glamorgan.
Plant Protection Ltd., Fernhurst, Haslemere, Surrey.
Shell International Chemical Co., St Helen's Court, London EC3.
Universal Crop Protection Ltd., Nicholson House, Nicholson's Walk, Maidenhead, Berks.



Neg. No. B1091/70

PLATE 1 Hydraulic seeding in progress

ABSTRACT

The establishment and maintenance of roadside vegetation – A review of methods available: P. T. SHERWOOD B.Sc., F.R.I.C.: Ministry of Transport, RRL Report LR 351: Crowthorne, 1970 (Road Research Laboratory). In this Report the methods that are available for establishing roadside vegetation are described and details are given of maintenance programmes for verges along different types of road. The various types of cutting equipment and chemicals that are available for the control of vegetation are reviewed and the relative merits of different methods of maintenance are discussed.

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