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Forest Ploughs

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FOREST PLOUGHS

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INTRODUCTION

This leaflet describes and defines ploughs available to the forester. Although the function and limitations of ploughs are outlined no discussion of evidence or use is included. Ploughing tractors are a subject in their own right and where they are named it is merely to indicate the size and configuration which has been found satisfactory. Single mouldboard ploughs can be made to throw either to the right or left and therefore no further mention will be made of this.

NOMENCLATURE

Terms such as "deep" and "complete" in ploughing have been redefined over the years as ploughs were made larger which partly explains why there is confusion in the nomenclature of ploughs today. The following new system of plough descriptions is proposed to remove such confusion. (See figures 1 and 2 for the names of parts on trailed and mounted ploughs respectively). On any type of plough the following four features may be recognised:

- (a) Mouldboard type—single (S)
—double (D)
 - (b) Depth of furrow (in centimetres)
 - (c) Depth of tine (T) channel if present (in centimetres)
 - (d) Plough carriage type—mounted (m)
—trailed (t)
- } both depths
} from the
} original
} surface

Using the abbreviations given above a single-furrow tine plough for steep ground can be described by (a) S, (b) 45, (c) T60, (d) m; ie S45/T60/m.

If a further abbreviation (I) for interval is made then the ploughing done with an

S45/T60/m plough can be described using the same system. For example, it might be S40/T55/m/12·0 where the final figure is the interval between plough runs in metres. Note the depth differences between the design specification of the plough (S45/T60/—) and the achieved result S40/T55/—). Ploughing by all types of forest ploughs may be described in a similar way.

MOUNTINGS AND CARRIAGES

Confusion has arisen over the names for various parts of a forest plough and even what is meant by "the plough". The abbreviated descriptions in figures 1 and 2 will resolve much of this problem. "The plough" correctly refers to the carriage plus mouldboard assembly.

The 3-point linkage found on agricultural tractors is adequate for easy sites; but it is usually more economical to use a trailed plough on such sites. Mounted ploughs are used on steep slopes or where there are many obstacles which require the plough to be lifted frequently. Where these conditions prevail, a more substantial linkage than the agricultural 3-point linkage is required, the type used being known as a "pivot-head assembly". Two sizes of the currently recommended pivot-head assembly are available, one for ploughing depths down to 60 cm and a larger version for ploughing down to 90 cm deep.

Carriages for trailed ploughing come in two basic forms, the Universal or Standard and the Arch beam. The Universal or Standard carriage has a straight beam which is 5 in (0·12 m) wide and 8 in (0·2 m) deep, and is currently used for ploughing depths up to 60 cm. For ploughing with double mouldboard assemblies on gley soils this beam is

preferably reinforced with a flat plate on the under-side. The Arch Beam carriage was first designed as part of the cross draining plough particularly where this was to be worked in regeneration areas. It has subsequently been used in most trailed ploughs reaching depths of 90 cm.

STANDARD PLOUGHS

Standard ploughs are those which will be useful for most normal afforestation and reforestation purposes. They represent the minimum equipment necessary to cultivate the major soil types.

1. Mounted single-mouldboard tine plough S45/T60/m (Shallow) (See Plate 1(a).)

TRACTORS—Fiat 70, Fiat 80, Fiat 100, BTD8.
CARRIAGE—Beam mounted on the appropriate small pivot head. A version of this plough which can be mounted on the normal agricultural tractor 3-point linkage is available.

NORMAL FUNCTION—For cultivation of steep upland slopes and small awkward areas where soils are either of a type requiring rupture of an ironpan or do not require anything more than provision of a planting position with weed suppression, ie, Brown Earths and Podzols. Normal operation is one-way ploughing.

ADDITIONAL CAPABILITIES—This plough will also operate through flushes often found on steep slopes, usually with surface water gley or peaty gley soils.

LIMITATIONS—The plough will not produce a furrow designed for drainage and is therefore ineffective on gley soils and peats. Moreover it does not fulfil the ideal requirements for enhancing stability in that the root platform width is limited by each furrow at 1.8–2.4 m spacing in normal spaced ploughing. Most indurated soils cannot be tackled by this plough.

Tractors with mounted ploughs tend to have narrow, short tracks with consequent high bearing pressure so that gleys and peats are hazardous for these machines. On good mineral soils slopes up to 35° can be attempted, but where a peat layer is present tractors can begin to tear this layer from underlying mineral soil. Wide or long tracked vehicles are most at risk of sliding downhill on a platform of peat. Foresters are responsible for the safety of their drivers and where they are in doubt as to the feasibility of ploughing any particular piece of ground they should seek advice. Drivers may have to be restrained from tackling ground on which it is dangerous to plough.

2. Trailed single-mouldboard tine plough S45/T60/t (Shallow)

TRACTORS—Fiat 70, Fiat 80, Fiat 100, BTD 8, Fiat 655, County 6.

CARRIAGE—Mounted on a standard beam carriage.

NORMAL FUNCTION—The function of this plough is the same as the mounted version S45/T60/m but is used on less steep ground.

ADDITIONAL CAPABILITIES—By using a tractor designed for soft ground it is possible to plough through gley soils and peats, although this is not recommended except where a small area of these soils occurs within a much larger matrix of Brown Earths, Podzols and Ironpan soils.

LIMITATIONS—The plough has the same limitations as the mounted version but the trailed plough has two main advantages; first the mouldboard assembly can be interchanged and second it tends to plough deeper. Slope limitations are associated with the problem of turning on steep slopes. If the trailed outfit can turn at the top of a slope, it can cope with the same slopes as the mounted version but safety indicates a limit of approximately 20° because, whereas the mounted plough can act as an anchor for the tractor, no such advantage can be claimed for the trailed plough.

The advantages of two-way ploughing are obvious but the limitations imposed by slope are hard to detail because they vary with soil conditions and size of tractor. There are advantages in using a larger tractor in order to continue two-way ploughing on a marginal slope.

3. Mounted single-mouldboard tine plough S60/T90/m (Deep) (See Plate 1(b).)

TRACTORS—FM Challenger 33, CAT D7.

CARRIAGE—Large pivot-head assembly.

NORMAL FUNCTION—For deep-tine spaced ploughing on indurated soils, to disrupt any indurated layer present down to a depth of 90 cm and leave a cultivated soil 60 cm deep. It has been specifically designed for regeneration areas with indurated ironpan or indurated gley soils.

ADDITIONAL CAPABILITIES—The plough can be used on other soils provided the tractor can travel over the ground. Complete ploughing can be achieved by ploughing with an interval of less than 1.0 m.

LIMITATIONS—Spaced-furrow ploughing on loamy or clayey gley soils or deep peats will limit root plate development thereby increasing the risk of windthrow.

The tractors associated with this plough are so heavy that any soft ground is hazardous and they are difficult to reverse up slopes over 20°.

4. Trailed double-mouldboard plough D60/—/t (Shallow) (See Plate 1(c).)

TRACTORS—Bowen 60, Fiat 655, TM 55, TM 70, Fiat 100.

CARRIAGE—Standard or Universal Carriage.

FUNCTION—To plough 2 ridges of turf either side of a furrow up to 60 cm deep in deep peat so that the planting distance across the furrow is less than 2.4 m.

ADDITIONAL CAPABILITIES—With extra strength on the carriage beam non-indurated gley soils can be satisfactorily ploughed.

LIMITATIONS—This plough will function on indurated mineral soils but the furrow depth and size of turf are reduced.

5. Trailed double-mouldboard tine plough D60/T90/t (Deep) (See Plate 1(d).)

TRACTORS—(2 in tandem) Fiat 70, Fiat 80, TM 55, TM 70, Bowen 60.

CARRIAGE—Arch-beam trailed or reinforced beam Standard carriage.

NORMAL FUNCTION—This plough has proved very versatile working on mineral soils and peats but is specifically recommended for clay and loamy gley soils, on which it will produce a furrow approaching 60 cm deep with a ribbon of turf on either side of sufficient size not only to suppress vegetation but to encourage rapid early growth. With furrows at 4 m spacing the width of platform available to roots is expected to enhance stability of species such as spruce compared to single-furrow ploughing.

(It is important to realise that although the plough is derived from the S60/T90/m plough, hence its name, it is only expected to produce a furrow and 2 ridges on the recommended soil types and do no subsoiling).

ADDITIONAL CAPABILITY—While it is possible to plough all soils, except on steep slopes, with this plough and achieve an acceptable result in terms of turf ridge and furrow, it subsoils only the centre of each furrow so that on indurated soils minimal useful disruption is achieved.

LIMITATIONS—On very soft peats the mouldboard assembly will sink unless held on the wheels of the carriage when the resultant furrow may become considerably shallower than the design depth. Although in certain circumstances a single tractor (Fiat 100) has been used to pull the plough it normally requires two tractors in tandem. On easier, loamy soils TM 55 tractors are adequate but

heavy clay subsoils will stress two Fiat 70 tractors.

(Modification—For hill peats a modification to the sock and centre plate can be made which deepens the furrow and increases drainage capability).

6. Trailed single-mouldboard drainer S90—/t (Deep)
(See Plate 2(a).)

TRACTORS—(In tandem) Bowen 60, TM 55, TM 70, Fiat 70 (Polder).

CARRIAGE—Arch-beam Carriage.

FUNCTION—To plough cross-drains through ploughed ground.

ADDITIONAL CAPABILITIES—This plough can be used as a normal cultivation implement but is not recommended because of likely tree stability problems.

LIMITATIONS—The plough functions most satisfactorily in peat and clay soils; on other soils the depth of ploughing tends to be reduced. Very few tractors can cross single-furrow ploughing satisfactorily. At present there is no tractor with tracks long enough to straddle ploughing by D60/T90/t ploughs. It is therefore difficult to cross-drain this immediately following ploughing.

SPECIALISED PLOUGHS

These are ploughs which have specific features required for, or of benefit to, specific site types. This means that a sufficient area of a precisely known site type is required before the plough is acquired.

1. Mounted double-mouldboard tine plough D45/T60/m (Shallow)

TRACTORS AND CARRIAGE—As for S45/T60/m.

FUNCTION—To provide two ridges for planting in soils which merely demand weed suppression and the provision of a position for planting; namely Brown Earth, Podzol and Intergrades.

ADDITIONAL CAPABILITIES—On gley soils this plough is more suitable than S45/T60/m because the distance between furrows is increased and thereby future stability enhanced. This makes the plough ideal for slopes which are predominantly Brown Earth soils but interspersed with flushes of gley soils.

LIMITATIONS—Double-throw ploughs are difficult to operate satisfactorily on side slopes because the upper turf may fall back into the furrow while the lower turf rolls an unacceptable distance down the slope. Therefore use of the plough must be more or less straight up and down the slope.

2. Trailed double-mouldboard tine plough D45/T60/t (Shallow)
(See Plate 2(b).)

TRACTOR AND ADDITIONAL CAPABILITIES—See S45/T60/m.

CARRIAGE—Standard or Universal trailed carriage.

FUNCTION—As for D45/T60/m but on gentler slopes where a trailed plough can be used in safety.

3. Mounted double-mouldboard plough D15—/m (Screefing)
(See Plate 2 (c).)

TRACTORS—Agricultural wheeled machines.

CARRIAGE—Mounted on the 3-point linkage.

FUNCTION—To provide a screefed line for planting on light Lowland soils.

ADDITIONAL CAPABILITIES—Nil.

LIMITATIONS—Can only satisfactorily operate on easy terrain and light soils.

4. Trailed single-mouldboard tine plough S60/T90/t (Deep)

TRACTORS—(In tandem) Fiat 70, Fiat 80, TM 55, TM 70, Fiat 100.

CARRIAGE—Arch-beam or reinforced Standard carriage.

FUNCTION—Deep-tine ploughing for Ironpan disturbance down to 90 cm.

ADDITIONAL CAPABILITIES—Nil.

LIMITATIONS—The outfit is not heavy enough to achieve subsoiling into induration unless this is quite mild.

5. Trailed double-mouldboard plough D90/—/t (Deep)
(See front cover)

TRACTORS—(In tandem) Fiat 70, Fiat 80, TM 55, TM 70.

CARRIAGE—Arch-beam.

FUNCTION—Ploughing in deep peat areas where conditions can allow a spacing of 3 m between trees across the furrow.

ADDITIONAL CAPABILITIES—This plough can function on regeneration areas with clay gley and peats, provided brash is removed from the path of the plough.

LIMITATIONS—Apart from the problem of distance across the furrow, the plough is seriously limited in that on mineral soils it tends to plough shallow and produce an inadequate ridge. The turf ridge lies on its side exposing vegetation along one edge, which increases weed competition.

6. Mounted double-mouldboard tine plough D60/T90/m (Deep)

TRACTOR—CAT D7.

CARRIAGE—A large pivot head assembly.

FUNCTION—To cultivate surface water gley soils in restocking areas where several years have elapsed since clearfelling or windthrow. In these circumstances a continuous furrow is produced providing drainage, and two ridges which give weed suppression and provide recognisable planting positions. Spacing between furrows at 4·0 m allows a more stable root system to develop.

ADDITIONAL CAPABILITIES—Can be used on afforestation areas but usually a trailed plough will be cheaper.

LIMITATIONS—Because the tractor is heavy, ploughing is restricted to dry summer months June, July, August and to grassy surface water gley soils only. There is a severe risk of bogging the tractor outside these times and conditions.

7. Twin-furrow plough 2S45/T60/t
(See Plate 2(d).)

TRACTOR—FM Challenger 33.

CARRIAGE—A special carriage with both mouldboards mounted onto it.

FUNCTION—To create complete ploughing on heathland Ironpan soils and thereby completely suppress vegetation and disrupt the pan.

ADDITIONAL CAPABILITIES—Nil.

LIMITATIONS—The plough normally has a large single tractor to pull it which limits it to hard ground. Also it has the same limitations as the S45/2T60/t plough.

8. Twin-tine plough S45/2T60/t
(See Plate 3.)

TRACTOR—Fiat 70, Fiat 80.

CARRIAGE—A special trailed carriage onto which both plough and subsoiler are mounted.

FUNCTION—This plough allows a subsoiled channel to be placed underneath the next ridge to be turned. On ironpan soils subsoiling is twice as frequent as in normal S45/T60/t ploughing.

ADDITIONAL CAPABILITIES—With addition of expanders and special socks the plough can produce mole channels which in some soils remain functional for an adequate number of years.

LIMITATIONS—Because the two attachments are mounted on the same beam any obstacle in the path of one affects the performance of both. Moreover if the obstacle is large there is a danger of it becoming jammed between the plough and subsoiler.

9. Double-mouldboard tine plough D60/T75/t (Intermediate)

TRACTOR—Fiat 100.

CARRIAGE—Reinforced standard carriage.

FUNCTION—Specially developed for mixed deep peat and peaty gley soils in NW Scotland to provide a furrow 75 cm deep and a planting distance across the furrow of 2.1 m.

ADDITIONAL CAPABILITIES—Like most ploughs derived from the D60/T90/t plough this plough is fairly versatile and can function in most soil types.

LIMITATIONS—A relatively heavy plough, it works best at higher speeds and therefore requires a more powerful tractor than the normal 60–70 hp range.

10. Single-mouldboard plough S60/—/t

TRACTOR—Fiat 70, Fiat 80, TM 55, BTD 8, County 6.

CARRIAGE—Standard carriage.

FUNCTION—To provide a single furrow in peat soils giving maximum drainage of the soil at a spacing of 2.1 m.

ADDITIONAL CAPABILITIES—It will also plough gley soils except where indurated.

LIMITATIONS—Not recommended for sites where stability is a problem. Since peats and gleys indicate a possibility of instability there can be very few sites where this plough is of

use. Even the use of deeper rooting Lodgepole pine may not overcome the problem of instability with the single mouldboard ploughing on deep peats and gley soils.

DEVELOPMENTS

The occurrence of several soil types on a single area of ploughing make it essential that many ploughs are versatile. In this context, versatile is defined as being able to plough through many different soils and produce a reasonable ridge and furrow, even though these may not be of the recommended type. In this respect plough development is directed to producing fewer ploughs which as well as being versatile also give the desired result on two or three soils. Mixed gley soils and deep peats are one example where it might be possible to produce a single plough able to give the desired specification on each soil but also versatile enough to plough other soils.

A trailed plough for indurated soils is an obvious omission requiring development. The problem is to achieve sufficient weight on the plough without creating traction problems on softer sites.

In the long term, the rotary-mouldboard plough, vibrating share or subsoiler, and the 6 × 6 ploughing tractor, all of which are being investigated, may produce changes in our basic concept of forest ploughs.

APPENDIX

MECHANICAL PLANT SPECIFICATIONS

These specifications are of the type used within the Forestry Commission and serve to illustrate the main technical details of the plough models described in the text.

Ploughs to these specifications have, in all cases, been made by Wm. Clark & Son, Parkgate, Dumfries.

S45/T60/m Parkgate Mounted Tine Plough	Specification No. 76/11
TYPICAL USE	As mounted plough for "Steep" ground operations for up to 60 cm deep cultivation.
PLOUGH BEAM WITH HYDRAULIC RAM	Including tractor rear frame fitting and kingpin, pivot head, stabiliser fittings, disc equipment, double acting hydraulic ram and attachments, hose, etc.
MOULDBOARDS	(1) Single-throw tine mouldboard c/w packer, fitted point (or sock), spare point (or sock) carried on rear fitting, and bolt fittings. Or (2) Double-throw tine mouldboard c/w packers, fitted point (or sock), spare point (as above) and bolt fittings.
OPTIONAL EXTRAS	Quick release—interchangeable double jaw, drawbar coupling; suitable for attachment to pivot head (allows tractor to be converted quickly and easily to normal drawbar work when hydraulically operated tine plough is removed).
NOTES	(1) Make and model of tractor for which required must be stated when ordering. (2) This mounted plough is ideally suitable for use with Fiat 70CI, 80CI Polder tractors. It might also be used with International TD8B Series III and Fiat 100CI Crawler tractors. (3) With the double-throw mouldboard NO disc is used.

Parkgate Trailed Forest Ploughs

Specification No. 76/31

TYPICAL USE	For cultivation operations to 60 cm with various mouldboards.
1. PLOUGH BEAM AND CARRIAGE	Carriage complete with roller bearing hubs and single wheels to suit 11.00 × 36 tyres (agricultural tread). Beam complete with attachments to accept disc equipment for both tine and cultivation operations.

- Drawbar and coupling; single-acting hydraulic ram, $\frac{1}{2}$ in bore hose, wheel valve fitted at end of and attached to draw-bar with male fitting; 5 ft length of hose with M & F ends to suit female coupling on tractor (in break-away bracket).
2. TOOL KIT
 3. TINE, SINGLE THROW MOULDBOARD (S45/T60) Right hand throw.
Depth of cultivation 45/60 cm.
Standard tine sock.
 4. TINE DOUBLE THROW MOULDBOARD (D45/T60) Depth of cultivation 45/60 cm.
Standard tine sock.
 5. DOUBLE THROW (D60) MOULDBOARD Mainly for ploughing in peat (maximum depth 60 cm) with sock.
 6. CENTRE DISC EQUIPMENT 50 cm (20 in) diameter disc complete with adjustable disc shears, cross shaft and compression spring equipment.
(To suit mouldboards 3, 4 and 5).
 7. SIDE DISC EQUIPMENT Two 86 cm (34 in) diameter high tensile discs complete with adjustable disc shears, cross shaft and spring equipment.
 8. EXTRA WHEELS (TWO) (WITH PNEUMATIC TYRES) As standard wheels (and tyres) to allow twin wheel operations on softer ground conditions.
NOTE: These have separate bolt centres so that the inners do not have to be removed when fitting or removing the outers.
 9. CAGE WHEELS In lieu of Item 8.
 10. WHEEL SPACER SETS To allow twin wheels to be set with about 28 cm (11 in) clearance between tyres for greater stability and flotation under certain ground conditions.

Parkgate Trailed 'Deep' Forest Ploughs (Arched Beam Models)

Specification No. 76/32

TYPICAL USE

1. PLOUGH BEAM AND CARRIAGE

Deep ploughing operations ie to 90 cm (36 in) essentially on drainage, including cross drainage, operations.

Parkgate Deep Trailed Plough comprising arched beam and carriage, drawbar pole (incorporating shear pin), coupling, twin single-acting hydraulic cylinders, 10 stud heavy duty ball bearing hubs with wheels to suit; 12.4/11 × 36 (4 ply) (30 psi) tyre equipment.

Wheels with different stud pitch circle diameters (so that the outers may easily be removed or fitted without disturbing the inners, so allowing the plough to be used or transported either with a single or twin wheel arrangement).

The beam, fitted with the necessary attachments, to accept both drainage and tine equipments and complete

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|--|--|
| | with two 86.5 cm (34 in) diameter discs on adjustable shears fitted to cross shaft with recoil spring equipment. Hydraulic cylinders complete with $\frac{1}{2}$ in bore hose, $\frac{1}{2}$ in male self-sealing coupling for connecting to tractor and suitable wheel valve at coupling end of hose mounted on end of plough beam. |
| 2. DEEP SINGLE THROW RIGHT HAND DRAINING MOULDBOARD (S90/—/t) | Large reinforced mouldboard for deep draining operations with adjustable trailing mould. |
| 3. DEEP SINGLE THROW LEFT HAND DRAINING MOULDBOARD (S90/—/t) | Large reinforced mouldboard for deep draining operations with adjustable trailing mould. |
| 4. DEEP DOUBLE THROW DRAINING MOULDBOARD (D90/—/t) | Large reinforced mouldboard for deep draining operations (where the spoil removal may be split and put on each side of drain). |
| 5. HYDRAULIC DEPTH CONTROL DEVICE (FOR ANY DEEP DRAINAGE MOULDBOARD) | Includes: one double-acting hydraulic cylinder, twin hydraulic hoses—each with appropriate attachments including self-sealing male couplings, attachments for plough beam (to be welded to beam).
(For use in peat only). |
| 6. WHEEL SPACER UNITS | Set of four per plough: two together provide space of about 11 in between each pair of twin wheels (this gives improved flotation characteristic). |
| 7. CAGE WHEELS | Outer of twin wheels may be of cage wheel type if desired (ie as alternative for outer pneumatic tyred wheel with 12.4/11.00 \times 35 tyre equipment). |

Parkgate Trailed 'Deep' Forest Ploughs (Straight Beam Models)

Specification No. 76/33

TYPICAL USE

- | | |
|-----------------------------|--|
| | Deep ploughing, ie to 90 cm (36 in) essentially on cultivation operations. |
| 1. PLOUGH BEAM AND CARRIAGE | Parkgate Deep Trailed Plough comprising straight beam and carriage, drawbar pole (incorporating shear pin), coupling, twin single-acting hydraulic cylinders, 10 stud heavy duty ball bearing hubs with wheels to suit; 12.4/11 \times 36 (4 ply) (30 psi) tyre equipment.
Wheels with different stud pitch circle diameters (so that the outers may be easily removed or fitted without disturbing the inners, so allowing the plough to be used or transported either with a single or twin wheel arrangement).
The beam, fitted with the necessary attachments, to accept both drainage and tine equipments and complete with one 86.5 cm (34 in) diameter disc on adjustable shear fitted to cross shaft with recoil spring equipment. |

- Hydraulic cylinders complete with $\frac{1}{2}$ in bore hose, $\frac{1}{2}$ in male self-sealing coupling for connecting to tractor and suitable wheel valve at coupling end of hose mounted on end of plough beam.
2. DEEP SINGLE THROW TINE MOULDBOARD (RIGHT HAND) (S60/T90) Deep tine mouldboard provided to give a depth of tining down to 90 cm (36 in) with standard sock. Soil turnover (cultivation) 60 cm × 60 cm (24 in × 24 in) approximately.
 3. DEEP SINGLE THROW TINE MOULDBOARD (LEFT HAND) (S60/T90) Deep tine mouldboard provided to give a depth of tining down to 90 cm (36 in) with standard sock. Soil turnover (cultivation) 60 cm × 60 cm (24 in × 24 in) approximately.
 4. DEEP DOUBLE THROW TINE MOULDBOARD (D60/T90) Similar to the single-throw models but with mouldboard on each side of tine.
 5. DEEP MOLE PLOUGH ATTACHMENT Similar to deep double-throw tine plough above but with cylindrical base. (NOTE: Preferred use on straight beam and not on arched beam deep ploughs).

2S45/T60/t Parkgate, Trailed, Twin-Furrow Tine Plough

Specification No. 76/39

TYPICAL USE

1. PLOUGH BEAM AND CARRIAGE

Complete cultivation to a depth of 60 cm (24 in) with two tine mouldboards equipped with standard socks.

Multi-beam chassis/carrriage with roller bearing hubs and single wheels to suit 11·00 × 36 tyres (agricultural tread). Chassis members complete with disc equipments comprising 50 cm (20 in) diameter discs in adjustable disc shears on cross shafts with compression spring equipment; twin single-acting hydraulic rams; $\frac{1}{2}$ in bore hose from each cylinder via a single wheel valve attached to the plough chassis at the drawbar with male fitting; 5 ft length of hose with M & F ends to suit female couplings on tractor.

2. TOOL KIT

3. TINE, SINGLE THROW MOULDBOARDS (TWO)

Right hand throw.
Depth of cultivation 45/60 cm.
Standard tine socks.

S60/T90/m, D60/T90/m Parkgate Mounted Deep Cultivation Plough

Specification No. 76/41

TYPICAL USE

PLOUGH BEAM

The cultivation of felled woodland areas when mounted on a large crawler tractor.

Very heavy duty plough beam with twin double-acting hydraulic rams, stabiliser equipment, back plate etc. to suit appropriate crawler tractor.

MOULDBOARDS

- (1) Deep single-throw tine mouldboard—S60/T90. To give tining down to 90 cm (36 in) with standard sock soil turnover (cultivation) 60 cm × 60 cm (20 in × 20 in) approximately.
- (2) Deep double-throw tine mould board—D60/T90. Similar to single throw version but with mouldboard on each side of tine.

NOTES

- (1) This plough with hydraulic mounted beam has been designed to suit crawler tractors in the 180/200 hp range ideally.
- (2) No discs are used.
- (3) Make and model of tractor for which required must be stated at time of ordering.

S45/T60/m Parkgate Three-Point Linkage Cultivation Plough Specification No. 76/42

MAKE/MODEL	Three-point linkage plough to suit County 1164 wheeled tractor.
TYPICAL USE	As a mounted plough for moderately easy conditions and also where a lot of local inter-site movement can be covered by the tractor. For agricultural reclamation type ploughing also.
PLOUGH BEAM	Fabricated frame to suit category II 3-point linkage with fittings to accept plough equipment.
MOULDBOARD	Modified "tine mould" board type S45.
NOTE	(1) County 1164 ("Super-Six") wheeled tractor to be appropriately specified to suit ploughing operations. (2) Further discussion normally essential before this model ordered by Conservancies.

ACKNOWLEDGEMENTS

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The photographs for Plates 2(c), 2(d) and 3 were taken by Mrs. T. K. Evans, I. A. Anderson and H. Swinyard respectively. G. G. M. Taylor provided the photographs for the front cover and Plates 1(a) and 2(a), the remainder being taken by the author. All the photographs are now in the Forestry Commission collection. D. McQuillan, Engineering Draughtsman, prepared Figures 1 and 2 and J. Williams, Graphics Officer at the Forest Research Station, Alice Holt Lodge, prepared the drawing for Figure 3.

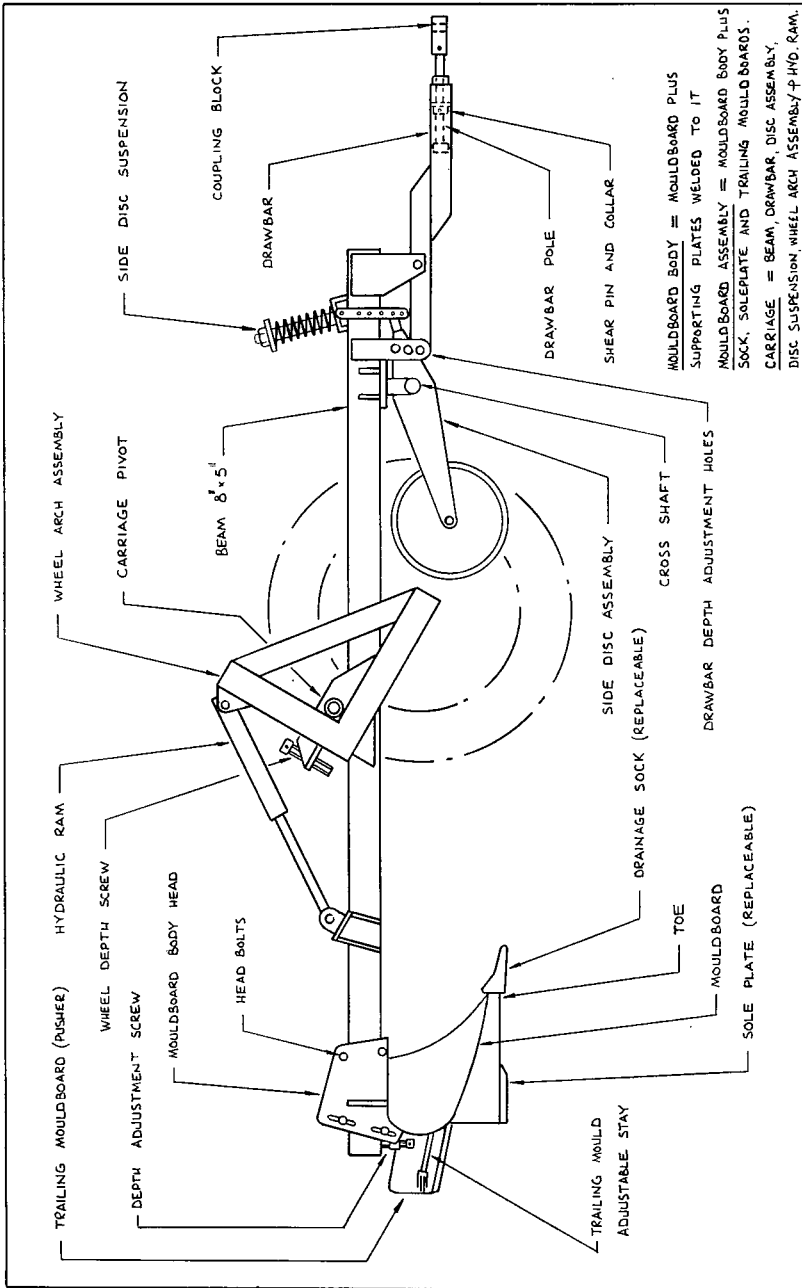


FIGURE 1. Components of standard forest plough carriage and D60/mouldboard assembly.

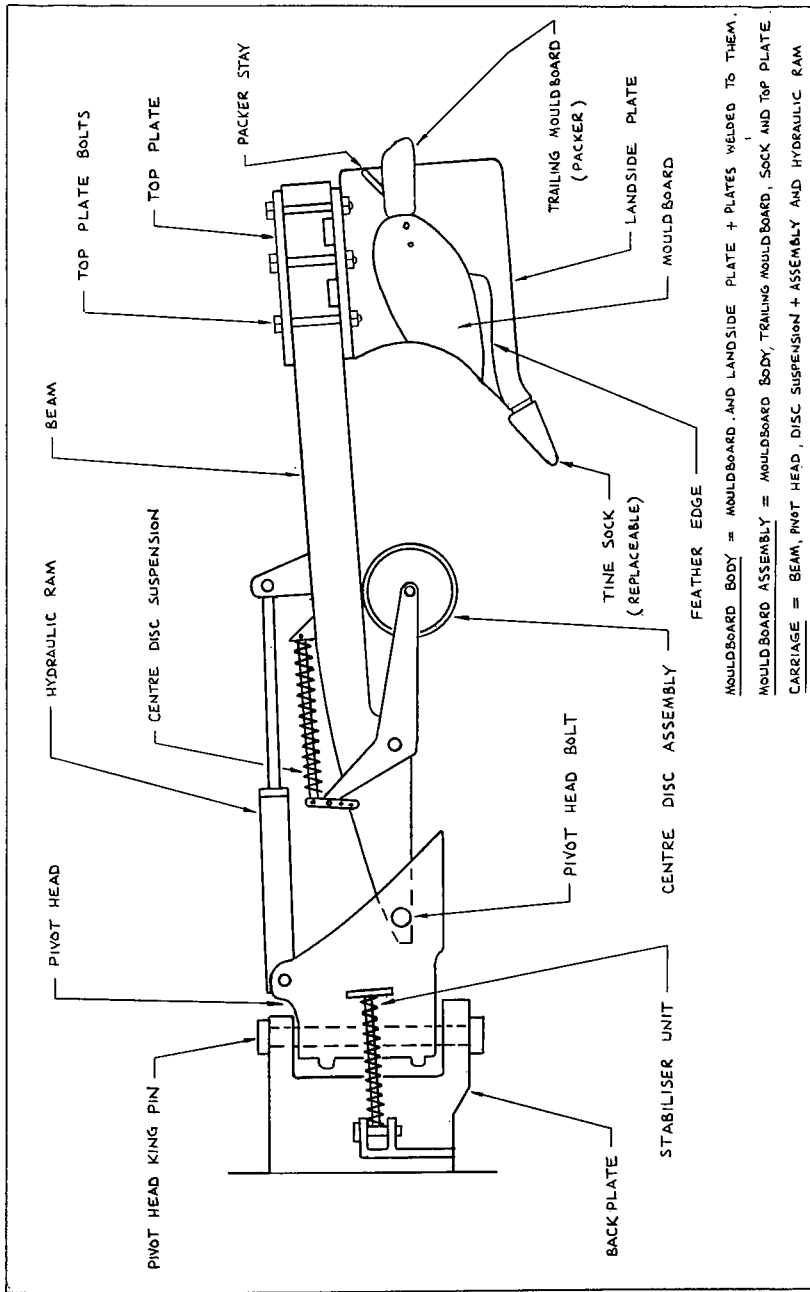


FIGURE 2. Components of mounted forest plough carriage with small pivot head assembly and S45/T60/m mouldboard assembly.

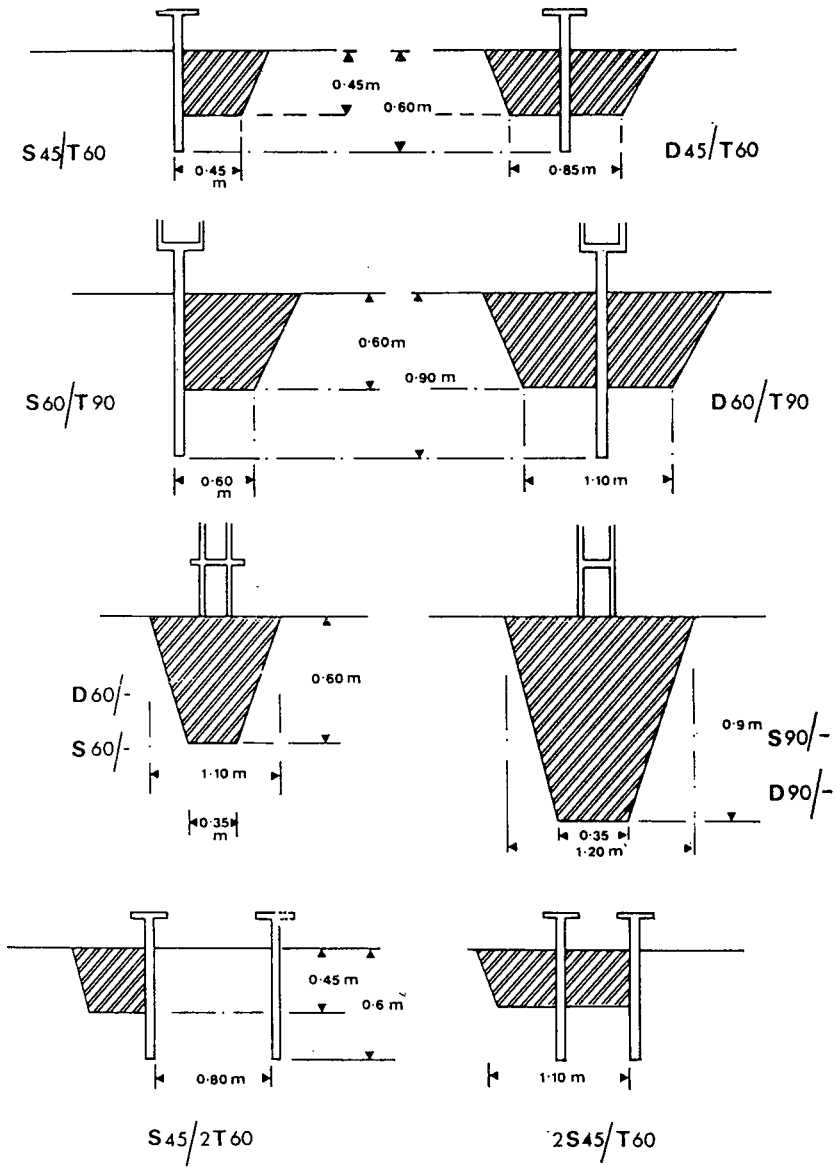
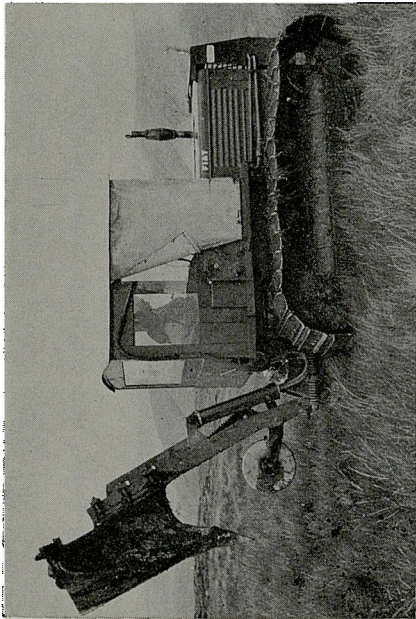
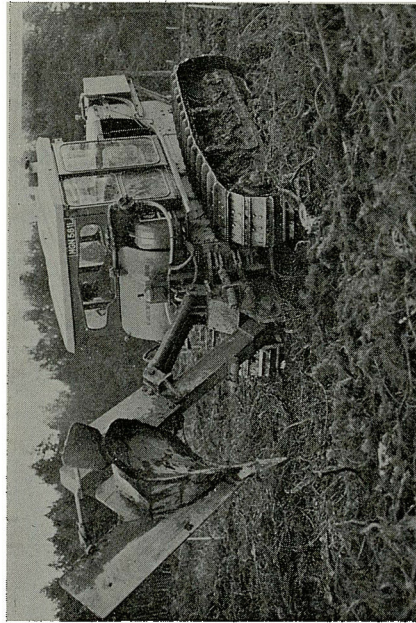


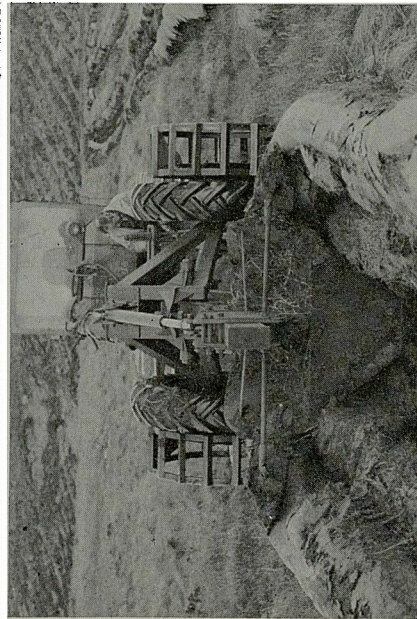
FIGURE 3. Plough furrow profiles at design depth.



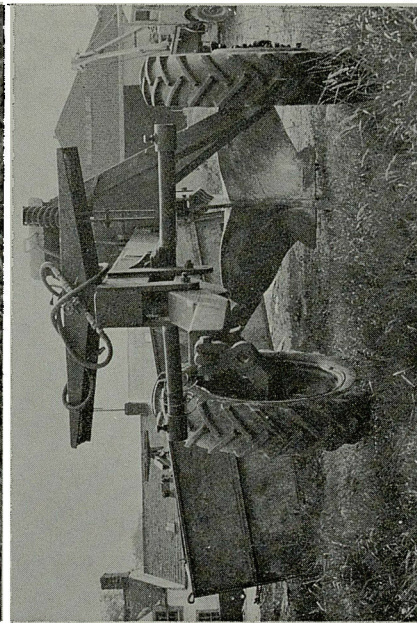
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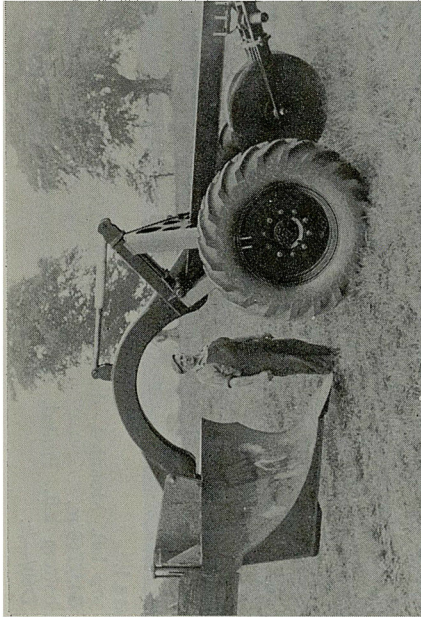


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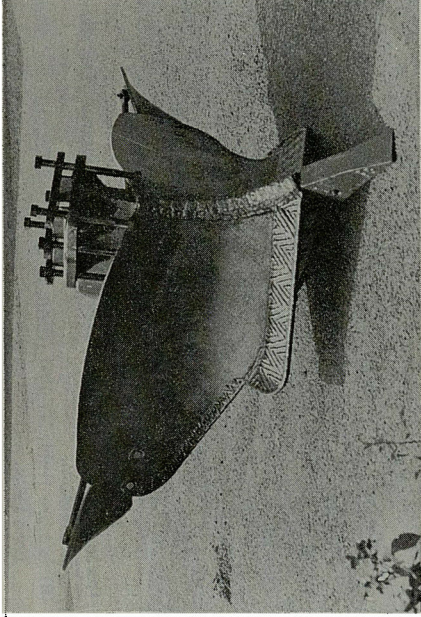
PLATE 1.

(a) top left. Mounted, shallow, single-mouldboard tine plough S45/T60/m.
 (c) bottom left. Trailed, shallow, double-mouldboard plough D60/—/t.

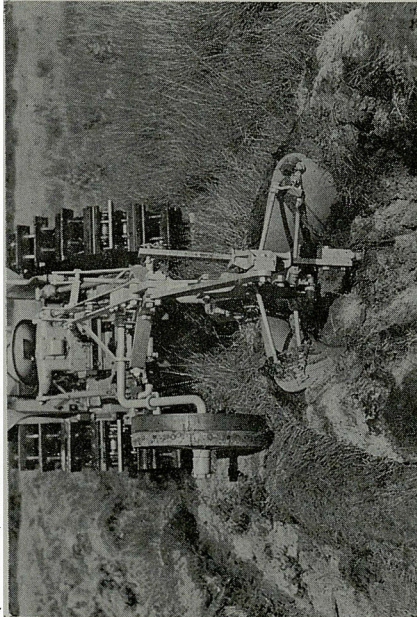
(b) top right. Mounted, deep, single-mouldboard tine plough S60/T90/m.
 (d) bottom right. Trailed, deep, double-mouldboard tine plough D60/T90/t.



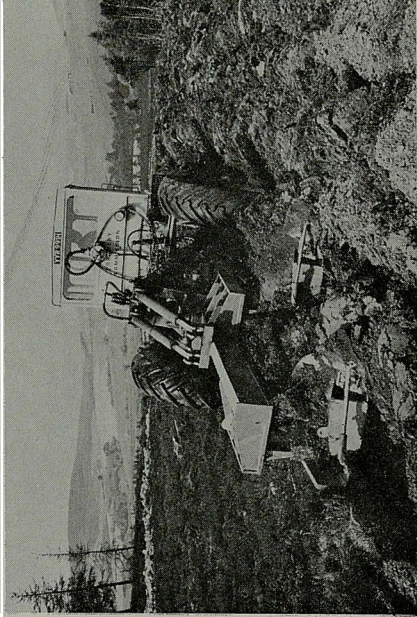
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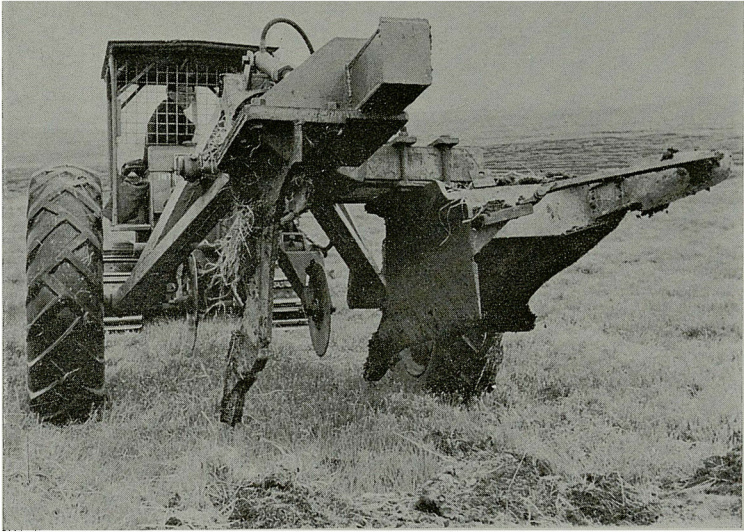
D3038



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PLATE 2.
 (a) top left. Trailed, deep, single-mouldboard draining plough S90/—/t.
 (c) bottom left. Mounted double-mouldboard plough (very shallow) D15/—/m.

(b) top right. Trailed, shallow, double-mouldboard tine plough D45/T60/t.
 (d) bottom right. Trailed, shallow, twin-furrow plough 2S45/T/60t.



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PLATE 3. Trailed, shallow, twin-tine plough S45/2T60/t.

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