Establish plants outdoors

Note: This section is in two parts

Prepare ground for establishing plants

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PART 1

Establishing plants outdoors

Preparing the area

In order to establish plants outdoors successfully:

- It is essential that a suitable soil or growing medium is used both of which should be in the correct condition.
- Weather and ground conditions must be suitable for cultivation and preparation.
- The plants or seeds must be healthy and viable.
- Aftercare should be appropriate.

In order that suitable soil/growing medium conditions are provided:

- Appropriate cultivations need to be done at the right time.
- Nutrition levels need to be checked and adjusted as necessary.

Appropriate cultivations include:

- Clearing the site of unwanted vegetation.
- Cultivating to produce an appropriate tilth.
- Amending soil/growing medium as appropriate.
- Adjusting nutrient levels and pH if appropriate.
- Evenly firming the soil.
- Levelling the surface.

Selecting appropriate equipment

- Mechanical and/or hand tools.

All work to be carried out safely making sure that:

- Tasks required are understood.
- The presence of services under the site are checked.
- Appropriate Personal Protective Equipment (PPE) is worn at all times.
- Appropriate tools and equipment are selected.
- All tools and equipment are fit for the purpose.
- Tools and equipment are used correctly throughout.
- Tools and equipment not in use are stored safely.
- Tools, equipment and PPE are cleaned and stored correctly on completion.
Soils and growing media

In most situations 'establishing plants outdoors' means dealing with a soil. Soils are variable but are all made up of:

<table>
<thead>
<tr>
<th>Mineral matter</th>
<th>Stones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sand</td>
</tr>
<tr>
<td></td>
<td>Silt</td>
</tr>
<tr>
<td></td>
<td>Clay</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Organic matter</th>
<th>Vegetable matter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Humus (well decayed organic matter)</td>
</tr>
<tr>
<td></td>
<td>Organisms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Air</th>
<th>in pore spaces between the particles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>in the pore spaces between and attached to the particles</td>
</tr>
</tbody>
</table>

The mineral matter is derived from rocks and is classified according to particle size with stones being the largest and clay the smallest. The type of soil is determined by the relative proportions of sand, silt and clay – this is called 'soil texture'. It may be classified by 'feel' – rubbing soil between the fingers – a gritty feel means a sandy material, a silky feel means silty and a sticky feel means clay, however this should be used as a guide only. More accurate results can be obtained from a representative sample in a laboratory.

The different types of soil have different characteristics, which will mean a variation in the timing, type and intensity of cultivation and to the aftercare of plants growing in them.

Due to chemical, organism and plant root activity within soils, the various particles can form aggregates – this is called 'soil structure'. The formation of these larger aggregates gives rise to larger pore spaces between them. The ability to form structure and retain it, is another difference between types of soil. Sandy soils tend not to form much structure, silty soils tend to form structure but it is easily broken down and clay soils can form a strong structure. Soil structure can be broken down by cultivating at the wrong time e.g. when the soil is too wet, using the wrong method e.g. using a tractor rotavator or by severe compaction. Compacted soil is where structure is broken down and the individual particles are starting to pack together.

Sandy soils tend to drain better because the pore spaces created by the larger particle size allows water to percolate through more easily, however sandy soils tend not to retain water and plants growing in these type of soils need regular irrigation to survive. Sandy soils also do not retain nutrients, as the particles tend to be inert (not chemically active) and so need regular fertilising to maintain growth.

Silty soils can drain well if there is structure in the soil but compaction can easily break it down. These soils can hold water and some nutrients.

Clay soils tend to be chemically active and can drain reasonably if there is structure present. Water tends to be held in and between the aggregates where the nutrients are also stored.
Organic material in the soil adds to the nutrient reservoir as it breaks down as well as contributing to structure and water retention.

Water and air occupy the pore spaces – a saturated soil contains no air which is not good for most plants, whilst a dry soil contains little water which is unavailable to the plants and will cause plants to wilt. A soil with a very coarse structure or tilth will not assist plant establishment. The roots are unable to make sufficient contact with the soil particles to obtain nutrients and water.

Because of the nature of the sport, intensively used areas such as golf greens tend to have the soil replaced by an alternative growing medium often based on a mixture of sand and soil. This is done to ensure good drainage at all times and minimise the effects of compaction (sand has no structure to break down). Other alternative growing media are also used in plant production. In both cases maintenance treatments are different from that required on a natural soil.

In order to grow, plants need light, warmth, water, air and nutrients. Nutrients may be applied in various forms either organic or inorganic or in solid or liquid form. Nutrients must be easily available to establishing plants. It is also important that the correct pH is provided which may mean the addition of lime for some plants whilst acidifying materials may be required to adjust the pH of soil for others e.g. heather. Prior testing of a soil can provide a guide to requirements. The pH of a soil is a measure of the acidity or alkalinity of the soil. This is important as some plants thrive in alkaline conditions while others will tolerate acid soils. The pH level also affects the amount of nutrients available to the plants from the soil.
Clearing the site

Site clearance can be done manually/mechanically or chemically depending on the type of vegetation present.

- Manual clearance would involve the use of spades, forks and rakes.
- Mechanical clearance would involve the use of a turf-lifter or larger equipment.
- Clearing the site chemically would involve the use of a non-selective herbicide and either of the other two methods.

The purpose of site clearance is to ensure that there are no unwanted plants or plant material which might interfere with subsequent cultivation and establishment of the desired plants. It is particularly important to remove perennial weeds and other unwanted materials.
Potential hazards

When preparing ground for planting or seeding there can be hidden hazards and checks with the line manager and site plans before work starts would reduce the risk of damage or injury. Potential hazards are likely to include water pipes, drains, electricity cables, telephone cables, underground structures etc. Service providers e.g. gas, water, telephone and electricity, should be contacted before work starts, if there is any doubt.

Initial cultivation

Once the site has been cleared the amount and type of preparation will depend on:

- The soil type and condition.
- The size and types of plants to be established.
- The size of the area.

In most situations, manual cultivation will involve single digging and the incorporation of organic matter although the current thinking is that forking over the area would be sufficient in many instances. Deeper cultivation such as double digging would only be necessary if there was severe compaction present or a pan in the soil which might hinder root development and/or drainage. Therefore basic preparation of a relatively small area might involve the use of a spade or fork to turn the soil over and break down larger clods.

On medium sized areas, cultivation may be done using a pedestrian cultivator while on larger areas tractor ploughing and/or specialist landscaping cultivation equipment might be employed.

At this stage any remaining perennial plant material should be removed.

If cultivation is done at the right time and time allows, then the weather (particularly frost) will assist in breaking down large soil clods but in most cases the process of initial cultivation, preparation and planting is continuous.

The purpose of initial cultivation is to ensure that there is no hindrance to root development and to ensure that the cultivated area has no unwanted perennial plants. It may also allow incorporation of materials to correct deficiencies e.g. organic matter, lime or nutrients.
Soil preparation

Preparation involves firming the surface and producing a suitable tilth and both can take place at the same time.

Following initial cultivation it is important to ensure that a good tilth is produced. The term ‘tilth’ refers to the crumb structure of the soil at the surface. This means ‘treading’ on smaller areas to firm the soil down evenly and to break down larger clods, thereby removing large pockets of air, which would inhibit plant growth. After treading it is normal practice to rake the surface to the desired levels before treading and raking again. The raking and treading process ensures that there are no soft spots.

Failure to ensure that large pockets of air and large clods of soil are eliminated would mean that sinkage is likely to occur at a later date – this is particularly important if a permanent grass cover is to be established.

If grass seed is to be used then a fairly fine surface tilth is needed to ensure that the seeds can achieve good contact with the soil.

On relatively small areas the usual method is to repeatedly rake and tread the area to obtain good levels. On larger sites tractor equipment would be used and several passes would be necessary to achieve the desired results. The amount of work required will depend on the soil type – sandy soils will require less treading as any crumb structure will break down easily, but in some soils (silty), care should be taken to avoid too fine a tilth otherwise capping may occur after rain. The surface should be evenly firm.
Soil amendments

During initial cultivation it may be appropriate to add organic matter to the soil depending on what is being planted. The most commonly used organic matter is farmyard manure for ornamental or decorative areas. This material not only supplies some nutrients but also assists in moisture retention and maintaining a soil structure. In the case of sports turf, the material may be compost (as a suitable alternative to peat), but in this case the addition of excessive amounts should be avoided.

At this stage an opportunity exists to check the pH of the soil, in case it needs to be adjusted to suit the plants being established. An acid soil can be treated with lime to raise the pH while an alkaline soil may be treated with sulphur to lower the pH.

The availability of nutrients can also be checked and applications made if necessary during the final stages of preparation.

During the final stages of preparation it may be necessary to adjust the nutrient status by altering the pH with lime or sulphur and/or adding fertiliser to ensure nutrients are readily available for the establishing plants. The need and amounts of these materials should be determined by a soil test. Lime is rarely, if ever, required for fine sports turf.

There are a large number of nutrients required by plants, and different plants require differing amounts of each nutrient. In most soils, the main nutrients required by plants are nitrogen, phosphorus and potassium. Where a soil has been regularly cultivated and fertilised previously, there are unlikely to be deficiencies but it is beneficial to the establishment of plants to ensure that these main nutrients are readily available.

Nitrogen is the main growth stimulant and can be applied in various forms – ammonium sulphate, granular ammonium nitrate or organic sources such as urea. Ammonium sulphate is the most commonly used.

Phosphorus is generally used by the plants for root growth and is considered desirable to assist in establishing plants or seeds. Regular use can however cause detrimental effects especially on turf. The most common source is superphosphate.

Potassium is also considered desirable in the establishment of plants and seeds and is usually applied as potassium sulphate. Potassium plays a part in disease resistance.

There are many other nutrients required by plants but deficiencies are rare especially where cultivations have been done before. A number of specialised plants may be susceptible to deficiency of minor nutrients.