

# Deep-seated problem

by D. B. HARGREAVES

WITH ALL sports turf the outstanding problem is getting rid of excess surface moisture and this involves getting the water through the top soil and then having somewhere for it to go. The latter is usually a matter of drains or drainage layers and is not the subject of this article. There is, however, little value in a drainage system if surplus water does not reach it or reach it fast enough.

Getting rid of surplus moisture is important not only from the direct point of view of providing good playing conditions which stand a good deal of wear, but also from the indirect point of view of allowing plenty of air to get to the plant roots. Poor aeration results in lack of oxygen in the soil.

It may be caused by compaction which pushes the soil particles close together, thus reducing the volume of pores in the soil. It may also be caused by an excess of water held in the soil pores thus displacing air. Commonly both factors are involved.

For root growth there must generally be at least 10 per cent air filled pore space in the soil. Oxygen in the soil is used up by plant roots and soil organisms and must be replaced by fresh oxygen from the atmosphere above the soil. Thus barriers to the exchange of gases such as a surface cap or a water-logged top soil will result in poor aeration.

Preservation of a good soil structure helps to provide sufficient pore space, to facilitate passage of surface moisture and to maintain conditions of good aeration in the soil. Unfortunately, the use of sports turf by players and the passage of machinery necessary to maintenance readily cause damage to soil structure and induce compaction. This

leads to wet surface conditions and increased susceptibility to damage.

The effects are obviously most marked on the less sandy soils such as clays or silts. Such soils, even under the best conditions, transmit water only slowly so that they are, as a result, more easily damaged.

In agriculture, improvement of soil conditions can be achieved by ploughing up and cultivating, but obviously sports turf is meant to be a permanent "crop". Nevertheless, despite the difficulties, it is generally appreciated that some kind of top soil cultivation to give improved moisture transmitting and aeration characteristics is required for sports turf.

With demands for ever-increasing amounts of wear tolerance, the need for effective action is increased, and there is thus an ever-increasing requirement for the use of efficient aeration machinery by means of which over-compaction in the soil can be relieved (or, better still, prevented from developing) since this means stronger grass and better drainage, less mud and increased tolerance of wear.

Further, routine maintenance involving sufficient attention to this problem can greatly reduce the amount of the kind of wear which involves costly renovation at the end of a playing season.

On the majority of fine turf areas and a very large proportion of other sports turf areas such as football fields, hockey pitches, and golf fairways, routine treatment with suitable implements penetrating to about 4 in. is common practice, and the benefits have been well proved by experience.

There are, however, numerous situations on football fields etc. where deeper penetration is necessary. This is

[Turn to Page 15]

## [Deep cultivation from Page 13]

particularly so where sports turf constructed relatively recently has been sown down under conditions of inadequate cultivations. Deep aeration should not be required for well constructed new fields in the first year but unfortunately sometimes it is.

Much thought has been given to the required shape and form of tines to make the large hole necessary for deep penetration with a view to ensuring the quickest and most beneficial effects. In order to break the compacted earth to a depth, a shattering effect needs to be produced, but obviously with the minimum of surface disturbance and interference with play.

Solid or hollow tines do not produce this shattering effect because their action is to cause sideways displacement of soil into the walls of the hole produced. This is the whole effect with round solid tines and part of the effect with hollow tines.

Observations on the holes produced by flat bladed tines led to the adoption of larger flat, pointed tines capable of producing a deep shattering or cultivating effect. These tines do cause some minimal surface disturbance, especially when compaction is severe.

A chisel shaped root development

tine produces a rather less deep but uncompacted hole of large area below the surface. It is clean at the point of entry under almost all conditions and is, therefore, capable of being used in a regular maintenance programme even on areas in regular use.

The two tines referred to are shown in figures 1 and 2, together with penetration diagrams based on plaster casts of actual holes. It will be seen that these holes have a large volumetric capacity for the immediate acceptance of surface moisture or of applied top dressings. Their shattered condition encourages rapid movement of both air and water to the roots which are thus able to grow much better. Increased root development leads to improved soil structure and to increased drought resistance. Some of the principal benefits to be gained from the use of machinery to improve deep aeration of the soil can be summarised as follows:—

- Deep holes with uncompacted walls.
- Shattering of the top soil to a depth.
- Improved passage of moisture.
- Improved penetration of air and easier exchange of soil air with the atmosphere.

[Turn to Page 18]

Fig. 1. Deep Cultivating Tine

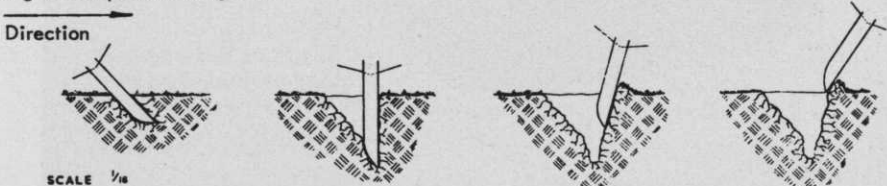
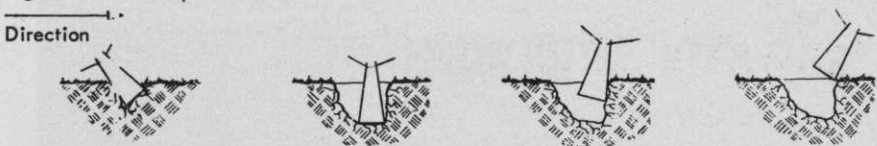


Fig. 2. Root Development Tine



## [Deep cultivation from Page 15]

- Better root growth leading to better soil structure.
- Improved incorporation of top dressings.
- Improved drought resistance.
- Improved wear resistance and, therefore, frequently, reduced costs of maintenance and end renovation.

If adequate drainage conditions are absent there are limits to the benefits which can be obtained by these procedures. Most sites need a full drainage system, but on occasion the provision of deep sumps filled with aggregate has helped considerably.

The choice of implement for a particular application is, as usual, dependent on the tractor available, and obviously the type of tractor also affects the number and frequency of applications.

An agricultural type tractor with grassland tyres and provided with a three point hydraulic linkage is the most suitable. The linkage allows the

implements to be raised for turning with consequent reduction of adhesive loads on the driving wheels.

It is, of course, important to use the implements when surface conditions are not too wet to cause difficulties at the surface, but with the soil sufficiently moist to get adequate penetration. For this and other reasons the operation offers the greatest benefits when used on a preventative basis, and should not be undertaken only when drastic remedial measures become essential.

A particular aspect might be the relationship between what is now conventional aeration as discussed here and present work with slitting, trenching and back filling procedures. It is considered, for example, that the movement of surface water towards such supplementary drainage ways will be assisted by regular spiking.

Study of actual case histories facilitates useful practical conclusions and it is hoped that users of this equipment may have useful contributions to offer regarding their own experience.

# cut for cut, your best buy

Don't take our word for it. Simply cast your eye over the Atco 20" 'Special' and look at these outstanding features—

#### **Smooth, robust power**

From a 6 h.p. four stroke engine and a 6 pint fuel tank ensures longer hourage mowing between refills..

#### **Superb cutting ability**

Twelve precision ground cutter blades giving 135 cuts per yard, and special, thin bottom blade ensures superfine cut down to 60 thou. And furthermore, the close spacing between the front rollers and cutter reduces the risk of scalping to a minimum.

#### **Other plus features—**

Include a 'combit' rake, fitted as standard, radiused rollers to avoid marking at end turns and fully powered transport wheels for rapid transportation from green to green.

#### **Finally — Wise Investment**

The Atco 20" 'Special' is cut for cut, your best buy. So why not ask your nearest Atco distributor for a demonstration by ringing or writing to the address below, and find out for yourself.

# ATCO

*as famous as the turf we cut*

CHARLES H. PUGH LTD. ATCO WORKS TILTON RD. BIRMINGHAM B9 4PR  
TELEPHONE: 021-772 2524. 2551. 3892