

**The Soil 'Stratometer': A Method for the Examination of Deep-lying Soil.**

In alluvial soils there are frequently large variations of soil texture, especially in a vertical direction.

With deep-rooting crops like cotton, the soil at depths of more than two metres may be directly important to the plant, quite apart from its indirect importance by influencing drainage, or infiltration under irrigation. The study of such deep soil by soil-boring and sampling has certain limitations, while its complete disturbance by digging large holes is even more objectionable and tedious.

Some infertile areas of the Botanical Section Farm at Giza were being examined for the presence of 'pans' when it was noticed that the mechanical resistance of the soil varied greatly, whether such resistance was felt by a Fränkel borer or by the use of the digging tool. From this observation was developed a simple instrument which has been entitled a 'stratometer,' whereby the variable hardness of soil along vertical lines can be found, giving results somewhat analogous to the records of variability on the surface, in a horizontal plane, which have been made at Rothamsted with dynamometers attached to ploughs (B. A. Keen, NATURE, Dec. 19, 1925, p. 905).

The present note is intended to put the actual method on record. Detailed studies of Egyptian soils by this method are being continued, and will be published later.

The method consists merely in driving a rod into the soil by repeated application of a uniform impact blow, as in pile-driving. The error which would otherwise be caused by increased friction on the sides of the rod as the depth increased is avoided almost entirely by the use of an enlargement like a spear-head at the point of the rod; this head is detachable to save trouble in removing the rod from hard soils, the head being left below and a new one fitted to the rod. The uniform impact blow is conveniently applied by a perforated weight through which the rod passes loosely; this weight rests and strikes on an anvil-stop clamped firmly to the rod, while the height through which the weight drops on to this anvil is fixed by a stop above it, also clamped to the rod.

The distance through which the rod descends at each blow is measured in any convenient way; a simple method is to fasten a tape just behind the head and to mark on the tape after each blow at the point where the tape passes through a zero level, indicated by a spiked plate driven into the surface soil with a hole through which the rod and tape both pass.

The tape-records may be afterwards computed and plotted in various ways, but-usually it is convenient to show the hardness of successive strata, between 10 cm. or 20 cm. intervals, in terms of the energy required (*i.e.* number of blows) to traverse such intervals. The whole apparatus is very simple, can be made by any blacksmith, and a single set of observations down to two metres takes about ten minutes to make with two operators at work.

As an illustration of the information thus obtainable, the case of a 'pan' may be cited. The cotton plants in one corner of a field were stunted during

mid-summer, recovering later. An exposure was made and showed that their roots found difficulty in penetrating a layer at 30-60 cm. deep. Less than 15 metres away they were quite healthy. Soil water-content samples showed the hard layer to be impermeable to water also. The digging of pits showed an exactly similar distribution of clay above and sand below in both spots, the hardness and impermeability of the lower edge of the clay in the panned spot not being obvious except to the feel of the tools used in boring or digging. On applying the stratometer the difference was most strikingly revealed as a four- to five-fold difference in maximum hardness (Fig. 1).

If the stratometer impinges on a stone this is readily indicated by the sound as the blow is given, and the sudden and persistent resistance to the rod.

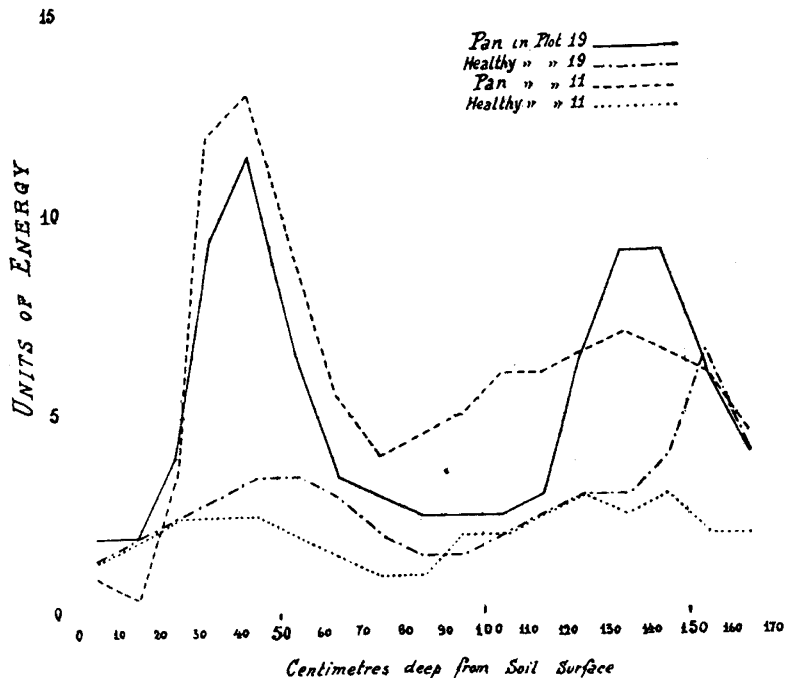


FIG. 1.—Graph of stratometer records.

The design of the rod for depths exceeding two metres needs care in order to avoid loss of energy by undue vibration, and the relation between water-content and hardness of soil is an obvious source of variability when comparisons over an interval of time are required. These are being investigated in conjunction with the direct employment of the stratometer for detailed survey of the deep soil and subsoil on particular areas.

Moh<sup>ED.</sup> ZAGHLOUL,  
Ministry of Agriculture,  
Botanical Section,  
Giza, Cairo.

**The Nitrogen Afterglow.**

THE phenomena connected with active nitrogen and its afterglow have recently received a great deal of attention. A view almost generally accepted now is that the afterglow is due to the recombination of nitrogen atoms produced in the discharge. Though it has not been possible hitherto to determine thermochemically the heat of dissociation of molecular nitrogen, a value a little above the equivalent of 11 volts has been found for it from the characteristics of its band spectrum. On the recombination of two atoms taking place to form a molecule this amount