more balanced composition, the average deviation of the latter is reduced to ± 2.33 per cent.

Where an accuracy of ± 10 per cent is adequate, on the basis of equation (1), the K constants for the individual minerals can be estimated using peak intensities of type specimens. The lower accuracy of this direct calculation procedure arises from the inherent inaccuracies attached to the estimation of specific mineral density and of mass absorption coefficients.

A. A. THEISEN
E. BELLIS

Scott Agricultural Laboratory,
P.O. Box 30028,
Nairobi, Kenya.

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FORESTRY

Field Technique for the Concentration of Rainfall within the Individual Seedling Root Range

FORESTRY nursery practice provides young seedlings, particularly during the critical period following germination, with conditions in which the necessary protection and adequate soil moisture are ensured. In the field, direct seeding in partially buried bamboo sleeves will ameliorate the seedling environment. However, under field conditions it is not feasible to augment soil moisture by watering, and the plant is therefore dependent on rainfall, which in many cases is unreliable and insufficient. Recent work by Glover and Gwynne¹ has demonstrated that the interception of rain by the aerial parts of established plants can concentrate otherwise ineffectual light showers of rain into useful quantities of water within the root range of the plant. An experiment on the direct seeding of three commonly grown exotic species *Pinus radiata*, *P. patula* and *Cupressus lusitanica* at Muguga, Kenya (1° S., 37° E., altitude 6,800 ft.), has shown that a rainfall conductor stick implanted in the soil adjacent to the sown seed increases the seedling survival rate, when used in conjunction with the bamboo sleeve technique (which will be described elsewhere).

Fig. 1. The mean increase for 1-in. conductors, classified by three storm sizes. O, rainfall class 0.50-1.00; x, rainfall class 0.25-0.50; ▲, rainfall class 0.00-0.25

Fig. 2. Percentage increase of rainfall catch by conductors for all storms

To measure the catchment effect of these conductors, bamboo splits, 1 in. wide and 3 in. to 60 in. long, were mounted vertically in standard Snowden-type rain-gauges and placed in line at right angles to the prevailing wind, with a similar gauge used as the control. After the first rainy season these conductor sticks were halved in area by reducing their width to 0.5 in. The daily rainfall catch was measured for two rainy seasons in 1963; it totalled 17 in. in 46 wet days and 13 in. in 43 wet days respectively. The rainfall pattern was similar for both seasons, with about half of the total rainfall in each period occurring as light showers of less than 0.25 in. These light showers would, under the evaporation conditions obtaining at Muguga, contribute little or nothing to the soil moisture build-up². The measured mean daily wind speed at the site ranged from 5-9 m.p.h., and as few rainstorms were accompanied by strong winds the angle of rainfall for the vast majority of the storms was near the vertical.

The mean daily rainfall totals during the first season, when the 1-in. conductor sticks were in operation, have been classified by storm size into three groups as shown in Fig. 1; the efficiency of the conductor is maintained in all three classes. Fig. 2 illustrates the effect of surface area on rainfall catch for both widths of stick measured over the two rainy seasons. Both figures show that for each class of rainfall the gain in water is consistently proportional to the surface area of the conductor sticks. A depression of the order of 2 per cent occurred in all catches due to the reduction in receiving area of the rain-gauge consequent on the installation of the bamboo sticks; this cancelled out the gain in rainfall from the 0.5 in. x 3 in. stick, but for larger conductors the effect was negligible compared with the increased rain catch. A conductor stick of practical size for field work, say, 30 sq. in., will increase the quantity of water arriving at the base of the stick by more than 60 per cent. Thus, rainfall conductor sticks effectively increase the soil moisture within a given area and thereby enhance the conditions for plant survival and growth. In areas where the daily loss by evaporation is high, the conductors can turn ineffectual light showers into beneficial concentrations of water.

P. H. HOSEGOOD
P. HOWLAND

East African Agriculture and
Forestry Research Organization,
Muguga, Kenya.

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