EFFECT OF PLANTING DEPTH ON EMERGENCE PERCENTAGE OF MAIZE IN MOROGORO

by

J. Dumelow & B. Kayombo

Department of Agricultural Engineering and Land Planning, University of Dar es Salaam.

It is desirable that veterinarians who are concerned with health and nutrition of animals and are often requested to advise on various aspects of crop management, should acquaint themselves with establishment of one of the most important animal feeding stuffs - the cereal crops.

A knowledge of appropriate soil preparation techniques is therefore advantageous. Soil preparation is carried out in order to (a) obtain a tilth which will permit the seed to be sown in a position where it will germinate, (b) get rid of weeds which would otherwise compete with the crop plants, and (c) ensure that nutrients are present for the developing plant, if necessary, by adding fertilizers.

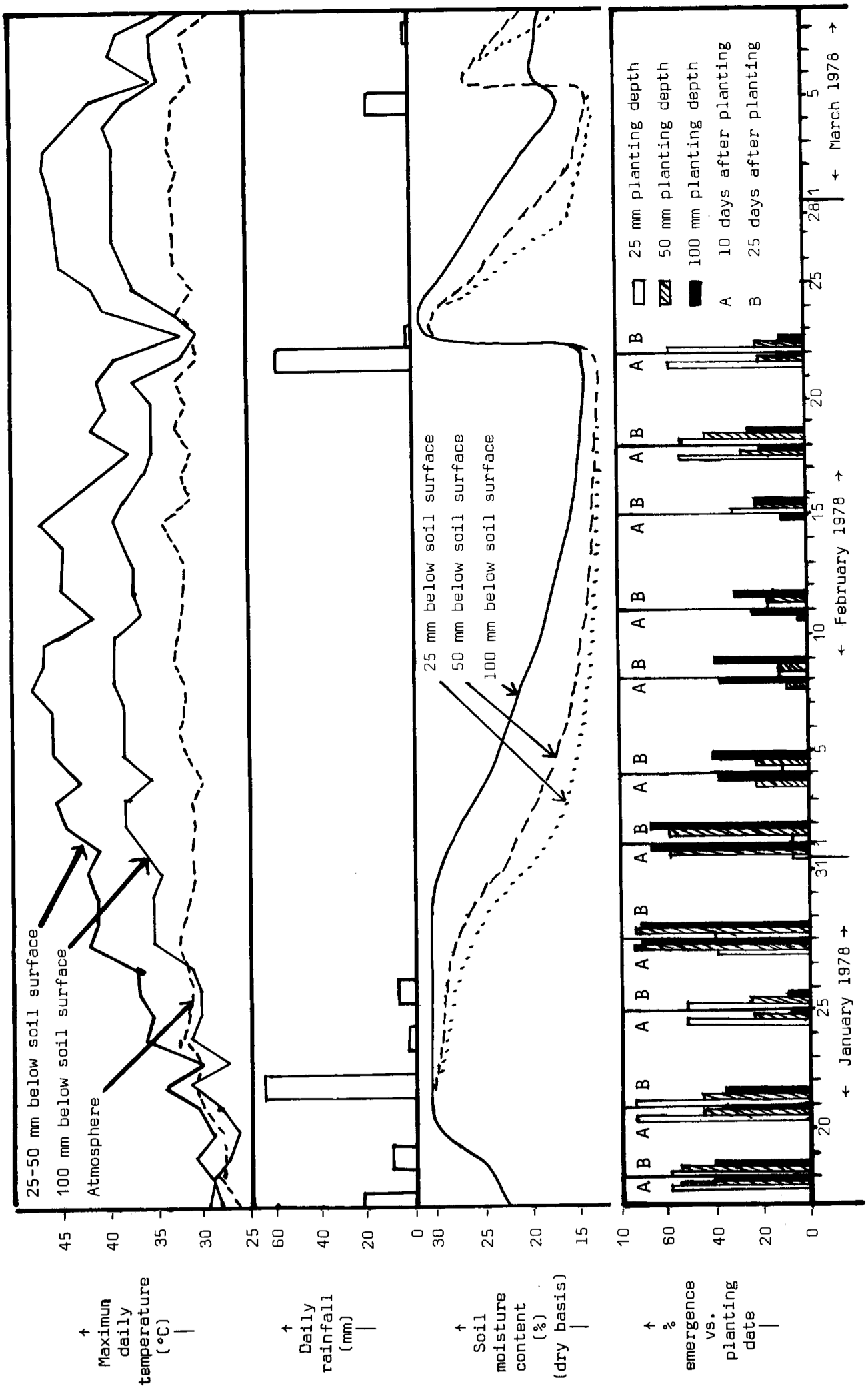
In mechanical cultivations it is generally recognized that seedbed preparation is a compromise between cost and effectiveness. A large number of operations, several ploughings and harrowings, to prepare a fine seedbed, encourages rapid and even germination and kills weeds. There is, however, a risk of soil erosion, soil compaction, poor aeration and loss of residual moisture. Furthermore, a fine seedbed is expensive to produce. Poor emergence of maize on the University Farm (Morogoro) may be due to the fine seedbed prepared. However, Taylor (1974) has shown that the finer the seedbed the greater the emergence. Also the seed may not be placed at the optimum depth. Maize seed placement recommendations have been given (Acland, 1971): in moist soil the seed should be placed 25-50 mm deep but in dry soil it should be placed about 100 mm deep to prevent it germinating due to a light shower.

It was felt that deep planting would be particularly desirable in dry conditions so that the seed could take advantage of residual soil moisture at lower levels, particularly if mechanical cultivations were minimized in order to conserve soil moisture and that poor emergence on the University Farm could be due to shallow planting in dry conditions. The aim of the experiment reported here was to test this hypothesis.

Deep planting has the extra advantage that, once established, maize can make use of very light showers by concentrating the rain from these at the stem base, where many roots are found (Turner, 1966).

Method

A field plot was prepared on the University Farm by ploughing and harrowing to a depth of 100 mm. The soil type was a sandy loam having a field capacity of 28% and a permanent wilting point of 11%. Maize seeds were planted at twice weekly intervals at depths of 25 mm, 50 mm, and 100 mm in the plot over the period 18th January 1978 to 22nd February 1978. Daily moisture contents and maximum daily soil temperatures were recorded at these planting depths using gypsum blocks and mercury thermometers. Daily percentage emergence for each treatment, daily rainfall, and maximum daily atmospheric temperature were also recorded.


25-50 mm below soil surface
100 mm below soil surface
Atmosphere
25 mm below soil surface
50 mm below soil surface
100 mm below soil surface
25 mm planting depth
50 mm planting depth
100 mm planting depth
A 10 days after planting
B 25 days after planting
Maximum daily temperature (°C)
Daily rainfall (mm)
Soil moisture content (%) (dry basis)
% emergence vs. planting date
January 1978
February 1978
March 1978

Results and their interpretation

The results are summarized in the attached chart from which the following observations can be made:

(i) The maximum soil temperatures at 25 mm and 50 mm below the soil surface were virtually identical and accordingly one graph is shown combining the two.

(ii) The maximum soil temperatures at 25 mm and 50 mm below the soil surface were considerably greater than those at 100 mm.

(iii) The maximum soil temperatures were considerably greater than the maximum atmospheric temperatures except after heavy rain when the former dropped markedly.

(iv) During dry spells soil moisture contents decreased more rapidly the nearer the surface the readings were taken.

(v) Soil moisture contents were normally greater at greater depths.

(vi) Emergence was complete after 10 days except during dry spells when emergence could take upto 25 days if the dry spell was succeeded by heavy rain.

(vii) Although the soil temperature at 25 mm and 50 mm were virtually identical considerable differences in percentage emergence occurred between seeds planted at these two depths. These differences could not therefore be due to temperature.

(viii) Shallow planting was preferable when the soil moisture contents in the days succeeding planting were high.

(ix) Deep planting was preferable when the soil moisture contents in the days succeeding planting were low.

(x) The latter two observations are presumably due to optimum emergence occurring at a certain soil moisture content that is achieved near the surface shortly after heavy rains and lower down later on as a result of observation (V).

Conclusions

It is often difficult to forecast soil moisture contents several days ahead. However, clearly planting depths of 25 mm should only be used in extremely wet soil conditions (around field capacity) or when these are anticipated in the very near future whereas depths upto 100 mm should be used when soil moisture contents are low. A planting depth of 50 mm would be a good compromise in the event of neither of these conditions being obvious.

References

(1) Acland, J. D. (1971). East African crops. FAO, Rome.

(2) Taylor, M. S. (1974). The effect of soil aggregate size on seedling emergence and early growth. E.Afr. agric. for J., 40 (2): 204-213.

(3) Turner, D. J. (1966). An investigation into the cause of low yield in late-planted maize. E.Afr. agric. for J., 31: 249-259.