Growing subterranean clover on deep sands

G. H. Burvill
Subterranean clover established on deep sand in the Esperance district. A marked improvement was brought about in this soil by using inoculated seed. Both plots received 200 lb. super, without lime, but with copper and zinc. The seed in the right-hand plot was inoculated, that in the left-hand plot was not. Commercial seed was hand-sown in both plots and the super was kept separate from the seed in the sowing operation.

GROWING SUBTERRANEAN CLOVER ON DEEP SANDS

By G. H. BURVILL, M.Ag.Sc., Chief Plant Research Officer

Subterranean clover (Trifolium subterraneeum) is the most important sown pasture plant on Western Australian farms. It is important too in South Australia and other Australian States. Since World War II several million acres have been planted with subterranean clover in Western Australia and South Australia, mostly on soils with coarse-textured sandy surfaces, often with ironstone gravel. These soils are of low natural fertility but commonly have clay subsoils within two feet of the surface. Subterranean clover pastures, given liberal dressings of superphosphate and the trace elements copper and zinc, and sometimes molybdenum, are the basis of improved grazing and of soil fertility build-up. An example from Esperance illustrates this. Oats (variety Avon) yielded almost 90 bushels per acre in 1958 at Esperance Plains Research Station on land which had been developed for seven years with subterranean clover pasture.

The oat yields in 1951 on new land followed, with super, copper and zinc were less than 10 bushels per acre.

Both in Western Australia and South Australia where subterranean clover is doing such a good job on many soils of low natural fertility, there are also areas of deep sandy soil. This white, or almost white, quartz sand goes down from two to over 20 ft. in some areas without reaching clay subsoil. Subterranean clover establishment on these very poor soils does not succeed when proved methods for other soils are used—for example, good land preparation, superphosphate, trace elements and seed inoculation are not sufficient on deep sands.

USE OF LIME

Research workers of the South Australian Department of Agriculture have used lime successfully on the deep sands of the lower south-east of their State. A 50-50
mixture of super and ground limestone is used at two bags (that is about 375 lb.) per acre. Copper, zinc and molybdenum are also added. Lucerne and *Phalaris tuberosa* are recommended for sowing with subterranean clover in the deep sand areas with 20 in. or more annual rainfall.

It has been found that mixing seed with a superphosphate-trace element mixture before sowing in deep sands greatly reduces the number of seedlings compared with mixing with the lime-fertiliser mixture. Lime-dusting or lime-pelleting the seed has not been effective in overcoming the problems. More recently it has been suggested that the seed and limestone-super could be mixed and drilled, and more super plus trace elements applied in a separate dressing to avoid seed contact.

Western Australian research workers have also worked on sub. clover problems on deep sand in the last few years. Such sands are common in the west coastal strip and from Albany to Esperance. Experiments are in progress at Muchea, Kojonup, Kent River (which is south of Rocky Gully), Narrikup, Gairdner River (below Jerramungup) and Esperance. These centres range from 20 to 35 in. rainfall. The deep sands are well drained, and before clearing carry scrub or tree banksias and other scrub, and sometimes stunted jarrah and coastal blackbutt. Humus darkens the top three inches of the soil which has a pH about 5.5. Various combinations of phosphate, lime, trace elements and seed inoculation have been tried, and so far results are not consistent at the various sites. It must be emphasised immediately, too, that at no site has a really good stand of sub. clover been achieved.

Lime drilled or broadcast, or in 50-50 mixtures with super, or basic super, has generally given some improvement. Copper and zinc have been used in the form of copper ore and zinc oxide, both of which are far less water-soluble than the copper sulphate and zinc sulphate generally used in South Australia. From general experience copper and zinc are believed to be essential additions on deep sands and they have been used in all trials.

C.S.I.R.O. experiments showed benefit from molybdenum on deep sands at Kojonup but Department of Agriculture trials at Muchea did not. Seed inoculation caused a big improvement at Esperance and Gairdner River, but not at Narrikup, Kent River or Muchea. Urea and dried blood to supply about 10 lb. of nitrogen per acre improved early growth. The urea effects did not persist, but with dried blood the benefit continued late in the growing season.

Because the surface of deep sand dries so readily seed sown 1½ in. deep does better than if sown on the surface. But mixing seed and fertiliser has reduced germination and in some cases final growth. Fertiliser should be in the same row with seed but, if possible, separated from it by half an inch of sand.

Both in South Australia and Western Australia it is recognised that deep quartz sands must have very small reserves of other essential plant foods. Potassium is almost certain to become deficient if good clover growth is obtained from phosphate, lime and trace elements suitably applied. After the first year potash is almost sure to be needed as fertiliser. On deep sands in the West Swan area near Perth an improvement from potash was demonstrated on first-year subterranean clover.

Deep sands occurring on existing farms or in good rainfall areas present another challenge in agricultural research. The South Australian workers have achieved quite good results for their conditions. In Western Australia attempts to establish subterranean clover on large areas of deep sand are not encouraged at present. Work will continue, but it must be realised that with soils so poor, any practical success will be costly. It may be too that other species will prove better than subterranean clover.

For those who wish to try subterranean clover on deep sands the following recommendations are made:—

Sow 6 to 10 lb. per acre of inoculated good quality seed.

Plant 1 to 1½ in. deep in moist soil.

Use basic super, or 50-50 super and limestone, at 2 to 4 cwt.s. per acre. Copper and zinc should be included.

If possible, sow seed and fertiliser in bands near each other but aim to have about half an inch of sand separating them. If this cannot be done, mixing seed and fertiliser should give reasonable results.
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