Giving local soils international class

Last November some 50 Australian soil and agricultural scientists and an American professor met at a workshop in Brisbane to see what happens when you try using an American scheme to classify Australian soils.

Pedologists need to classify soils for much the same reason that biologists name and group organisms: to develop a common language for communication, so that discoveries made in one place may be applied elsewhere.

In constructing a classification, soil scientists face two major difficulties. One involves selecting which of soil's many properties should characterize the classes into which different soil types are put — and then defining those properties adequately. The other problem arises when a soil scientist tries to create a clear-cut group without 'fuzzy edges'. This difficulty soon becomes apparent in the field.

Imagine that you are attempting to classify soils using the system of Australian 'great soil groups' (which was developed in the 1950s, based on an American scheme of 1938, which in turn grew out of a Russian classification). All goes well until you meet an orange-coloured soil.

The classification you are using includes one major group called 'red earths' and another of 'yellow earths'; your soil shares the general features of these two groups, but falls between them. You must decide whether your specimen belongs with the 'reds' or the 'yellows' — not always an easy

decision, as the groups lack 'cut-off points, and it is not clear where one group ends and the other begins. (Perhaps those 17th

Century mathematicians

were right who, in John Evelyn's words, 'reckon up no fewer than one hundred seventy-nine millions one thousand and sixty different sorts of Earths'!)

This was one of the obstacles confronting scientists when, soon after World War II, the CSIRO Division of Soils decided to compile a national soil atlas. To overcome it, and other difficulties, Mr Keith Northcote of the Division devised the 'Factual Key for the Recognition of Australian Soils'.

This key, based on the profile and other characters that could be examined in the field, enabled scientists all over Australia to classify and map the nation's soils and so contribute to the atlas, which was published over the period 1960–68.

For classifying Australian soils, and for communication within Australia, particularly

The back-hoe begins to excavate a study pit on CSIRO's research station at Samford, Queensland.



among agronomists and soil conservationists, the 'Factual Key' has proved very useful, but it suffers a serious drawback — overseas scientists do not know it.

For international discussion pedologists have a choice of two schemes: 'Soil Taxonomy', produced by the United States Department of Agriculture, and the 'World Soil Map Legend', developed by the United Nations Food and Agriculture Organization, using several of the American definitions.

To judge from the papers appearing in international journals of soil science, 'Soil Taxonomy' seems the more widely accepted of the two systems. It holds a further appeal: its categories, at any rate in the United States of Ameriéa, apparently agree well with the uses to which soils are put. The two Australian classifications do not always group soils into classes that can be used in similar ways, and some agricultural scientists have been asking for a soil classification better geared to predictions and advice on land use.

A number of soil scientists in Australia — from State Agriculture Departments, universities, and CSIRO — have been making some use of 'Soil Taxonomy' since the mid 1960s.

The system is not exclusively American; scientists from various countries, including Australia, contributed ideas, and Dr Guy Smith, who supervised its development, visited Australia in 1958 to see some of the local soils and discuss them with scientists here.

Unfortunately, 'Soil Taxonomy' is complex. It cannot easily be mastered from a teach-yourself book. Many of its classes are defined by laboratory data obtained by methods not generally used in Australia. Thus there have been doubts about its application to those Australian soils that do not seem to fit its classes.

For these reasons, Mr Cliff Thompson of the CSIRO Division of Soils felt that an expert in the scheme should visit Australia. A submission from CSIRO, supported by the Queensland Department of Primary Industries and the University of Queensland, resulted in Professor Al Southard of Utah State University arriving in Brisbane in April 1981 on a 9-month Fulbright scholarship, awarded by the Australian-American Educational Foundation.

Brisbane made a particularly suitable base. Far more than half Australia's main soils, as recognized in the 'Atlas of Australian Soils', occur within 500 km of the city, and more than 1000 soil profiles had already been examined by laboratories in the region. After sifting this information, Professor Southard and Mr Thompson selected about 200 of the profiles for study in the field.

A typical field trip involved putting a back-hoe on a trailer and driving to a site from which one of the original 200 profiles had been taken. After using the back-hoe to dig to 1.5 m, Professor Southard and pedologists from CSIRO and the Queensland Department of Primary Industries described the soil on the spot; they then compared their description with the information on the card bearing the original laboratory description and analyses of that soil.

They classified the soil by the Australian and American schemes, then discussed the soil features likely to affect land use with advisers from the State Departments of Primary Industries and Forestry and from the Bureau of Sugar Experiment Stations. The scientists found this a very useful collaborative exercise that should assist them in assessing the practical value of 'Soil Taxonomy'.

The scientists managed to fit — albeit provisionally — about nine-tenths of the soils they examined to the scheme. To accommodate the 'misfit' soils, the American classification would need a fair amount of modification.

The 4-day workshop, held at the CSIRO Division of Soils laboratories in Brisbane, gave Australians with a professional interest in soil the opportunity to hear Professor Southard talk about 'Soil Taxonomy' and to discuss in detail the classification of specific Australian soils and particular difficulties people have experienced with the American system in both field and laboratory. Professor Southard's visit and the workshop have created an opportunity for greater Australian involvement in international soil classification in the future. It remains to be seen how many Australian soil scientists will avail themselves of this opportunity.

In the past only a few have been involved; for example, Mr Ray Isbell of the Division of Soils in Townsville has for several years contributed to one of the international committees examining the application of 'Soil Taxonomy' to different groups of soils in the tropics.

Other international committees have been formed recently and would welcome the special contributions that Australian pedologists, with their knowledge of the unique features of this continent's soils, are well placed to make.