Distribution and properties of cracking clay soils in relation to sustainable agriculture in the Namoi Valley

A report to the COTTON RESEARCH COUNCIL on project CS 37L, February, 1990

by W.T. Ward, Division of Soils, CSIRO c/- AES, Griffith University, Nathan, 4111

Summary

Project CS 37L will finish at the end of this financial year. The present situation is as follows.

A large part of the data base has been published in hard copy and is publicly available in Narrabri, Wee Waa and at Myall Vale. A copy of the electronic data base is held at Myall Vale.

The method of data analysis, a new program, is close to publication. A report on the soils of the Myall Vale Research Station is with the editor. Nine other manuscripts are nearly complete.

The electronic data base, a major outcome of the work, will have a continuing value especially to graduate students, agronomists and agricultural advisers. However, there is a need to maintain the data base so that it remains accessible to potential users. This is not an immediate problem but might become so when Ward's work on the data is finished.

In 1990/91 it is proposed to complete laboratory analysis of 290 soil samples. These samples, from soils near Wee Waa, had not been fully analysed when the laboratory in Brisbane was closed down.

Ward also proposes to prepare, in 1990/91, a brief guide to the soils of the district. This will take the form of a self-guided tour through the district with stopping points and descriptions of the landscape and soil at particular vantage points. The information will be directed to students and interested lay persons.

Introduction

Project CS 37L was originally planned to finish in June, 1989, but progress was held up by the closure of the Brisbane laboratories of the Division of Soils and the consequent loss of most staff. Approval was given to extend the project into 1989/90.

This report outlines the state of project CS 37L in February, 1990. It is anticipated that all reports will be completed before the end of the financial year.

The Edgeroi soil data base is a major product of the research.

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It is possible that the data base might fall into disuse with the termination of the project. This should not be allowed to happen because the data base is in fact a resource that would repay further study. Ward, who is the only present user, will have little need for the data base after June, 1989. Others will find much of value in it, but the problem is to find interested researchers. Potential users are most likely to be agronomists or graduate students in the universities. In the meanwhile, there is a need to maintain the database. A new project proposal which accompanies this report will help to achieve this end.

Report on project CS 37L for Jan 89-Jan 90

Distribution and properties of cracking clay soils in relation to sustainable agriculture in the Namoi Valley

The project (a) investigates soil physical and chemical measures relevant to the evaluation of the agricultural potential of cracking clay soils of the Namoi Valley; (b) provides laboratory data suited to the application of computer and geostatistical techniques to the grouping of the soils into classes for sustainable land use; and (c) relates the soil of local research stations to the soils of the neighbouring district.

Using data from an extensive survey of 1250 sq km near Narrabri, geostatistical techniques were used to identify soil attributes of possible relevance to agriculture. The essential tasks are

1. To display the data on maps, in order to identify geographic patterns.
2. To relate the data to the soil units identified from the landscape study.
3. To identify patterns in the chemical data.
4. To group the data in useful classes by numerical techniques.
5. To identify features significant to management.
6. To complete the geological and soil reports.
7. To report on the completed study to potential users at Narrabri.

These tasks will be completed and reported upon before the end of June, 1990.

210 of the 390 soil profile descriptions, with relevant laboratory data, have been published and are available in the public libraries in Narrabri and Wee Waa. Similar reports for the remaining 180 soil profiles are being prepared and other articles are being prepared for publication.

Work done in the period Jan 89-Jan 90

The Edgeroi soil database was completed by describing the remaining 17 soil profiles and by supplying missing field data for samples analysed in the laboratory.

Files relating to surface soils and lost at the time of laboratory closure were retrieved from a VAX backup tape.

Data to support the geological report have been obtained and are currently being written up. Several statistical summaries of the data have been prepared.

Various scripts were written for publication (see below).

Published

1 Soil studies in the lower Namoi Valley: Methods and data - The Edgeroi data set, vols 1 & 2. McGarry, Ward, McBratney.

This publication is available in the public libraries in Narrabri and Wee Waa. Similar reports for the remaining 180 soil profiles (Item 13, below) will be drafted this year.

2 Spatial variation, prediction and mapping of surface soil attributes in the Edgeroi area of New South Wales. McBratney, Hart, McGarry. Journal of Soil Science.

With editor, CSIRO Division of Soils:

3 MacFUZZY- A user-friendly program for data analysis by generalised fuzzy k-means on the Macintosh. A.W. Ward, W.T. Ward, A.B. McBratney and J.J. de Gruijter.

(This report includes examples showing applications of the analytical technique: "Soils of "Myall Vale" research station - Surface chemistry"; "Rainfall at 'Pendennis' - Yearly patterns"; and "Anderson's iris data - A test of fuzzy k-means").

4 The soils of the Agricultural Research Station at "Myall Vale", near Narrabri, with data analysis by fuzzy k-means. Ward, McTainsh, McGarry, Smith.

In preparation (These scripts are nearly complete but require some cross-correlation and revision):

5 Parent rocks and landscapes of the Edgeroi district in relation to soils.
(This is complete except for descriptions of topsoil data analyses).

6 Round Swamp, lower Namoi Valley. Ward and McTainsh.

7 The Llano transect, near Narrabri, NSW: fuzzy classification of routine soil analyses. Ward, Cumming and Little.

8 Soil structure in grey clays (vertisols) from Edgeroi, N.S.W. Little.

9 Edgeroi database: summary statistics for all soil layers. Cumming and Ward.

10 Edgeroi Surface Soil Data: Analyses Using Systat and Fuzzy. Ward, Cumming and McGarry. This is the 0-2 cm soil data.

11 Surface soils from the Narrabri area, NSW: fuzzy classification of routine soil analyses. Ward, Cumming and Daniells. This is the 0-10 cm soil data.

12 A soil profile at Llano, near Narrabri, NSW: fuzzy classification of analytical results. Ward, Little and Cumming. (Most of the text has yet to be written).

13 Soil studies in the lower Namoi Valley: Methods and data - Supplementary profiles and transects, vols 1 & 2. Ward. (Extended profile descriptions are done but transect descriptions have to be compiled).

Unpublished material made available to researchers at Myall Vale:

Copies of the main scripts in preparation were given to researchers at Myall Vale. They were also given a copy of the electronic database for their use, together with a copy of MacFUZZY, the application for data analysis.

The Edgeroi District soil data base

The data base compiled by the CSIRO Division of Soils with the assistance of funds from the Cotton Research Council contains a very large amount of information about the soils of the Edgeroi and Myall Vale districts. There is no other data base like it in Australia, and no similar data base in any other country.

The data base describes 2,624 soil samples, taken from 390 soil profiles. 2334 samples have been analysed mostly for 14 variates. 290 samples lack particle size data. This limits the usefulness of the data that is available for these samples, and should be remedied.

210 of the 390 soil profile descriptions, with relevant laboratory data, have been published and are available in the public libraries in Narrabri and Wee Waa. Similar reports will be produced for the remaining 180 soil profiles in 1989/90. These reports merely present raw data, however. Other reports will present the data in more informative ways.

A lengthy report on the soils at Myall Vale has been completed, and is being prepared now for publication. The report on the entire field study is in its final stages. Drafts of both reports are held for local reference at Myall Vale Research Station by Mr Ian Daniells. Mr Little has been working on the structurally poor soils near Bald Hill and has submitted a report on those types of soil for publication.

The work undertaken in project CS 37L will be totally completed by the end of this financial year. In 1990/91 it is proposed to do the mechanical analyses of 290 Edgeroi soil samples not done as a consequence of laboratory closure, so that the source profiles can be fully utilized in the Edgeroi data base.

Ward intends to prepare a tour guide to the soils of the Edgeroi district. (This is envisaged as a self-guided tour that may be used by school groups, interested farmers and agricultural advisers).

Ward also plans to summarise soil reports completed in 1989/90 as journal papers, where appropriate, and will complete a report on the soils of the I.A.Watson research station, for which there was no time this year.

An important question which should be considered concerns

The future of the Edgeroi soil data base

The results that Ward is getting from the data base are limited by the extent of his skills, and quite obviously he can cover only those parts where he has some expertise. Much useful information remains. Others could use the data base to advantage.

The Edgeroi database is public property and the information is freely available especially to *bona fide* researchers. The problem is to find the researchers, and in the meantime maintain the data base while waiting for the researchers to be identified.

Ward understands that no-one in the Division of Soils wishes to do work on the Edgeroi data base when his involvement ceases. It is planned simply to transfer the Edgeroi data to the Division's WARIS database in Townsville. As few demands are made on that data store, it would seems likely that the Division of Soils will simply cease to use the data. Nevertheless, many people outside the Division could have a use for the data base. The obvious candidates are the graduate students of the Agriculture, Agronomy and Soil Science departments of the universities. One would hope also that there are professional agronomists that will use the information. There is a need to engage the interest of students and professionals, with the long term aim of benefiting the cotton industry. However, there needs to be a central location for the main copy of data base.

There are two sorts of potential use. One is - how do the observations relate to problems recognized by managers and agronomists in this district? The second use is more frequent: a researcher has a problem in some district, and wants to know whether the Edgeroi data can help. In both instances the questioners need to access the data by contacting the data manager.

Proposal

In the coming financial year I plan to summarise the Edgeroi work that I will complete this year, as journal articles that will describe the Edgeroi district in general terms. These papers will not add anything to what will be in the reports of Project CS 37L but merely transmit the results to a wider audience.

I shall also prepare a self-guided tour guide to the soils of the Edgeroi district. This could be used by school groups for educational purposes, by interested farmers and by agricultural advisers.

I also plan to summarise soil reports completed in 1989/90 as journal papers, where appropriate, and will complete a report on the soils of the I.A.Watson Wheat Research Institute.

The attached new project application provides a detailed costing.

W.T. Ward