

**FINAL REPORT  
COTTON RESEARCH AND DEVELOPMENT  
CORPORATION**

**Project Number:** Dan 66C

**Title:** Attend the ASSSI National Soils Conference

**Organisation:** NSW Agriculture

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## **INTRODUCTION**

The 4th National Soils Conference was held in Adelaide in April, 1992. This conference is held every four years. The conference theme was 'Soil Protection and Productivity'. Approximately 400 delegates attended from Australia and overseas.

## **POSTER PRESENTATION**

A poster was displayed by Ms Greenhalgh titled 'Field Diagnosis of Soil Structural Conditions', co-authored by David McKenzie and Donald MacLeod. It was the only display or presentation that dealt with the practical assessment of soil structure in the field. This poster was highly commended for its content and presentation. It was ranked one of the top 4 posters out of 160 posters by the judging panel .

## **HIGHLIGHTS OF PAPERS PRESENTED AT THE CONFERENCE**

### **Soil Structure**

*Murphy (NSW)* Soil structural properties exhibit a lot of temporal variability. Hydraulic conductivity of soil changes during a growing season with larger conductivity at the beginning and the end of a season. Most water movement and variability is accounted for by the soil macropores, rather than the micropores.

*Weaich et al. (QLD)* A temperature and shoot length dependent model was developed to determine how the physical system behaves and how seedlings interact with the physical environment of hardsetting red soils. It found that the coleoptile and first internode growth was simultaneously impeded at a cone index of 1.1 MPa.

### **Tillage and compaction**

*Koppi et al. (NSW)* The effect of different engineering practices on soil macropores was studied using a resin impregnation technique. The structural changes caused by reduced ground-pressure tyres was less than that caused by conventional tyres in both degree and depth. In cotton soils the furrows showed a marked loss of soil macropores compared to under the ridges.

*Schaffer et al. (QLD)* Soil-crop responses on a Vertisol between zero till and conventional tillage was compared. In favourable conditions, zero till had more uniform crop establishment, higher dry matter production, slightly higher yield, and greater losses of nitrogen. In dry conditions the absence of compaction layers may increase effective rooting depth and enhance water and nitrogen distribution and storage.

*Lindsay and Marinopoulos (VIC)* Compaction was observed to effect the regrowth of mixed species Eucalypt forests in south central Victoria. This compaction was the result of forest clearing using bulldozers. The soil types involved ranged from Krasnozems (red gradational clay loams) to yellow duplex soils. The results from this study showed that mild compaction can modify regrowth of some species for many years. It was also concluded that not all forest species are affected to the same extent and response of both the soil and, subsequently, the plant growth, depends on the soil type.

### **Soil Degradation**

*Condon & Sippel (NSW)* Large areas of Australia are affected by secondary salinity, soil acidification and soil structural breakdown. For sustainable landuse there needs to be a reversal of these trends. Use of Old Man Saltbush (*Atriplex nummularia*), a native perennial, would achieve this aim.

*Muirhead et al. (NSW)* High watertables have led to salinisation and waterlogging in the Murray Darling Basin. The use of mole drains has been effective and economical in lowering the watertable after irrigation and rainfall.

*MacEwan (VIC)* Use of mole drainage to overcome waterlogging has proved economic in the heavy clay soils. In duplex soils these moles tend to collapse. Specialised machinery such as the floating beam mole plough has been successful in installing moles, but the problem of channel stability is still being addressed.

### **Erosion**

*Misra and Rose (QLD)* GUEST (Griffith University Erosion System Template) is a process based model designed for the determination of soil erodibility parameters. A fundamental erodibility parameter can be obtained when rates for rainfall, runoff and sediment concentration are known as functions of time in an erosion event. An approximate erodibility parameter can be obtained when total soil loss for the event and runoff rates are measured. An alternative usage of the model is to predict sediment concentration for a soil of known erodibility in any particular event.

*Cresswell et al. (ACT)* Soil-water relations and surface soil physical condition both affect wind erosion. Hydraulic conductivity was reduced in 'excess' tilled soil. Shortwave albedo measurements highlighted small changes in tillage induced soil structural changes. The use of this information along with mechanistic soil water and energy simulation models can assess changes in the water balance. This allows various tillage systems to be evaluated on the basis of soil-water relations and subsequent risk of wind erosion.

## **Earthworms**

*Baker et al. (SA)* Earthworm abundance is greatly influenced by agricultural practices (eg. fertilisers, drainage, tillage etc). Increasing abundance and diversity of earthworms may be achieved by introducing more appropriate strains from overseas or other parts of Australia.

## **Plant Water Relations**

*Denmead et al. (ACT)* Transpiration losses between two wheat cultivars differed by 38% but the actual water losses differed by only 6%. Thus, selection for high transpiration efficiency associated with low leaf conductance may be beneficial.

## **New Technology**

*Stewart et al. (ACT)* Plant roots exhibit a phenomena called autofluorescence. A technique is being developed that enables images of these fluorescing roots to be obtained.

*Zegelin and White (ACT)* Time Domain Reflectometry (TDR) is a technique for monitoring soil water content. It has some limitations, but these are being overcome by redesigning some of the TDR hardware and computer software. Presently, it is more suitable for use in the sandy soils and less suitable for heavy clay soils and highly saline soils.

## **Soil Classification**

*Johnson (QLD)* Land suitability classifications in Queensland lack the flexibility to reflect a changing technological and economic environment. An expert system has been developed which enables essential biophysical, economic and productivity data to be integrated into the model. This model has been successfully employed in the Herbert River district in North Queensland. This type of system could be of value to the cotton industry as the model is flexible enough to be revived annually as updated crop yields, environmental criteria and tolerances etc become available.

*McKenzie (ACT)* Soil survey and land evaluation in Australia has a lot of inconsistencies between and within States and Territories. These inconsistencies are being addressed by the Australian Collaborative Land Evaluation Program to enable reliable and cost-effective information acquisition for land resources.

*Thomas et al. (QLD)* PERFECT is a model that simulates the plant-soil-water-management dynamics on a broadacre, dryland agricultural system. It predicts runoff, soil loss, soil water storage, drainage, crop growth, and yield.

## **Nutrient Loss**

*Datal (QLD)* Pastures have been shown to be effective in restoring the fertility of depleted soils. The sensitivity of measuring the effectiveness of restorative practices decreased in order: anaerobic mineralisable N > total N > organic C = microbial biomass N.

*Islam et al. (QLD)* Losses of nitrogen from pasture systems was wheat 3 1/2 yr grass legume pasture rotation > wheat/chickpea rotation > wheat/1 yr lucerne pasture ley > conventionally tilled wheat > wheat/1 yr medic pasture ley > long fallow. It appeared that N loss due to denitrification from various tillage, crop and pasture systems is related to the amount of freshly added carbon substrate available for denitrification.

## **COMMENTS**

Presently there is a lot of soil structural research being carried out in Australia. A majority of this work is on dryland soils. Most of this research deals with the effect of tillage or changes in soil structure on plant growth, water infiltration and soil stability. Some of this work could be extended to the cotton industry especially work such as the measurement of soil structural stability on the farm. Some of the infiltration studies and management strategies to improve rainfall infiltration may also be extrapolated to the dryland cotton situation. However, most of the research deals with specific cropping systems.

There appears to be little research currently being undertaken on irrigated soils, particularly grey clays, or about the objective measurement of soil structure in the field. Also alot of work is involved in theoretical concepts rather than practical research that can be directly related to industry needs. Thus, soil research funded by the Cotton industry is addressing issues that aren't being dealt with by other organisations.

The conference provided an excellent opportunity to liaise with other soil scientists working on soil structure, to discuss their research and to make known the soil research that is being carried out by the Australian Cotton Industry.

## **ITINERARY**

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|-------------|---|
| April 17    | Travel to Adelaide                                    |
| April 19-23 | Attend 4th National Soil Science Conference, Adelaide |
| April 24    | Travel to Trangie                                     |

## **MAIN SOURCES OF FUNDING**

**Salary:**

**Cotton Research and Development  
Corporation**

**Travel and Registration Expenses:**

**Cotton Research and Development  
Corporation (\$630)**