7/88 to 6/91 C91 ✓

Cotton *Research and Development Corporation*

Final Report

Corporation's Code: DAN 41

Commencement Date: July 1988 **Completion Date:** June 1991.

Project Title: **Development of SOILpak: a decision-support system for soil management**

Field of Research: Technology transfer **Field code:** 6.1

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Research staff:	Mr I Daniells	75%
	Mr D Larsen	100%
Other collaborating staff:	Miss V Brooks	75%
	Mr D McKenzie	5%

Project Title: **Development of SOILpak: a decision-support system for soil management**

Aims:

1. Promote awareness of the importance of soil management.
2. Collate existing research results and practical knowledge of the management of irrigated cracking clays.
3. Provide, in consultation with users, a decision-support system for soil management suitable for use at the workface.
4. Provide a framework for identifying research needs and for co-ordinating future research efforts.

Industry Significance:

Wrong decisions in soil management can result in serious reduction in land productivity and unnecessary, ineffective operations. Although knowledge about irrigated soils has increased greatly, much of the research data and practical expertise remain inaccessible to growers. The provision of a soil management decision-support system will provide options and strategies to maintain high productivity and low costs.

Research Proposal Summary:

A decision-support system for soil structure management in the cotton industry is being developed. Funds are requested to assist development to the stage where the system can be used routinely by farmers and their advisors.

The system is intended to be simple, relevant and accessible. Extension officers will be involved from the start. Initially, the major emphasis will be towards a system that can be used in the field: such a system may well prove to be sufficient for the needs of many growers. Later, more sophisticated decision-support will become possible as the system develops and becomes computer-based.

The appointment of a Technical Officer to the SOILpak project will provide a focus for the efforts of over 20 people who have already made a commitment to provide information. The appointee will assist with collating research results and practical expertise; developing such information into rules and guidelines for soil management; compiling printed notes, a field manual, videos and photographs; and developing computing packages.

Objectives to be achieved in each year of the grant:

Year 1: Produce prototype manual. Contact contributors. Collate knowledge.
Year 2: Produce and distribute first edition.
Year 3: Produce and distribute second edition.

APPROVED BUDGET

This project terminated in June 1991.

Item	1988-89	1989-90	1990-91
STAFF COSTS	31,229	43,316	43,441
TRAVEL	2,500	3,100	3,100
OPERATING	2,500	7,500	7,500
CAPITAL	6,000	nil	nil
TOTAL APPROVED	42,229	53,916	54,041

Other projects: Mr Daniells is devoting 5% of his time to a proposed project 'Soil management training'.

Funds for this and other projects of the project supervisors	Requested in this proposal	Provided by own institution		Provided or requested from other sources	
	$	$	Source	$	Source
This project	150,186	300,372	NSW Ag & Fish	nil	
Other projects					
Project proposal to CRDC 'Soil management training'	139,834	160,000	NSW Ag & Fish	nil	

Estimated income from project: nil

Amount of grant for 1991/92 sought as a first payment for the July-December period: nil

Supervisor's Signature:.....Date:.....

Attachment C

PROGRESS REPORT

Code DAN 41

The goal of the project was to produce a field manual to assist decision-making in soil management.

Achievements against objectives

1. We produced a series of prototype manuals in 1989 and distributed them to selected potential users for comments.

2. We published the first edition (alpha version) of the manual in 1990. All 400 copies were distributed.

3. We published 750 copies of the second edition (beta version) of the manual in 1991. These are being distributed through District and Extension Agronomists in NSW and Queensland to the 545 names on our list.

Contents

The following chapters are current.

- Introduction.
- Ideal soil for cotton.
- Harvesting on wet soil.
- Options after a wet harvest.
- Options after a dry harvest.
- Applying nitrogen to cotton.
- Nursing a cotton crop in a damaged soil.
- Clues to soil structural condition.
- Digging a soil pit.
- Soil pit observations.
- Determining soil moisture before tillage.
- Using a neutron probe to detect compaction.
- Chemical tests and soil structure.
- Alternatives to the soil pit.
- Improving soil structure.
- Avoiding soil problems.
- Overview of Australian cotton soils.
- Compaction, smearing and the effects on plants.
- Organic matter.
- Clay minerals.
- Sodicity and salinity.
- Environmental issues.
- Appendix 1: Acknowledgements.
- Appendix 2: Further reading.
- Appendix 3: Checking for Heliothis pupae in soil.
- Appendix 4: Supply of soil pit inspection sheets.
- Glossary of terms.
- Index.

Promoting and testing the manual

Industry conferences and seminars: SOILpak was promoted by talks at QDPI Soil Structure Working Group at Toowoomba, Agronomists Seminars at Moree and Gunnedah; Australian Cotton Conference at Broadbeach; regional cotton seminars at Dalby, Warren, Moree and Gunnedah; a compaction workshop organised by Queensland Wheat Research Committee; and a land-forming seminar at Boomi.

Training workshops. Consultants and industry representatives attended two-day soils workshops in the Macquarie, Namoi, Gwydir and Dalby areas. Participants used SOILpak to learn how to recognise and interpret soil structural features, and make recommendations for management. Terry Abbott (NSW Agriculture & Fisheries) and Des McGarry (Queensland Department of Primary Industries) organised the workshops under CRDC project DAN 45.

Field days. The manual was promoted at field days at Mungindi, Yanco and Spring Ridge. Local growers and

consultants examined soil pits and discussed management options. Parts of the manual were presented as hand-outs.

Poster displays at the Small Farms Field Days (Mudgee), AgView (Camden), AgQuip (Gunnedah) and the Australian Cotton Conference.

News items in the Land newspaper, Narrabri Courier Supplement and the Cotton Irrigator newsletter.

Reviews

Special mention is due to those who reviewed the whole manual at various stages in its development: Terry Abbott, David Anthony, Tom Batey, Mike Braunack, Rod Browne, Mac Kirby, David McKenzie and Bing So. Terry Abbott and David McKenzie put a lot of effort into reviewing. Tom Batey's ideas led to a numerical system for classifying soil structure (Chapter C3).

Comments from users

A discussed in a previous progress report, the following notes are based on interviews with 10 users (consultants and corporate agronomists) during 1990.

Manual is readable. Topics are useful. Addressing specific topics is good. Flow charts not always easy to follow, but helpful when undecided.

No problem with manual being distributed before completion. Happy with free distribution of manual within industry, but one consultant commented that it shouldn't be put up for indiscriminate delivery. Portability of manual is good (unlike a computer).

Training workshops are very useful; the manual is a back up to soil pit work. Would like follow-up workshops. Varied feelings about workshops for farm hands: depends on individual and level of responsibility: aim at growers and field supervisors.

Topics that should be included or covered in more detail: objective measurements for soil pits; soil test interpretation and standardisation; lime; mycorrhyzae and rotations; wide beds; narrow rows; economics of compaction; summary of nitrogen experiments (how are guidelines formed?); other nutrients and interactions; implements for different conditions; effects of implements on wet soil; deep ripping various soil types; land levelling; organic matter and how to manage it; contour farming for dryland water retention; emphasise that there is still some damage under min till; give more guidance on the best options for sustainability; more specific examples needed.

Technology needed:

how to relate observations of soil structure to potential yield;

the potential yield increase due to an ameliorative operation;

a simple 'compaction meter'.

In addition to the above comments, one message from consultants is loud and clear: SOILpak has increased growers' awareness of the penalties of soil structural degradation; growers are now beginning to change their farming operations as a result of reading the manual.

Computerising

Although the main aim of this project is to produce a field manual, some computer software is available as well. The software is not essential but forms an alternative vehicle for the information. Users are welcome to try it out. Included are:

- decision-assistance on tillage options (based on information already in the manual);
- decision-assistance relating the presumed gains in productivity due to various tillage options to the costs associated with those options;

- animations to help explain aspects of soil science and soil management;
- Greg Constable's NRate program.
- a database of references from the Australian Cotton Grower.