

**BUREAU OF SUGAR EXPERIMENT STATIONS
QUEENSLAND, AUSTRALIA**

**FINAL REPORT
SRDC PROJECT BS146S
FARMING SODIC SOILS -
A SITUATION STATEMENT AND FUTURE DIRECTION
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EXECUTIVE SUMMARY

Soil sodicity will be a major limiting factor to long term economic sugar production on expansion lands throughout the state. They are easily degraded and expensive to crop.

Sodic soils represent a significant proportion of existing and potential canelands. Sodicity could conservatively reduce the industry's production by 500 000 tonnes valued at over \$22.5 M. Recent BSES trial work showed that these losses could be reduced 25% by using gypsum. This would represent a return of \$5.5 M to the industry but there is only marginal cost/benefit to applying gypsum. More sustainable and viable solutions must be found to maintain these soils in production.

BSES staff are at the crossroads with their research on sodic soils. Research has provided short term solutions to increasing production on sodic soils by applying gypsum. However there is a need for longer term more sustainable solutions to the problem.

The aims of this project were 1) to document research on, and farming systems for, cropping sodic soils to sugarcane, and 2) through an expert review of research and current practices for farming sodic soils identify directions for future research and extension efforts on the subject.

There was agreement at the review on the issues to be addressed. The four main topic areas of future research identified were:

- 1. lime/gypsum/soil products - more understanding of the processes for amelioration,***
- 2. the role of organic matter in ameliorating sodic soils,***
- 3. water management for sodic soils and,***
- 4. macroporosity.***

These research topic areas do not differ greatly from those identified at the client focus group meeting.

Participants at the workshop then broke into interest groups for the main topic areas to develop an action plan for future work. These action plans are presented in the report and are now being used as a base for research and development on sodic soils by BSES and the CRC for sustainable sugar production.

1.0 INTRODUCTION

Soil sodicity will be a major limiting factor to long term economic sugar production on expansion lands throughout the state. Sodic soils are easily degraded and expensive to crop.

Sodic soils represent a significant proportion of existing and potential canelands - southern region 10%, Mackay 24%, Proserpine 15%, Burdekin 15%, and Mareeba 10%. BSES research shows that when soil sodicity is above 6%, every 1% increase in soil sodicity reduces cane yield 1.5 tonnes/ha. In a moderately sodic soil, say 16% sodicity, cane yield losses are about 24 t/ha. Sodicity could conservatively reduce the industry's production by 500 000 tonnes valued at over \$22.5 M. Recent BSES trial work showed that these losses could be reduced 25% by using gypsum. This would represent a return of \$5.5 M to the industry but there is only marginal cost/benefit to applying gypsum. More sustainable and viable solutions must be found to maintain these soils in production.

BSES staff are at the crossroads with their research on sodic soils. Through a needs analysis they have identified sodic soils as a major constraint to increasing production on some expansion lands. Research has provided short term solutions to increasing production on sodic soils by applying gypsum. However there is a need for longer term more sustainable solutions to the problem.

The aim of this project was to document research on, and farming systems for, cropping sodic soils to sugarcane, and through an expert review of research and current practices for farming sodic soils identify directions for future research and extension efforts on the subject.

2.0 METHODOLOGY

A situation statement on cropping sodic soils with sugarcane was prepared in the early stages of the project. This document outlines the problems, research and practical experience gained on cropping sodic soils.

The second phase of the project identified international and domestic experts in the field of sodic soils, and invited them to review the research and experiences of cropping sodic soils with sugarcane. The experts were identified after discussions with staff of the CRC for Soil and Land Management and a literature search. The review commenced with a tour of the Burdekin and Proserpine districts to familiarise the group with cropping sodic soils in the sugar industry. An open forum was then conducted with individual members of the expert group presenting their research and commercial experience with sodic soils to a broad representation of industry, including both research/extension personnel, agribusiness and grower representatives. At a smaller workshop on the following day BSES staff, and staff from other local organisations then summarised research on sodic soils in the sugar industry. Smaller groups were then formed and their perceptions and attitudes of the research and current practices for farming sodic soils in the sugar industry were determined. Their views on the future direction of research and extension for sodic soils in the sugar industry were identified, prioritised and action plans developed.

Using focus group techniques, the project also determined the industry's, or clients' perceptions, of research and current recommendations for farming sodic soils.

3.0 SITUATION STATEMENT

The document "A review of sodic soils research in the Queensland Sugar Industry" was prepared by A Z Cox, G J Ham and G G McMahon for the first milestone of this project. The review showed that increasing levels of sodium on the clay, in the absence of high levels of soluble salts, are not believed to be toxic to the cane plant. Any adverse effect on crop production is through deterioration of the soil structure (Crema, 1994). Under wet conditions, increased clay dispersion accompanies increasing exchangeable sodium percentage (ESP). This is associated with sealing and crusting in surface soils and dense subsurface clays which resist penetration of roots and water. Even if water does penetrate the surface, it is held strongly in the very small pores formed in the dispersed soils. It is difficult for roots to withdraw this moisture. The end result of sodicity is similar to that of salinity, water stress. Both water infiltration and water storage are adversely affected.

Reclamation of sodic soils can be achieved by application of gypsum or lime to promote replacement of the sodium on the clay particles by calcium, and hence improve soil structure. Research work indicates that sugarcane yields on sodic soils with ESP less than 25 can be improved by up to 20% with the application of gypsum 10 t/ha (Ham et al., 1995). Improvements in yield can also be achieved by improving surface and subsurface drainage to promote leaching of displaced sodium salts from the soil profile. Reduction of natural slope from 0.49% to 0.07% has improved sugarcane yield by 24% over the crop cycle (Ham et al, 1995).

Research has developed ways of increasing production on sodic soils. With the expansion of the cane industry into marginal areas there has been an associated extension campaign, concentrating on farm planning and demonstrating the benefits of applied gypsum. A good example of this is in the Burdekin where the BSES program on sodic soils is estimated to have resulted in an extra 26 000 tonnes of cane to the Burdekin District in 1994 alone with a gross value to the industry of \$1.02 M.

4.0 CLIENT NEEDS AND RECOMMENDATIONS FOR FUTURE RESEARCH

In November 1995 a focus group was conducted with clients of the sodic soils research program. The transcripts of this discussion are given in appendix 5. The focus group was conducted to obtain client views on the future direction of the sodic soils research and extension program. Attendees at the focus group included growers farming sodic soils, representative from two local agribusiness firms, proprietors of the two local lime companies, members from Water Resources and DPI, representatives from BSES and the Productivity Board in Proserpine.

The group were asked to answer 4 questions and the responses from the following discussion was recorded and later transcribed. The questions were;

1. How do you treat sodic soils differently on your farms?
2. How are they farmed profitably?
3. Are your current production methods sustainable in the long term?
4. What do you see as future research needs if any?

The facilitators for the group were Shane Norrish from BSES Mackay and Bryce Davies a local extension officer. These people were selected so as not to bias the discussion.

A summary of the focus group discussion is given below. Much of the language used in the discussion is reported here so as not to lose the meaning or impact of the remarks.

4.1 How do you treat sodic soils differently on farms?

- It was considered that sodic soils were suitable for farming but required higher inputs.
- It was felt that sodic soils got better over time.
- Deep ripping of fallow and ratoons was required. Fallow land should be ripped before the wet season and ratoons ripped in the centre of the interrow.

4.2 How are they farmed profitably?

- Deep ripping should be done prior to planting when soil is dry to promote shattering. No subsoil should be brought to the surface. It was also felt that the response may only be temporary. Deep rip the centres in ratoons was also required.
- Trash incorporation was thought to help with best results occurring if the ground was irrigated first and made softer.
- Trash blanketing could also assist by
 - lowering evaporation
 - trash slows water down so it has longer to soak in and the drill runs deeper.
 - hasn't really been tried yet so unsure about results.
- Farm design was considered very important with the following pertinent points made.
 - maximum fall (0.016% slope)
 - don't remove topsoil when levelling
 - laser the paddock in several different planes if necessary to minimise soil movement
 - try and keep soil types separate in paddocks. This way you can treat them separately i.e. water more often, more timely cultivation.
 - another school of thought is to design the paddocks so that the sodic soil is at the top of the drills. The sodic soil is then irrigated for a longer period of time and it is possible to run water over these sections between routine irrigations. Disadvantages are timing of cultivations and the ratoons will run down faster on the sodic soil than the rest of the paddock, therefore the crop cycle would be shorter.
- Gypsum was considered the best ameliorative treatment with the following points raised.

- good responses at rates as low as 2.5 - 5 tonnes per hectare.
 - an initial spreading of 10 tonnes per hectare probably better.
 - will get a response to rates as high as 25t/ha, but 12.5t/ha is economic threshold.
 - need to trial different rates on each farm.
 - after the first crop cycle only need to apply 2.5 - 5 t/ha as a top-up.
 - better to spread it before planting than use a dissolvenator if you can afford it.
 - dissolvenators are expensive and play up so you have to keep an eye on them.
 - dissolvenator applies gypsum to whole paddock : can't target sodic areas only.
 - natural gypsum is slower acting than chemical gypsum.
 - to get a short term response requires twice the amount of natural gypsum.
 - if only applying a low rate, should use chemical gypsum.
 - suggestion that ccs where gypsum has been spread is lower than where dissolvenators are used.
 - good response when spread on surface then planted straight into.
 - other school of thought is that natural gypsum must be worked into the soil or the rate doubled to get a response.
 - Natural gypsum doesn't work in dissolvenators as it isn't soluble enough and has too many impurities.
- Gypsum/Lime Mixtures. There was a suggestion that gypsum/lime mixtures are giving better responses in Leichhardt than straight gypsum or lime.
 - Burnt Lime - terrific response on acid sodic soil.
 - Lime - gives a better response than gypsum on saline/sodic soils.
 - Proserpine - acid sodic soils so can use lime.
 - often whole farms are sodic rather than pieces of paddocks.
 - Varieties - Q117 doesn't perform well on sodic soils, although this was disputed.
 - best varieties are Q124, Q133, Q96, Q117 in that order.
 - Fallow Legume Crop- didn't give a very good response.

4.3 Are our current production methods suitable in the long term? (what if sugar price decreases or gypsum price increases?)

It was felt that if the price of sugar falls, gypsum won't be economical. Maybe trash blanketing could provide the answer. Another view was that you can't afford not to apply gypsum, even in years of low sugar prices. A further view was that in good years "put lots of gypsum on. When things are tighter you can cut back on gypsum rates."

A question was asked should severely sodic soils be excluded from development? The answer was no, but they should carry a severe warning so that buyers know what they are getting. They should also come with a water allocation.

4.4 Research Needs

- Clarify the responses from different rates of gypsum on soils with different ESP levels. (Modify gypsum rate recommendations for different soil ESP's).
- Investigate the response from mixing lime and gypsum.
- Target sodic soils in the variety breeding program.
- Research methods that will improve sodic soils in the long term, rather than treat the symptoms.
- Investigate the effects of trash blanketing.
- More efficient use of irrigation water.
- Look at trickle irrigation.
- Investigate the use of saline groundwater to alleviate sodicity.
- Ploughing
- Is there good soil below the sodic layer. If so maybe it can be inverted.

5.0 SODIC SOILS WORKSHOP

5.1 Introduction

A workshop on sodic soils was conducted at the Burdekin Sugar Experiment Station for a week commencing Monday March 11, 1996. The participants at the workshop included an international visitor, seven scientists working in the field of sodic soils from various states of Australia, ten BSES staff, one student from the University of Queensland, two local DPI staff, one local CSIRO scientist, two local growers, the executive officer from the local canegrowers and the proprietor of the Burdekin Lime Company. The actual list of attendees is presented in appendix 1. This selection ensured that the workshop had a diversified group of people representing many sectors of the sugar industry and research organisations.

5.2 Selection of Participants

Selection of the workshop participants outside the sugar industry was completed after conducting a literature search on sodic soils both nationally and internationally, reviewing the proceedings of the Australian sodic soils conference and personal references. It was also decided that the visiting group would have a diversity of backgrounds and not be all soil scientists. BSES attendees were selected from areas where sodic soils are farmed and comprised both extension and research staff.

It was also believed that other local organisations and growers should be represented at the workshop to access a broader skills base. An SRDC representative was also asked to attend but unfortunately their Board meeting clashed with this workshop and he was unable to attend.

5.3 Workshop Program

The program for the workshop was designed to expose sugar industry and local representatives to experiences with sodic soils from other areas and crops; to give the visitors an insight into the sodic soils problem in the sugar industry; to rate the BSES research program and identify future research needs and directions.

The program for the workshop was as follows

Tuesday am. 15 minute presentation by the each of the invited speakers on their topic of expertise. This was followed by a 5 minute question and answer session. This session was open to any interested person and resulted in attendance of approximately 60 people.

Tuesday pm. Invited guests were shown the problem of alkaline sodic soils in the Burdekin District. They visited the properties of David Cox to see deep cultivation and surface applied gypsum being used to improve sodic soils; Alec Christensen to examine the responses to gypsum and the dissolvenator; The Burdekin Agricultural College to view the dissolvenator and varying soil types; and Chris Hesp to understand correct farm planning and levelling techniques. A tour of the Burdekin Lime company was also organised to give commercial perspective to the problems and solutions.

Wednesday am/pm

A tour of the Proserpine district was organised to view acid sodic soils and the potential problems for a newly developing area. This tour was led by BSES extension Officer Neil Judd.

Thursday am. A summary of the BSES research was presented to the group by Gavin McMahon, Les Chapman, John Reghenzani and Gary Ham. DPI research in the Burdekin district on other crops was presented by Peter Elliot and Dan Coutts outlined farm planning and design implications from a Water Resources perspective. Finally a grower Vin Sorbello presented a growers perspective on amelioration and management of sodic soils.

Thursday am/pm

A workshop was then held where small groups identified issues and research needs. After the needs were identified the three working parties were asked to develop an action plan for the three most important issues.

Friday am. A question and answer session was held to clarify any issues that arose during the week.

5.4 Summary of presentations from invited guests

Jim Quirk stated that much of the problem associated with sodic soils is actually related to the swelling of the clay in the soils. Sodium in the profile causes additional swelling and

this reduces the porosity and infiltration. To counter this Jim stated that the threshold concentration of the irrigation water must be established to allow the electrolyte effect to flocculate the soil particles and reduce swelling. This will allow better water infiltration.

Isaac Shainberg also stated that much of the problem with sodic soils was related to water infiltration and soil dispersion at the soil surface. Isaac also stressed the importance of clay mineralogy which determines the activity of the clay fraction in the soil. To overcome the problem of poor water infiltration and low hydraulic conductivity, the water solution must have sufficient electrolyte concentration to allow flocculation of the soil particles. The various amelioration products will have different effects on the electrolyte concentration of the irrigation water; with phosphogypsum having the greatest effect and lime the least effect because of solubility differences. Isaac also showed that there has been success in other countries with polyacrylamide polymers (PAM) to flocculate the surface soil particles and improve infiltration.

Pichu Rengasamy showed that in soils with high free calcium carbonate in the soil profile, green manure crops or the addition of glucose could reduce the soil pH which promotes dissolution of the calcium carbonate. This occurred as a result of microbial activity with bacteria forming acids. This reduction in pH improved dry matter production on sodic soils. He also found that the combination of green manure and gypsum applications was more effective in increasing production from sodic soils than green manure crops alone.

Yin Chan in his experiences in NSW showed that mixtures of lime and gypsum were much more effective in ameliorating acid sodic soils than gypsum alone. In fact high rates of gypsum alone in his experiences were the least beneficial of all the treatments. Yin also pointed out the consequences of the over use of gypsum being ground water accession and leaching of nutrients and pollutants. Yin believes that the use of gypsum is only part of a total soil management package.

Bing So indicated that most sodicity problems are associated with a physical problem of the surface soil i.e. dispersion of unstable surface soils leading to a range of other physical problems such as reduced infiltration, surface waterlogging, surface crusting, hardsetting, compaction, excessive clodiness of the surface soil and increased erosion. These problems will be exacerbated by decreased organic matter associated with excessive cultivation. He questioned the distinction between sodic and non-sodic soils as problems associated with sodicity increase progressively as the Exchangeable Sodium Percentage (ESP) of the soil increases. In trials comparing surface application of gypsum and gypsum plus deep ripping on red brown earths with sodic subsoils, he found that approximately 80% of lucerne yield responses were due to surface application of gypsum, which also explains why on these soils deep ripping alone without surface stabilisation with gypsum would not give satisfactory results. Bing demonstrated the use of a cost-benefit analysis to determine the most economical rate of surface gypsum application which averaged 2.5 t/ha for wheat on Vertisols. It was also Bing's experience that one application of gypsum would last 3-4 years on the Vertisols in the Gwydir Valley, NSW and approximately 2 years on the Red Brown Earths in Victoria.

Aravind Surapaneni showed that long term saline irrigation by groundwater pumping will lead to soil sodification despite attainment of equilibrium soil salinity levels. Following

18 months of non saline irrigation, electrolyte concentration and sodium adsorption ratio reduced considerably. Even though topsoil sodicity is reduced, sodicity in the subsoil is maintained as before. Arivinda believes that this retained sodium in the subsoil, in combination with a reduction in electrical conductivity could produce a throttle to water transport. Subsoil sodification could be of potential threat to the long term sustainability of “conjunctive water use” in the Shepparton Irrigation Area.

Roger Shaw challenged the classification of sodic soils and believes that the processes involved need to be more fully understood. He believed that when assessing soils for sodicity potential we needed to understand the clay content, mineralogy, chemical properties and potential rainfall. This data can then be used to categorise sodicity better. There is also a need to identify if the problem is a soil surface or subsurface oriented. Surface sealing problems can be managed but subsurface soil problems are difficult and costly to manage.

Albert Rovira spoke more on sustainable farming systems as the future of Australian agriculture. The use of reduced tillage and the retention of organic matter has shown to be more beneficial than traditional farming practices. The application of gypsum alone provides only a temporary solution to sodicity in wheat growing soils of Victoria. Unless this is combined with minimum tillage and trash retention to improve structure and increase organic matter farmers have to repeatedly apply gypsum to the soil.

5.5 Pertinent issues

This session raised some very important issues for sodic soils research in the sugar industry.

1. Can we better classify sodic soils rather than relying on ESP. This may be extremely important for areas such as Proserpine.
2. We need to distinguish between surface sodicity and subsurface sodicity and appropriate management practices be identified.
3. What are the best amelioration products or combinations of products? How do they work and in which instances should they be used?
4. What role does organic matter play in the amelioration of sodic soils?
5. What is the threshold concentration required to obtain the electrolyte effect on different soil types? Are polymers also of use in surface soil stability?
6. Can irrigation management reduce soil sodicity and its adverse effects?
7. Can this information be drawn together into a package that would be useful to advisers and farmers operating with sodic soils?

5.6 Ranking of the BSES research and extension program on sodic soils

A situation statement collating the research conducted on sodic soils in the sugar industry was produced in an earlier milestone report.

Members of the workshop were asked to rank the BSES program on sodic soils in the sugar industry. A ranking sheet is attached as appendix 2. Rankings were obtained for identification of the problem, the technical aspects and quality of the work, the relevance of the work to the client base and the impact of the work on the client base. The responses

were separated into three groups being the invited visitors, BSES staff and other participants.

The results of this survey is presented in the table below with the data in the table being % response.

RATING OF BSES SODIC SOILS PROGRAM

From participants of the sodic soils workshop 1996.

PROBLEM IDENTIFICATION (% response)

RATING	HIGH			LOW	
	1	2	3	4	5
BSES STAFF	29	71	-	-	-
VISITORS	33	45	11	11	-
OTHER	63	25	-	12	-
COMBINED	42	46	4	8	

88 % of participants had rated the BSES problem identification for sodic soils as high. There were very few participants who ranked the identification of the problem as low. From this it can be deduced that BSES has a good understanding of the problems associated with farming sodic soils in the sugar industry.

TECHNICAL ASPECTS (% response)

RATING	HIGH			LOW	
	1	2	3	4	5
BSES STAFF	-	43	57	-	-
VISITORS	11	45	33	-	11
OTHER	12	38	38	12	-
COMBINED	8	42	42	4	4

The technical aspects of the BSES program were rate high by 50 % of the participants with only 8 % giving a rating of 1. 42 % rated the program as moderate with only 8 % rating it low. It is interesting that the BSES staff rated the technical aspects of the program lower than the other two groups. These results most likely reflect that most of the research was production oriented rather than understanding the mechanisms and processes. However the resources allocated to the program only made it possible for the work to be production driven.

RELEVANCE OF THE WORK (% response)

RATING	HIGH			LOW	
	1	2	3	4	5
BSES STAFF	57	29	14	-	-
VISITORS	56	33	11	-	-
OTHER	12	50	38	-	-
COMBINED	42	38	20	-	-

80 % of the workshop participants believed that the work was highly relevant and was addressing the major issues. There was no one who thought that the relevance of the work was low.

IMPACT ON FARM (% response)

RATING	HIGH			LOW	
	1	2	3	4	5
BSES STAFF	29	14	43	14	-
VISITORS	33	56	11	-	-
OTHER	38	12	38	12	-
COMBINED	33	29	29	9	-

62% of the group thought that the sodic soils program had a positive impact on the districts' farms. 9% believed that there was a low impact on the farm with 29% only ranking moderate impact. The BSES staff ranked lower in this aspect of the work with 43% indicating a moderate impact on farm.

Generally the BSES program on sodic soils has been highly ranked by the participants at the workshop. The most favourable rankings were for problem identification and relevance of the work. Although impact on the farm was ranked high by 62% of the participants there were 29% with a moderate ranking. The technical aspects of the work were rated high by only 50% with 42% ranking moderately the quality of the work. This indicates that future work should be have a good mechanism based understanding and not only be production oriented. This may also increase the impact on the farm as understanding the processes can help refine advice given.

5.7 Future directions workshop

Method

For the workshop on future directions held on Thursday the participants were split into three groups. The groups were heterogenous rather than homogeneous. It was felt that heterogeneous groups allowed a flow of information across disciplines and interests and that invited guests would have the added benefits of local experience. The groupings are presented in appendix 3.

Each of the groups were facilitated by an extension officer experienced in group techniques. In each group the issues requiring further research were listed by the group. After these issues were listed by the groups they were then ranked by the group using a pinboard technique where every participant has 5 votes to distribute as they see fit. Each of the smaller groups then reported back to the larger group and the rankings were then combined. For the top three issues a working party was then established to develop an action plan for these priority issues.

Issue/topic identification

All of the issues and notes from each discussion group are given in appendix 4. However a summary of the issues and rankings are given in the table below.

Group 1 issues and rankings

<i>Issue/topic</i>	<i>Votes obtained</i>	<i>Ranking</i>
Subsoil porosity	10	1
Gypsum	8	2
Organic matter	8	2
Water Management	6	4
Long term sustainability	6	4
Co-ordinated approach	3	6
Consistency in testing	2	7
Varieties	1	8
Detailed resource mapping	1	8

Group 2 Issues and Rankings

<i>Issue/Topic</i>	<i>Votes</i>	<i>Ranking</i>
What is the role for organic matter	8	1
Response and use of lime and Gypsum- understanding mechanisms	6	2
Irrigation management and water supply to crop	5	3
Assessment of sodicity to allow problem identification-definition of sodic soils, tolerance limits of sodium	4	4
Use of saline irrigation water or conjunctive use, long term effects, mechanisms and reclamation	3	5
Alternative land use and farming systems-: is cane the appropriate crop? rice/cane, trees/cane saturated culture?	3	5
Adequate rooting depth	2	7
Collate information and understand processes	2	7
Economic evaluation	2	7

Group 3 issues and rankings

<i>Issues/topics</i>	<i>Votes</i>	<i>Ranking</i>
Lime gypsum and other amendments	10	1
Improved irrigation efficiency	8	2
Organic Matter and trash blanketing	7	3
Changes in soil properties with time/ monitoring	5	4
Studying water storage/ripping needs as a function of subsoil compaction	5	4
Water Quality	5	4
Long term environmental effects	5	4
More detailed land evaluation	3	8
Holistic approach	1	9

There was agreement across the groups on the issues to be addressed. When combining the rankings, four main topic areas of future research were identified:

Lime/gypsum/soil products - more understanding of the processes

The role of organic matter in ameliorating sodic soils

Water management for sodic soils

Macroporosity.

Participants then broke into interest groups for the three main topic areas to develop an action plan for future work.

5.8 Action Plans

Lime/Gypsum action plan

1 Define the problem.

- What problem do we want to solve?
 1. Surface infiltration?
 2. Subsurface hydraulic conductivity?
 3. Calcium replacement?

2 Assessment of the problem and its solution.

- Soil tests
 - chemical (including water)
 - physical
- Which product will work and why?
- How do we apply it and at what rate?
- How long will it have a beneficial effect?

3 Apply the solution and monitor its success.

All this comes down to the identification of tests that have a solid basis and are robust.

Research Issues

1. The need to identify the relationship between available tests so that a tool kit can be developed to give reliable information to growers.
2. Why are remedial effects transitory?
3. Is gypsum use more or less cost effective than conjunctive water use if the aim is to achieve a certain electrolyte concentration.

Water management action plan

- The long term effects of gypsum. Water management and interpretation of water availability was seen as a generic issue to realising and explaining response of sodicity management.
- What tools are available to the soil water situation.

- The problem needs definition-is it a sodic top-soil restricting water intake and water availability or a sodic subsoil restricting the root zone and therefore water storage. Different approaches needed.
- Water management must be fine tuned in relation to amelioration technique and depth of amelioration. Time frame of amelioration responses must be described and beware of interactions e.g.
 - Effects of water quality on infiltration via ESP, furrow shape, furrow length and furrow volume.
 - Effects of GCTB on water advance and infiltration and different furrow slopes may be relevant.
 - Is there a role for trickle irrigation?
 - How long will trickle systems be effective in turbid waters?
- Need to be aware of the time factor in the improvements in soil properties.
- There are social and political issues associated with water management.
 - Concern that 8 ML is not sufficient allocation for frequent smaller applications.
 - Smaller more frequent applications has implications for infrastructure, labour costs and lifestyle.

Parameters for minimum data set at amelioration/water management sites.

- Soil profile data
 1. pH, EC, ESP, texture x depth, infiltration rate x water quality x depth x measurement technique.
 2. Hydraulic conductivity x depth x water quality.
- Root depth
- Quantitative water extraction and success of treatment in meeting soil water deficits.
- Time frame effects of treatments.
- Opportunity for modelling to integrate the complexity of effects across situations.
- Plant response as elongation rate, dry matter accumulation, commercial yield.
- Irrigation efficiency.

Organic matter action plan

1. Sugar cane crop and its residues

- Understand the mechanisms involved in amelioration with organic matter.
- Audit existing information or long term GCTB sites.
- Monitoring plant material decomposition and identify what is getting into the soil and effects. Processes and rates.
- Removal of organic matter, compost and return to the soil.
- Trash management, incorporation- mechanical or biological.

2. Fallow management

- Audit existing information
- Identify suitable crops for fallow management.
- Determine the efficiencies and effects of different residues.
- The effects of incorporation of organic matter.
- Application of Mud/Ash combinations and their effect on sodic soils.

3. Subsoil amelioration with organic matter

- It was felt that this was a real long shot and should assume least priority.
- Can organic matter incorporation influence subsoil properties.

4. Other issues

- Any research on organic matter should include the CRC for Soil and Land Management and the CRC for Sugar.
- An organic matter expert should be identified and used.
- Links should be made with the CRC for legumes.
- Existing long term trial sites such as yield decline and GCTB sites should be used.

Macroporosity

Although this subject was not treated as a working group a general discussion was held and notes on the discussion are reported.

Macroporosity is influenced by the packing of the clay particles in the subsoils. Is sodicity the cause? Roger Shaw believes not, but it is an effect of the clay particles. It was felt that advice on macroporosity was missing in the BSES advice to farmers. Deep ripping appears not to do the job. Will deep ripping and the electrolyte effect have positive impact? If considering deep ripping then perhaps a civil engineer should be consulted to obtain advice on the best way to disturb soil and how to stabilise the effect. It was felt that if irrigating with gypsum the electrolyte effect may stabilise the disturbance in the subsoil and have a synergistic effect.

It was also felt that the subsurface cannot be separated from the surface conditions. Much of the literature shows that there has been no effect of ripping. The question to be answered is, that after ripping, is the surface soil stable, and if not then macropores are of no use.

There was also a suggestion that biological tillage may also be useful if the break crops are grown to dry out the soil and cause macro pores.

6.0 CONCLUSION AND RECOMMENDATIONS

Through an expert review of research and current practices for farming sodic soils this project has identified directions for future research and extension efforts on the subject.

There was agreement across all groups at the review on the issues to be addressed. The four main topic areas of future research identified were:

Lime/gypsum/soil products - more understanding of the processes for amelioration
The role of organic matter in ameliorating sodic soils
Water management for sodic soils
Macroporosity.

These research topic areas do not differ greatly from the future research issues identified at the client focus group.

Participants at the workshop then broke into interest groups for the main topic areas to develop an action plan for future work. These action plans are presented in the preceding section of the report and are now being used as a base for any future work on sodic soils

Appendix 1

Participants at the workshop

- 1) an international visitor - Professor Isaac Shainberg , The Volcani Institute, Bet Dagan, Israel,
- 2) seven scientists working in the field of sodic soils from various states of Australia
 - Professor Jim Quirk, University of Western Australia
 - Dr Pichu Rengasamy, CRC for Soil and Land Management in Adelaide
 - Dr Yin Chan, Chemical and Biological Research Institute, Rydalmere, NSW
 - Professor Hwat Bing So, Department of Agriculture, University of Queensland
 - Dr Aravind Surapaneni, Institute for Sustainable Irrigated Agriculture, Tatura, Victoria
 - Dr Roger Shaw, Natural Resources Institute, DPI, Brisbane
 - Dr Albert Rovira, private consultant and former Director of the CRC for Soil and Land Management, Adelaide.
- 3) a post-graduate student from the University of Queensland , Mr Andrew Grabski
- 4) ten BSES staff -:
 - Dr Graham Kingston Bundaberg
 - Mr Les Chapman, Mackay
 - Mr Peter Larsen, Mackay
 - Mr John Reghenzani, Tully
 - Mr Neil Judd, Proserpine
 - Mr Drewe Burgess, Meringa
 - Mr David Eksteen, Burdekin
 - Mr Gary Ham, Burdekin
 - Mr Andrew Cox, Burdekin
 - Mr Gavin McMahon, Burdekin/Brisbane
- 5) two DPI staff
 - Mr Peter Elliot, Burdekin
 - Mr Steve Ockerby, Mareeba
- 6) one CSIRO Townsville scientist - : Dr Rob Bramley
- 7) two Burdekin Growers
 - Mr Primo Pilla
 - Mr Sergio Sartori
 - Mr Vince Sorbello
- 8) the proprietor of the Burdekin Lime Company -: Mr Terry Morato
- 9) the executive officer from the Burdekin canegrowers -: Mr Tod Lees.

Appendix 2
Ranking sheet

Name: _____

Organisation: _____

Rate Work To Date

	High				Low
	1	2	3	4	5
Problem identification					
Technical aspects					
Relevance of the work					
Impact on farm					

Appendix 3
Workshop groupings

Group 1	Group 2	Group 3
S Sartori	V Sorbello	P Pilla
J Quirk	I Shainberg	B So
R Shaw	Y Chan	P Rengasamy
A Grabski	A Rovira	G Kingston
P Larsen	L Chapman	S Ockerby
J Reghenzani	R Bramley	P Elliot
D Coutts	D Burgess	G McMahon
A Cox	G Ham	A Surapaneni
T Lees	D Eksteen	
	T Morato	

Appendix 4**Identification and Priority of Issues*****Group 1*****Soil management**

- Lime/gypsum and other amendments.
 1. Rate of products
 2. Surface or subsurface application
- Organic matter and trash blanketing.
- Changes with soil properties with time/monitoring.
- Studying water storage/ripping needs as a function of subsoil compaction/ ESP.

Water management

- Improve irrigation efficiency.
- Water quality.
- Long term environmental effects.
- How to apply the water -slope/rate of application/shape of furrow/furrow length/time of application/use of surge irrigation/final infiltration rates.

Others

- More detailed land evaluation-region-farm.
- Holistic approach.
- More and better extension.
- Plant breeding.
- Crop rotation.

Group 2**Water management.**

- Efficiency of application.
- Rooting depth
- Increasing infiltration-polymers
- Better irrigation methods e.g. trickle.
- Conjunctive use of waters.

Subsoil

- Is the type of ripping and advice appropriate
- Mole/slotting
- Macro and micro fauna
- Infiltration, plant water storage, rooting depth.

Organic matter

- Trash blanketing, over time
- Incorporation
- Advice and experience.

Gypsum

- Gypsum and lime
- Dissolved versus spread
- Quantitative relationships
- Burdekin versus other areas
- Guidelines on the electrolyte effect.

Consistency of soil testing

- Objective site assessment
- Soil, water analysis
- Is ESP the correct measure?

Detailed resource mapping

Varieties-Tolerance

Sustainability

- long term effect on the water table.

Coordinated approach- more holistic to total management.

Group 3

Issue	Votes	Rank	Topic Detail
1	5	3	<ul style="list-style-type: none"> Water supply to the crop (how well does management meet soil water deficits); Irrigation management (how can management/technique be improved to allow full realisation of the amelioration).
2	2	7	<ul style="list-style-type: none"> What should we aim at in terms of an adequate root zone x conditions; What techniques will increase root zone depth (ameliorants, deep ripping, mixing of non sodic subsoil into the A horizon ?)
3	6	2	<ul style="list-style-type: none"> What are the mechanisms which explain / control response to lime and/or gypsum (ESP, EC, pH, texture, lowest limiting water range.) Improving efficiency of amelioration through better placement and timing of application in relation to the problem.
4	4	4	<ul style="list-style-type: none"> Assessment of sodicity to allow problem definition, factors effecting response and lead to recommendations (ESP, EC, pH, variable clay charge in acid soils); From above what is the definition of a sodic soil. What are the tolerable limits of sodicity; when does amelioration go into a maintenance strategy and what is maintenance.
5	1	11	<ul style="list-style-type: none"> What is the most limiting factor ? (sodic topsoil or sodic subsoil); this will affect management approach.
6	2	7	<ul style="list-style-type: none"> Results from research and recommendations do not have consistent expression at the farm level; Why ? Incomplete understanding of response mechanisms, other limiting factors, management of recommendation. Need to collate information on sodicity onto kits for advisers and farmers.
7	8	1	<ul style="list-style-type: none"> What is the role of organic matter from GCTB or other sources alone or in combination with other ameliorants. Is there benefits in enhancing the rates of trash decomposition ?; Organic matter utility on acidic and alkaline soils ?
8	2	7	<ul style="list-style-type: none"> What are the long term effects of management to improve sodic soils (effects in the profile and off-site effects from higher leaching areas and export of sodium.) At what rate do soils with marginal levels of sodicity deteriorate and how is this measured ?
9	1	11	<ul style="list-style-type: none"> Is there a role for soil conditioners such as poly acrylamides (PAM).
10	3	5	<ul style="list-style-type: none"> A better understanding or exposition of existing knowledge needed of role for conjunctive use of saline water to manage sodicity. What are the long term effects on ESP of higher salt irrigation waters in different soils and climate situations ?
11	0	-	<ul style="list-style-type: none"> Impact of sodicity on stability of irrigation channels ?
12	0	-	<ul style="list-style-type: none"> What is the impact of turbid irrigation waters on soil hydraulic properties.
13	0	-	<ul style="list-style-type: none"> Impact of sodicity and its management on sugar quality (ash and ccs.)
14	0	-	<ul style="list-style-type: none"> Does cane uptake sodium and can this be enhanced by breeding or genetic engineering ?
15	0	-	<ul style="list-style-type: none"> Are there genotype x water use efficiency interactions which could be exploited to give varieties which produce more cane for less water in the root zone of sodic subsoils ?
16	3	5	<ul style="list-style-type: none"> What are the land use alternatives, other than cane, for sodic soils (trees or other crops). Is exclusion from development an option. Are there non conventional approaches which could be applied to grow cane in sodic soils (bedded culture, saturated systems, intercrops).
17	1	11	<ul style="list-style-type: none"> Are there interactions between sodium and other nutrients.
18	2	7	<ul style="list-style-type: none"> All management options from research need economic evaluation for the projected life of benefit. Risk analysis is needed to quantify size and frequency of response in economic terms.

APPENDIX 5**FOCUS GROUP FOR SODIC SOILS****(Held on Wednesday 22/11/95)**

Well, we might kick off gentlemen. There still are a few to come but if they come they can come in late rather than tie you all up for the day. First of all I would like to thank you all for coming along. Basically what we are trying to do today is to, we've come to a stage in our research on sodic soils where we don't really know where to go from here on. If we actually go anywhere, at all. Whether people are happy with what's being done today. So what I have tried to do is get a collection of people from the industry, people that actually farm it, people that farm sodic soils, people that are involved as distributors with them and a few from outside. Just to get your ideas and opinions on farming sodic soils.

I've got Shane up, Shane will actually run the group today. Shane is from Mackay and I've just asked that if Bryce could take some notes from the meeting. Basically it's not a discussion from us to try and inform you of what's happening. What we are trying to do is get a collective opinion out of the room here as to what you think on farming sodic soils. Whether you think what you're doing is satisfactory. What happens in the longer term if the price of products go up, or if the sugar price comes down, we're still sustainable. Have we been too harsh on sodic soils in there of what we think we can grow on them. And so, and at the end, what I hope to get out of this is a picture of what sort of research needs to be done from this station so we can set up a plan as to what's the next step for BSES in research on sodic soils. Do we do any more? Do we stop there? What's sort of direction do we need to take? And hopefully that's what will come out of it. Shane will run you through it through the day and we should take about an hour and a half. I won't be here because I don't want to influence what anybody says. Feel free to say what you like. And if you want to get up BSES that's fine. I've got no drama about that. And if you don't I would be a bit disappointed that obviously people aren't truthful. But one thing I would like to do is just record it. If anybody has any troubles with that, I would like to say that what I will do is go through the notes when you're finished and I can actually read the whole days events and just pick out and highlight the points and items of interest.

Come in Terry. Grab a chair. Up the front because you are late. So I just want to record it so that I can have some transcripts later on that I can go through and do it. Like I said the outcome, what I want to come out of this meeting is where we actually go to from here as, for BSES as a research team. Without that, I will leave you in Shane's hands. When we are finished, if anybody is interested we sort of documented all the work that has been done on sodic soils and we have actually put it in a document if anybody is interested, I can get a copy of that sent to you if you like. You can just have a squiz through it. But I don't want to influence anybody's discussion by presenting anything here from BSES's point of view. So I will hand over to you Shane. If we go to about half past eleven I have got some lunch organised so that people can stop and have a sandwich and have a bit of a chat after they have finished. Thanks very much for turning up.

Well the first thing I would like to ask you to do gentlemen is if you would just write your first name on these and pass it around. Basically label yourself for me it just makes life a hell of a lot easier for me. As Gavin has just indicated here why we are all here is just to run through the process and what we will try and do is to basically go to your experiences and understanding of sodic soils in the area. Bryce is going to act as a bit of a belt suspenders for the tape recorder, he is actually going to take some notes here as well. Just to make sure that you record as discussed properly. There is a couple of very basic ground rules that I would like to part here with you and that is that all opinion is valid. We're not after a process of developing consensus here. If you have an opinion that differs from what other people have offered. Please put it in. We are not conducting this to derive some sort of consensus approach to sodic soils. What we are interested

in is to gather everybody's experience and attitudes to sodic soils in the area. The other thing I would like you to do is give everyone a chance to speak. Basically we can only have one person speaking at a time as that is what we are really talking about there.

So just to kick that off, I would really just like to clarify if anyone has got any questions in regard to what we are trying to do in regard to what the objectives of the day are. Gavin has run through them there. If anyone has any queries I'll just like to commence by asking you, basically your general thoughts on sodic soils in the area. And how you treat your sodic soils, how the growers in the region treat your sodic soils differently on their farm.

I've made a whole list of what ways to handle sodic soils but if you don't mind I'll stick them up on the board and people can look at them and discuss what they have used and what their results have been. There's about twenty. Twenty, yeah okay. And I'll also say that after my experiences with sodic soils I wouldn't mind in some ways if I had a whole farm that was sodic. So you are basically saying that you have had some good results. I've had some, and I have seen some people have some spectacular results. Right. Phil, if that's what you would like to do, yeah. Well you can talk while I put it on the wall. Yeah, I was just going to suggest that. Sure. All we need now is. Okay, we're in business.

Yeah. Anyway, while Phil's doing that, I will just say I would like to hear other peoples thoughts on it. What they have experienced on their farms, how they have treated their sodic soils different on their farms, as to their other soils. Yeah, well what I've found on our sodic soils is you know we are trying to work them deep and we think that the water is starting to leech it out, and the sodic is coming good on the influence, but the sodic soils end up growing real good crops. After your first crop cycle your second crop cycle is going to be good. Your first one is not too good. What we have found is if we levelled it and planted straight away we don't get a very good result. But if we can level it and rip it up and let it go through a wet season and then plant it we get a hell of a lot better results. But I'm quite happy with the sodic soils. They are going to be a lot easier to work they work beautiful when they have got a bit of moisture and that there. Clive you mentioned one thing you say working it deep. How deep do you work it? Ah, we get down about eighteen inches. This is before we plant and then in the ratoons we put a deep set of tynes right down the middle too. Then we put our fertiliser on and that. You can work it up deep before you plant, and let a wet season get on it seems to improve it.

Can I just add a different slant if I could, I'm from the designing group here with the Water Resources so we are doing the subdivisions of the new farms and the soil surveys obviously have shown a lot of sodic soils and in our development of those, a lot of those soils have been down graded to a class four which is excluded from farm areas on the basis of sodicity. And I would be interested to know if anything will come from what Clive just said that, is that a valid reason to be downgrading soils and excluding them from the development area. Just purely on sodicity. Is it something that we have been, you know I'm just making a question here. Are we being too short sighted that whilst it's now in current technology and current practices, you know our farm inspection committee is saying no we should exclude all those soils from out of our, you know the one with two A's and two B's soil groups. Exclude them from any farm areas on the basis of sodicity? Is that being too short sighted and in the long term that actually will be good productive soils? It's early stages yet, I think you have got to be a bit careful. I wouldn't be re-classifying yet the areas that has problems with them and Bob's area might be a bit different to some of those other areas. It's just we are moving into an area of land with severely sodic soil. To retain those soils there is the added expense of applying the gypsum and working etc. and the year off. So it's something that got pointed out but I don't think you would want to replace a farm without having that proviso that extra work has to be done. Does it have to depend on the severity? The severity too. It's fundamental. Yeah. The big problem you have is the barmix land form design for a start. I mean what happens is if it looks like these fellows are very apt at levelling, I mean they have been levelling for years. And when they, when William's do it they do it properly and a lot of people would say, I think Dal Santo's they're the inexperienced there avenue where you have actually levelled one paddock through and then stripped one and there is just. Took a bit too much off the bottom of one, yeah. And the thing is that, farm practice is number one and number two is sub soil depending on what's underneath it.

On the Home Hill side of the river you don't have water table problems and you don't have, there's a completely different sub soil structure as well. So you know I think you are on the right track by keeping it

at a low classification because there will be varying results from everybody here on sodic soils. On what results they get from them.

Yeah well we might come back and, leave that to the end. That's an important question. It actually leads us into an acute part of what we are discussing here and how we treat our sodic soils differently on the farm. But basically what we want to hear about is how are they farmed profitably? Well I've seen that it works and you're not just ripping it way down, you went down a fair way, with a knife? Yeah, when we ripped it. Yeah. And it came up as lumpy as can be but then you try to do it before the rainy season. Don't you? Yeah. So it kind of breaks down a bit. Yeah. As far as I can see you grew some beautiful cane. Yeah, ah yeah. It was hard to say that. Who has like I do, say if you can very heavy clays in the same plane. Well I think most paddocks are all varied. Yeah. They're all mingled. Well what I'll say about sodics is that if you have to work them you would far rather work those sodic soils than the clays. I mean you can usually get onto them and throw, what are they, those dirty clays or what they call Saturday afternoon or Sunday soils. If you go on them one day they are all cheesy and if you leave it go to two or three days they have gone like concrete. But, no as Clive said there has been a few people who have gone and knifed and ripped into these and also, that's fairly hard to read, you have incorporated trash into those soils too, don't you Clive? I was quite surprised after growing cane in some severely sodic soil for three, four years that when I actually came to plough it out, it didn't look like the soil it was three or four years ago. I mean three or four years ago it was pieces of white and orange and yellow and lots of gear and now it has kind of formed more structures and a lot more colour. Okay, thanks for putting these up.

Well these are the key things that you have seen as being things to influence better management of sodic soils. Is there anyone want to open any reports there. I mean obviously this is critical in regard to the area of constraints you are operating under. As soon as you have your farm you should design it to take into account the sodic soil. Clive would you agree that trying to keep the fall very slight on your sodic soils? Yes. Yeah, okay. Does anyone else want to add to that? Did anyone like to comment on any of these points as we work through them. Angelo you, Right. What are your slopes? About an eighth of an inch to the chain. So the problem is that, quite a few of the. I'm with the old school. Yeah the problem is that quite a few of the sodic soils is they do have a fair amount of slope. The main thing is, if you can, don't laser them. Okay, if you can. If you can't, try and laser the least from the measure you are able to. Can you just expand on that for us Phil what you rationalise with might not lasering. We'll you've probably got about that much top soil on if your lucky and if you take off that. Is there much stripping of top soil with lasering? Have you approached your lasering in any form by stripping certain areas of top soil, you mean your cuts have got to be the greatest? Is that what you're trying to tell us in practice here? I've seen it done, but in my case when I came here and bought a farm I had a very small amount of money to spend. And on most of my farm because the sodics did have a fair formal to them, we didn't have to laser them at all. We just left them just as they were.

These things run into two different sorts of problems. I have got a farm where my water supply is here, the rows run like that, okay and my sodic soils up here, okay, so I run my rows and this was the fall I had on the farm. We didn't need to do a great deal of lasering, so it seemed to be a good idea to run the rows from the sodic down into the clays and into the drain on the rational that the water takes about twenty four hours to come through. So you've got twenty four hours water constantly coming through here before you are even going to turn it off. That is a good idea except for the fact that now I'm into fourth ratoon. The cane up here is absolutely hopeless. And yet the cane in the clays is great. I mean it's as good as it was as plant cane. So you've got to balance the idea of doing it like that and putting up with some shocking grass and best of cane up year, while you keep ratooning your good clay as against segregating your soil which would have meant it's an old trend like that. Yeah. And then you could probably ratoon your clays out five ratoons or so that your sodics probably just go plant those ratoons the first time round and plough it all up and work in trash and try it again. So what you're saying is that basically there is an economic side of that too in regard to realising that. In a low price year you might even follow or take that attitude.

Does anyone else want to comment on that? Basically in regard to farming by other means to get segregation of sodic soils out? The only thing we did that tastes like that, we just put gypsum on the top and condition it up to the standard of the bottom and it comes just as good. Sometimes treatment becomes a problem because you can't, you've also get water logging. It's different to work in the paddock you put,

what Phil's saying is right. If you had to run the drills that way you can easily segregate out your soil types. I mean it makes a lot of sense. I mean you water one twice as much to the other. Yeah. The other advantage of going that way where your sodics here and your clays here is you can wash the sodic soils. Like you might be watering all the way through to every fourteen days well, what you can do is every seven days you can just water here. Do people flush? Yeah. It is quite useful in that you don't lose water at all. For the water goes somewhere but you're trying to put an extra watering into your sodic part. Variety of cane, have you all struck a 117's practically hopeless in sodics?

Before we go on with that, I just again ask if anyone has trouble checking their PH level? Like Terry did. Have you got any experiences in regard to the way you test. It's still a bit moist, the whole farm. Right. So you don't have much of an option to see if you. What you are talking about here is frightening. Similarly in Proserpine when we had 10,000 hectares we had entire farms of moderate sodicity. But it's different, Proserpine. We had much of it as an asset in sub soil. Here in the Burdekin most of it is alkaline. So the gypsum versus lime story becomes important to us in Proserpine. Graeme you've got to comment, it seems your whole farms, ah, except you've got sodic. Certainly in regard to minimum fall. What are your thoughts on that? Yeah, I agree. At the moment. I've got to harvest it either way. In one way we'll get one in five hundred or well get, you know a cross in one in seven fifty is the best I could get. And also down the bottom we lasered in six different ways so as not to touch as minimal amount of top soil as possible. Yeah. And I also agree with your deep ripping we cut above, deeper than normal and left the width in. That seems to work quite good. Yeah. Graeme how deeps that for you. Forget what it was, two foot six cut available. Still cut above nearly two foot. Yeah you can get down two foot. You come through with a great big fourteen in some places. I forget what we put it down a little bit further than we always do. Normally do. Now it's very important when you do that, that you do it when it's dry, because you won't shadow it. You do that in sodic soil when you have got any moisture it doesn't shadow it, it just means that. Laser levelled. And ripped up. Severely ripped it up, didn't use crumble bars. The good thing with the gypsum seems to be it makes the badder soils better. It must have an effect to the good part of the soil too, it seems to even the whole farm out. The biggest improvement is on the lighter soil. Yeah.

Just before we go on with gypsum. Okay. Just this kind of variation in cane varieties, can I just tap in there for a while, yeah sure. Ken you were just about to say something. You can. Yeah, no, I'm on a sodic soil, I'm not irrigating a farm on sodic soils, I'm supplying. That's gypsum and stuff. I'm not here for the sodic soil. Obviously you've seen a lot of sodic country around. Yeah. What about your experiences you've seen, what about growers and managing it. Yeah well just basically what everyone thinks and what everyone has been doing. The one question I've got to ask is there is only Williams that have really been farming for any length of time on the sodic soils. Well the life that you get out of gypsum on these soils is by far. My experiences when we were doing gypsum applications when I was at college you were about two or three years and you had to do a re-treatment so is that still, that's the same? Even repeating it, down the track. Time will tell to see whether the new soda that comes up and goes back to original, yeah, but so far it's still all right. You know the top becomes beautiful and pliable, that's the main thing. When you cultivate you haven't got bloody cheese through there, you know it rakes up pretty good. But it all will tell whether it will come back up. The longer you use the gypsum back to fairly low rates now. Yeah. Yeah their back. They are a bit more than five tonne applications and now they're back to one and two. This is tied up on the next plant. Well Rapisarda's would be the longest user, and he is back to a tonne and two tonne after four years. That seems to be holding the crops pretty well.

So, are you right Phil, you were talking about varieties. Some people find that it's nearly impossible to grow 117 on sodic soils. I mean someone growing it and producing reasonable crops. Your order is pretty right there. Yeah, 133, 124. From what I've seen, on severely sodic soils you can get about ten tonnes an acre off 117 maybe. On exactly the same sodic soils you will get thirty five tonne plus off in one go. No matter what you do there seems to be a tremendous difference in the varieties of cane. And you will make a heck of a lot more dough from that adding unit less sugar than you will from over there. All right, so you're saying 134, 125, 96 down to 117. Has anyone else seen that what Angelo said? Well what are you growing over there Col. I'm growing all of them. All of them on different soils. Yeah. What are you growing on your worst soil? Ah 133 and 124. What's in the area Col? Yeah, 124 around Giru on the sodic soils in around there. You know around what do you call it Trembath Road or whatever, that grows really a lot better than 133. But 117, as you go up the Haughton Road, it grows all right in the sodic soils there. It just depends on, but they only get, you don't get, 124 you get two returns at least. But the rest of them fall away

pretty quickly. If you've got 117 you're right. Dies after three. Second ratoon then it dies. Yeah. I think 124 is the best. Yeah. Because you getting the best of both worlds. You are getting the tonnage and you get better CCS than the 133 and we've gone to that.

Graeme, you said your soil is all sodic are you going for one variety more than some? No, I've got the whole lot. Yeah. My 117 is going all right. Right. Also the added tonnage also grew, the pest control board came up there to so you've got every variety in the wrong place. Yeah. And that was one of the worst sort of sodic soils. But also gypsum, back before we started. The 117 which everybody said the sodic soils would hold a bit more, did all right. The main part of those 96, 117, 134, 124 at least done eighty five tonne to the acre. And the 96 and 117 did seventy two and a half. Have you got any thoughts Graeme why you are getting good results from 117? Just say so other people know. Yeah. Well you go deep down so you get that sodic sub soils. But what about what the soil tests said. They're quite the opposite. The bottom part was deep in soil. The top part of the farm. Anyhow. You had cut above your soil and gypsumed it though. No, I cut above the soil and I dissolvinated it. Yeah. Okay. Well I gypsumed the top part of the farm because it was the worst hurting part. Right. I put four tonnes to the acre on there. That was the part when the pest control board came. The rest I used dissolvinator.

Did you notice the difference in your CCS in your cane where you used the dissolvinator to where you put the straight four tonne to the acre on. The only reason that is because that little plant cane is 1000 tonne plants. The rest we just took off. Yeah. You don't know what went, not went but it's not a fair test for the simple reason that we did less sitting there. Till we got to it. It ran just slightly above the mill. But it wasn't, the rest of the farm went above the mill also. The rest of the farm went better. The result, was about half a point unit above the mill all the time. And the other one, the last one we cut was fifteen in one, and the mill was only fourteen nine. It's not a very good test. Because. No, the reason I was asking that is because I have had several farmers contact me they are having problems with..... (END OF TAPE ONE, SIDE A).

Yeah, dissolvinators are a pain in the bum to say the least. The biggest problems with dissolvinators I've found is that gypsum just doesn't come, you need a lot of gypsum that's got everything in it plus gypsum. You do. This is chemical gypsum. Yeah. I don't think we use natural gypsum at all. No, not as good. You can get all types now. What happens is that it depends on the product that's there at the moment. Yeah, well we'll be able to get it down to 200 microns fairly shortly. So you will be able to. That problem is a problem with dissolvinator because that just wears out pumps, bloody turbo's and the works. But now they have developed with the mixing bowl which is three stage mixing bowl, and that does work. It works really good. Now the next stage that needs development on as I see it, the weak link in dissolvinator is using a sprinkler in the heat. Because I reckon you need a dissolvinator to go at least 12 hours without having to go and change the sprinkler and check on some. And under present situations, you can't do that. I mean when I go to, I live ten kilometres from the farm when I go home at night and let it go all night I know I'll come back next morning and it ran out of gypsum because the sprinkler didn't shift. And it doesn't really worry me that much because I work on a random pattern and I get my Mrs. out this watering and hopefully it will get picked up next watering. There's a way to fix that Graeme I'll show you one that works. I use a spray bar that sits across the top and sprays. The one I've seen and been looking at is the one that lays at the bottom of the pit, half round and cut out of the side and it just sprays out from that. And the whole picture is falling down and the further you tighten it up the bigger the pressure you put into it. So in your situation the dissolvinator works good because you get a positive soil type but there is a lot of people who have used them and had very little success. Because they had fall problem where they had lasered the paddock and the sodic has dripped on and angle across or there is a piece in the middle of the paddock. And what happens is you try to put a lot of gypsum on that piece and not much on other pieces. And you can't do it at all. It's very difficult with dissolvinator.

I think that one point that should be made though is that dissolvinator gypsum works on any soil. Ah yeah, without a doubt. So it's not a waste. No. You put it on good clay soils and you get a better crop every year. But see where the people make a mistake, like if you look at the people who have had the most success on sodic soils, they are the people who start with the money, they put the money in they rip it, they gypsum it, they do everything before they start. I mean when you started you gypsumed the worse piece of it, you did it properly. Where the people run into trouble with gypsum is if they try and fix the problem afterwards. Phil is the same. When Phil started we, Phil's was done initially before we started. So what

happens is the paddock was level and it was all done properly. No, mine, I, It was two years on my farm was done very, very cheaply. Even the whole farm was lasered. We barely had enough loose dirt to actually cover the cane. About a third of the cane was laying on the surface of the ground. It was just lucky that we got some showers of rain at times and it struck. That's right. It was too. Yeah. I only started to use gypsum after a couple of years. And I still don't use a lot of it. And I question whether, and I don't know. Clive used dissolvinator, Graeme used the dissolvinator, who else uses the dissolvinator here? I just question whether the capital cost of them and the running of them and the general to me they seem to be a pain in the bum. Yeah. If that's still advantageous to just go in and laying a couple of tonnes to the acre on in the first place. Clive do you think your dissolvinator is doing the job yet? You're probably better off, if you've got the money just to spread it. Then you haven't got to worry about keeping the dissolvinator going. You have to go and check them all day long. And their about seven grand aren't they by the time you put. Although you did yours cheaper. Yeah. Is that what you're saying? Ah seven thousand is the price I know some people, by the time they made their storage container for the gypsum. It's a bit like motor cars, it's a big range. Yeah. How about you Graeme, would you in hindsight you could have sort of put the gypsum over your whole farm. But you have still gone to the dissolvent? Not with the dissolvinator, I couldn't afford to do that. Yeah. You saw it as a cheaper option. Yeah. When you have still got the same amount of gypsum on you are not saving, but you haven't got the big capital cost up front. Especially trying to do a farm. I mean you. I know.

I thought when I bought my farm, I thought it was a bit unreasonable but one of the conditions of purchase was you had to spend sixty thousand on improvements in the first year. I mean I come up from New South Wales and knew nothing about cane. I think sixty thousand went in about the first three waterings. I mean it was the hundred odd thousand after that which. Yeah I mean I think myself this using any knife and spread gypsum then you can afford to that is if you have got that dough coming from somewhere else in the first place. It's, you can grow cane. Every soil, you know like your on one side of the river and this side of the river is different too. You know where the application rate can vary and get different response. Yeah. We did trials at Rapisarda's from one tonne to twenty five tonne to the acre. Yeah. Right through. Right through the whole range every tonne increase showed an increase. But, was that still profitable? No. Right. Where did your profits start to slow down? At five tonne. Started to slow it out. Five tonne and if you drew it on a graph it would go like that. Yup. And then like that, and then fall away. But your production would be. Yeah. Would be on a continuous climb.

Kevin you just made a point then that every soil is different in regard to it's response to gypsum. Would you like to expand on that please. Well you get different severity's of it and it depends on the depth of your sub soil and it relates to every farm should do their own trial. Like you know the difference that Angelo is doing a trial on his farm to your completely different area. You know. If you do a trial on your own farm, you know what your farm does. It's no good the BSES coming out and saying this is what is working elsewhere. You know once you find out yourself, you have a lot better idea of what your farm does. That's what the most important part is, your farm. I think you have got to have the base, there has got to be a basic level where you have got to work to and I think that ten tonne. Yeah, you get an idea is. Is what the maximum they said after which you do fall off. Yeah. So you have got guidelines. You have got to have some guidelines to work to so you are right. I think your ten tonne per hectare is your starting point. But that's not the point coming off to me. The point coming off to me was, I could have missed it wrong but when it first started off it had to be ten tonne per hectare otherwise. That's what we were saying. Yeah. Otherwise you're wasting your money. Yeah. Well what Graeme, was just, you go to do a hundred acres and you put on five tonne to the hectare and it doesn't work, you have. The BSES are in a fairly bad position, I mean, if somebody goes to them and says how much do we need to put on, I mean if someone comes to me and says I got a hundred acres, how much do I put on to make it work? I'm going to say exactly the same thing as the BSES Or what Kevin said. Let's trial it this year, and see next year. But If someone comes and asks you the question you know and they have got the cheque in this hand and they are saying, how much do I need? Well your really, their in a position where they have to say four tonne to the acre. But this depends on the area, where you said two tonne to the acre a long time ago. I would say four tonne or nothing. Yeah. Because, back in the early stages. I agree. If someone asks you for recommendation that's what, you can't say that two tonne is going to work. All we say is what everyone else has been doing. You know. What other results people have been getting. This is the point coming across today is that two tonne does work. Yeah. But four tonne works a lot better. And another four tonne you might waste your money.

It's just interesting to hear the different experiences that everybody is getting though. You get better response doing one tonne to the acre four years in a row than you do putting four tonne to the acre on at once. The dissolvinator goes a bit like, you know how urea goes if you put on one tonne of urea you will pick up, and then if you put on two tonne you will pick up some more and then after a while your just wasting dough. I'm the same as you Graeme, I got told like, it's five tonne at least or you don't worry about it. And at that stage, five hundred bucks an acre was just fairyland. So I got out a truck and I said well, do me one tonne per acre. And then I think we had some over so we came back up and done that at two. And the response from two tonne to the acre although it was better than the response from one tonne, was not twice as good. I didn't get twice as good a result at two tonne to the acre as I got from one tonne. But again I'll stress that as low as one tonne, gave me a greater than hundred percent result. I mean, zero, versus one tonne of gypsum was just an enormous result.

Who here hasn't used gypsum and has had that experience where your cane comes up and grows to that big and it just doesn't grow for the rest of the year. Has anyone actually had that. Yeah. It will die out. Yeah. It just dies out. Yeah. And that's your worst possible scenario where you have actually planted something and they probably, and because there has been a hill there they have sunk the laser down about that far. They have stripped off any top soil that was there. You plant, she's come up and she's grown about that big and it just either dies or it just grows no further. Now.

I think, answering your point there Phil, you know my job is giving recommendations. And I base my recommendations on what BSES come up with on their trial work. And if I were to give a recommendation of two tonne to the acre and it didn't work, you know we would be in strife. So I have got to stick to an area which is safe but also local knowledge comes in. Now what I would say is say Clive on the farm across the road come in and said what amount of gypsum are we using, I would say ten tonne to the hectare but your neighbour next door Phil is using two tonne to the acre. Four tonne to the hectare. By all means put a trial into that and see how it performs for you up there. And I'd also had guys come in they reckon they get a better response out of lime than they do out of gypsum on. Yeah. As you said before that depends on the severity of the sodic. Couldn't the trials be related to is it ESP was it exchange of sodic percentage? Yeah. That's what you have got to look at. When you do trials, it is very difficult because you have farm practices. Yeah. I mean at least you could take out the severity of the sodicity between the two's and the tens. I mean it is always going to be farm practices and management but it appears to me that the variation between will be just the severity and the sodicity. Graeme's light soils sound a bit like mine. But although they are classed as sodic they aren't severe. I wouldn't like to meet the man that sold it to me. It wasn't what they said at the auction. They said it was very, it was basically clay. What is the definition of sodic soils. I mean as far as the Water Resources is concerned. That's what BSES would say. Yeah, that's right. Six percent, level of six percent in some positions. Very, very negative at that auction. The level of six percent.

Could I just carry on with, the very important point that Terry made in regard to management practices, we will probably look at some of this what Phil's put up here, where he is talking about different ways of management. We have already discussed gypsum dissolvinator. We have spoke a little bit about flushing needed to lose those soils with the drainage aspect of it. There's a few other things that are up here in regard to centre ripping, trash incorporation ready for trash blanketing. Has anyone got any comments or any things that they have seen around or any experiences that they have seen around the area in regard to either those management strategies or any others?

Do you want to just let Clive point out the natural on chemical or natural on manufactured gypsum question before we go any further. You can if you like, yeah. I know, at low rates we always apply manufactured gypsum. Purely and simply because it's a lot more soluble. At the higher rates the natural gypsum is soluble but a lot slower. That's why it works that way. If you are on ratoon cane for example and your applying low rates, where you don't get the cultivation. You won't get the same result immediately out of the natural gypsum as you would out of the chemical gypsum. How hard would it be to mix the two together? Very difficult because of the moisture content. Too costly too I suppose. Cost and moisture, the thing is that you have basically come to the stage if you look for a quicker result with natural gypsum you have to apply more to get the same speed. Where if you get one tonne of manufactured gypsum you will need nearly two tonne of natural gypsum to get the same response in the same time. But over a period of time or if you can have cultivation, say in the furrow where you have cultivation you will see virtually no

difference. I'm just wondering about cultivation. Where do we want the gypsum to be? I mean obviously if we stick it down too far it's probably wasted. Where do we actually want the gypsum to be? Up here somewhere in the top ten centimetres. Basically you want to start in the top of the top and you want it to work through the profile to take with it the leech that exchanges the calcium and the sodium and leech it through.

The best result I got with using chemical gypsum was when we spread it a couple of days before planting. And it wasn't worked into the soil at all. Yeah. So when you think about it, when the planter came through it sort of pulled that into the furrow shape. Banded it basically, is that what you're saying? Yes. Which is probably exactly where you do want it to be. Well, we haven't really done any trial work with banding but I know that that definitely is the case. If you do anywhere where you, and minimum tillage is even worse. People who do minimum tillage it's just even worse. If you use natural gypsum you virtually won't get a result at all. And that's the difference. Can you just clarify that for me. Your saying you won't get a result until you can spread it on the surface? Not basically until you get some sort of combination. Yeah. So you're saying incorporation aspects of it. That's right. The thing is you will if you double it all. If you double the application. Because it hasn't got the same solubility. PH for a start is the difference in manufactured gypsum about five. Well it's about five point two or something. Can't remember. We did do a test there once but I can't remember. And natural gypsum is over eight. It's about eight point two. So what basically happens is the water irrigation, you don't have that, you just don't have a chemical reaction. You actually have that cultivation. Yeah, last couple of times we've put on a mixture of the gypsum and earth lime. We're getting results out of that, it's like the same thing about going to pulverised as with the gypsum.

Well see that's another thing I mean if your talking, I mean as a producer like those of you. In the Leichhardt area we've had some fantastic results with lime and gypsum together. One tonne of each. You put two tonne of lime, and nothing, two tonne of gypsum, and nothing and we put them together and the results were together are just phenomenal. I mean, nobody can really tell us why. So you're saying that that blending is far better than just straights. Well it appears that way. We don't have any notes on errors. We just come across that by accident. We over lapped and miscounted the drills and we over lapped it. And that's how it come about. There's no real reason why. But that whole area now isn't it. There isn't a farm land that doesn't do it. I can't see, Neil could be able to help here. I can't see any chemical reason or scientific reason why lime doesn't work or anyone on high PH sodic soils. You expect it not to because of the chemical reactions but try and give yourself a cop out, there have been some results from trials in other areas where the combination of lime and gypsum has given some outstanding results. So that's what we copied in Proserpine just last week, or the week before. What kind of lime is being. Well we've only been using the earth lime up there. Ground limestone or. We've done a lot where you put the gypsum on your bad loss hills so where before you would have had it on top of your crop and then lime the rest onto the grow side, or both. A lot of the times I'll do just separate applications in the one day.

Just without trying to take any time. There are soil chemical reasons for choosing lime in some areas such as Proserpine rather than gypsum. And there are chemical reasons soil chemistry reasons for looking at gypsum in the Burdekin. Now it's going to deviate too much from that, you would have to be suggesting very strongly that a fair bit of research is needed. That's so. I guess, yeah, there is a lot of discussion about the pros and cons of gypsum. And I think Phil said in a quiet voice there at the start he said. The thing is that. It is interesting, why, and I. Have you seen it too. I mean on lime spreaders they use lime and gypsum. Yeah. On land that was classed I think five, totally unsuitable for ready agricultural crops. And they have got probably some of the best plant cane I've ever seen. I tell you what else is fertile for some reason. We've put gypsum on sodic soil with a PH of nine and got a fantastic result. Sometimes calcium hydroxide. Calcium oxide. Calcium oxide is burnt. Okay. Yeah. Calcium hydroxide is slightly lime. And what do you call earth lime. Calcium carbonate. Right. We've also done trials on a block that, of the gypsum limes and everything where nothing worked at all the first year. We had to turn around and wait till the first ratoon was cut off before we saw a result at all. Over nothing at all. It was just back to the old story where you have got to do trials on your own farm.

Can we just move on. Yeah. These points I raised before. Clive or Terry might be able to shed some light on some of the experiences you've seen on your farm. And Phil, you touched on it also when you said that

trash incorporation is an option there and it has played a role. Other people seen it around the district or on your own farms. Are any of these standard practices or. I think that most people rip down the centres. I've tried it for the first time this year. Until my tractor packed itself in. And, has anyone tried to get tractor parts locally? It's a joke. How deep do you rip? Certainly into virgin soil that's never been touched before about six to eight inches down. Breaking shoe pins every row. I again question, it certainly allows more water to penetrate in the first couple of waterings. I don't know if it doesn't pack down half way through the year. Gypsum dissolvinators we touched on. Washing is what I call just giving that sodic stuff a quick extra water. Trash incorporation, we all know about that. And I'm trying a trash blanket this year over the whole farm. Now we can all think about the fact that water costs are going to get higher and they are going to end up practically sending us broke, so what are we going to do about that? And that's why I'm trying a trash blanket. Also I notice on sodic soils the two advantages of trash blanket: 1). Is that your not getting that fast evaporation as opposed to bare dirt. And 2). Is that the trash itself slows the water's passage down. Just the sheer amount of trash the water has to get under. The water has to come up higher into the hill. It's slower. I'll tell you I have been told about a hundred reasons why I'm going to lose the whole crop using a trash blanket. I'll tell you if it works or not in a years time. At the moment I will reserve my decision. So you have cut the whole farm green this year? No, I've cut a substantial amount of it green. And that's all I'll do. Just cut it green and go and stool split.

Graeme, Phil just raised the point there before, which I should have bought up before in relation to yield. What is the average yield then on your farm when you are doing the gypsum applications. Where I've used gypsum I would say I went to about ten tonne an acre to about thirty. Right. Well, the point why I raised that is, if you say went up to the four tonne to the acre, is it possible that you could have gone up to fifty tonne to the acre. Yes I would say certainly possible. The reason why I point that is there could be a substantial economic reason to go to your four tonne to the acre if your going to put out that four tonne to the acre. Which I think some of the neighbours. Ah Yeah. Sure. On the ground up there. Sure. So that's what I think on that. Yeah. Which is what Graeme is getting over in his area there. So it is a very valid reason to look at those higher rates, do some trials with it. See what you come out with. Well I do intend to have some gypsum more this year on some land I'm farming out. I'll try that a bit more. I'll just go back to think that I certainly don't grow very large cane crops. I grow very cheap cane crops. And I also go back to what quite a few of us.....(END OF TAPE ONE. SIDE B).

Ratoons here. Just about qualities? Sorry Clive, what did you say? Yeah. I'll either say we will rip and centre the ratoons and things that we do and I think it's worth it. You have been doing that consistently on those? Yeah, most of what's been done this year we are doing it. On the sodic soils mainly. And I think we have got pretty good results out of it. Angelo, in your case have you or have you seen at your neighbours. We just put gypsum on and then just rip it with four tynes. Right. Work it deep initially and then just ordinary grub it. Pretty deep though. We haven't tried ripping yet because when you ripped you usually go down and bring up the raw stuff. So we just leave it there, just scrub it a couple of times with coil tynes, you know. And you've got to put four tonne of gypsum to the acre, you know you get six percent of your tonne to the acre. Has anyone had in furrow they've tried legumes or anything like that on to help sodic soil? Rapisarda's did at one stage up there didn't they. I don't know what results they got. Not very good, but you see it's new ground. Yeah. I think that all. That's all what they are mainly doing. I think all of it seems to be improving. I mean I haven't seen anywhere that's going backwards. No, they are certainly improving it's just the amount of money that they put into it. Yeah, that's right. I haven't seen any sodic place anywhere going backwards. You know it's definitely all the soils are improving. Everybody is starting to learn. The original people who just mazed and sculpted itself or whatever I mean, everyone has learnt by driving around and watching and looking and everyone is learning. Steady, steady. Everything is improving all the time. What's the biggest lesson you have learnt? First up, farms gone. I mean if you don't design, to me, If anyone came to me and asked me for advice I would tell them if they didn't have a piece of farm to work, don't even think about starting. Because, you should, even some places with two inches of top soil. You're in trouble. Okay.

Has anyone seen much of trash incorporation or as Phil's just pointed out he's been trash blanketing this year. Has anyone seen that as a major tool on sodic soils or any other tools. I think we all trash incorporate don't we. Do you still rake and burn the tops at all? Well after the harvester there's not much trash left. No. I don't top it and there's only a few leaves, and you just run that in, but there's buggar all. You know. I wouldn't call trash incorporation a thing where you are cutting green virtually. Mostly you have got a good

fire and they don't top it and you get through it with coil tynes. It doesn't feel there's nothing, you know. It depends how good a burn you get. Sometimes you can have a fair amount of trash over and you do see people still raking the tops off and doing those trash fires, but. There's a lot of soils that you can't. A lot of soils you can't put the ripper in. Yeah. On Pelican Road there's no way. It's like, you would be better off with trying to rip cement. You just can't do anything with it. Until you water it first. Just about everyone around that way has to rake it. I haven't seen, I haven't been out of the office for a while but that's what they are doing down there. Graeme, what's Roncato's and Mio's doing. Well I do both, part of them I watered first and then ripped it, because it was cracked. The only reason for the ripping is to get water penetration levels down into it. And then you gave it a chance to crack for the trash to break up a bit. It's a lot easier to trash incorporate next time. The next block, because of timing and machine availability difficulties I went straight into it. But the best way to do it is simply the first way. If I do the preferred way I get a better result. Depends, see sometimes the crops don't dry out that much either. I mean I dried that crop out for a couple of weeks. Comes back to the farm it's on really, I mean if you get a sodic patch and you're trying to trash incorporate into a piece of Barratta clay or a piece of that other stuff, I mean you end up with all sorts of problems. You just can't work it all together. Some paddocks, some of the original paddocks that block 244. When they plant it, it's dying because it needs water on this end and it's mud in the middle and it's just nice on the edge. All they can do is just spray it. Because, you know in hindsight they should have had a better. It's just farm design. Farm design, Yeah.

Does anyone want to add to any of these points here that Phil's put up? Is there anything we haven't covered properly? Trash incorporation and trash blankets. There are plenty of areas around with major silt sodicity problems where they do both of those things. Yeah, I think I'm about the only one here who is using the trash, full trash blanket. There's a few around. There's a few different places. The other problem we had with trash blanket was that. I've got no problem with trash blanket itself. It's fire, when you've got neighbours burning, that tends to be the biggest problem because they will set you up. I wasn't going to knock your trash blanket, I was only, I think it's worth a trial. I mean everyone should pay you to trial. I've done practically everything totally unconventionally since I came here. I mean I make no bones about it. I can tell you if it works you will be laughing and if it doesn't work you will be a fool. So, that's the standard practice. I mean I will tell you in a year's time. At the rate the burning laws are going we will all be trialing it. I agree with you I think that we might, within ten years the whole country is saying if you're going to keep burning we won't buy your sugar. I mean that's the worse case scenario. Or we are going to have some sort of a carbon tax imposed which is going to be another way of the Federal Government raising dough by sort of penalising you for burning. Plus as I said the cost of water, I can see and you can all probably see what they're saying and what they are going to charge for over allocated water. I think, anyway you can sort of cut down on water in a dry year. It all comes back to farm design. I mean if you're going to have a trash blanket the reason why most people don't do it now is because they flood everything. If you knew you were going to thrash blanket when you designed your farm, you would have more fall. Well most people don't do it now because no one does it in the Burdekin. But if you go in and around Bundaberg and parts of Mackay and up north, whole, huge areas are all trash blanket.

But furrow irrigation is a different thing. Yeah. In Proserpine. No, Phil it's quite relevant. The actual focus here on trash blankets was last week. I should have invited you along to that one and you could have participated and had some input. I'd just like to bring us back to our real focus here and that is very much sodic soils. And while as I said a second ago it is relevant and it is important and is something that has to be trialed. There is no doubt about it. And as Neil has just bought up, in other areas it's played a very real part in dealing with sodic soils. Certainly I can vouch for the Mackay area. The growers have got very good responses. But, basically, the key thing I would like to go, because we are running out of time, what I would really like to go back to is some of the responses in regard to. If we are thinking about different rates, different applications, different management methods we have got a real question as to how long we are getting a response. I think we would agree that we haven't been dealing with sodic soils long enough at the rate of learning that's gone on in recent years to get a good handle on how much response that we have been getting but by the same token does the group have a regard to profitability in regard to those sodic soils. What sort of tonnage yield increases are we seeing, how long do we expect to see them. I can understand that's a bit of a subject here. But how long do we expect to see those sort of things for on your best, your gut feeling.

I think sodic soils will keep on improving. I also think that in a wet year you might pick your highest crops up off your sodic soils and your heavy clays could be a disaster. Clive? Yeah. I think the sodic soils are going to just keep improving. So far I'm pleased with the way they are looking now anyway. How many ratoons are you getting out of them? Clive. We're only onto our second ratoons now. But they're looking good. We went and improved the crop cycles on these soils? No well see we haven't been on the farm for that long. Oh, I see. We've only been there since 1990 I think. Who would have the oldest sodic soil block? Well I've got four three. In our area I suppose. In other words. Someone who has got their farm sold through there. Who's, got there, Kratzmann, Milanese, Mio's, Marchioni's. The first cane that went on the sodic ground. They used to grow rice first, and then cane. Nearly every bloke did the low areas of Mulgrave. Mulgrave. Isn't that where Rapisarda's. Yeah. What about the prolifial areas of plant in the South Burdekin Water Board areas, you know, not the delta farms but there's some areas where they are on the edge of the delta. Wouldn't they have been sodic? Sodic and salt in those areas I think, a combination. Yeah. Some temperatures. Some country they had back there. We're just talking about like Brett Boccolatte's and through there. Dave McDonnell's and that's sort of fairly sodic. Yeah, but there's a lot of salt through there too. Yeah. Different classes. Solinity problems. There's low salt coming from the water bore as well as being pushed up. Tell me about it. So it's a problem is it? Yeah. There's a combination of factors that come into it. Those actually are the soils where I first noticed where the lime was working better than the gypsum and might have been a conductivity problem perhaps too. I don't like recommending it, but I mean people try it and if it works.

Trouble is there are a lot of things that have worked I mean I can remember I used to bump heads with Gary Ham weekly years ago. But I mean after a while you do learn. I mean. What happens is a lot of people are happy with something but it isn't monitored. So you don't really know what the result is. I mean you can look at something and you say yeah, it's a lot better than last year. But, was the conditions different, was the farm different and really it needs to be, all trials need to be monitored properly. And that's another question that comes in. People say they get a big result or whatever, I mean obviously I've seen results thirty tonne to the acre increase. But we've done the whole paddock. It's thirty tonne to the acre over the last crop. I mean take this year, look at the growing conditions this year with the cane we have got. You have got to grow better cane this year than last year. You've got to. Well I think we all should try and do trials but it's important that we all should know how to do a trial. So you have to replicate it and you have to have controls. I did one two years ago. Peter DeZolt, a heap of the growers were saying these soils needed potassium and I hadn't used it. And I thought, well there's only one way to solve it. So I did five rows using a bag and a half of potassium, five rows without potassium, five rows with a bag and a half. I replicated that three times so it was always going to be grown under exactly the same field conditions. As you say there is no use saying I used four tonnes of gypsum over the whole farm and I got a great response. I mean, because you've got rainy years and dry years and all sorts of things. So anything you can write down you have to have a control and you have to replicate it a few times.

But it was interesting as a trial because neither Peter nor I could see a result. You couldn't see it. But when we harvested it and we brought the things from in here that they weighed it and all. Yeah we picked up five tonne per hectare. On just a very low rate. Has it put money in your pocket? Yeah, it more than paid for the fertiliser and the cost of the harvesting. The fact is we couldn't pick it with our, we actually had to go and harvest it. And of the three trial strips in with the controls, every trial strip was better than the control. Yeah. Thanks for that. That's important and it obviously needs something compared to what's exactly what the controls are done for. And the easiest way to do it is if you do something like you spread your gypsum at three tonne an acre and you have some over and you bring the truck back up and you spread the remainder out so you have put on six tonne. Just go a grab a few pieces of wood or a few pegs and just drive them in along near the fluming ends. So when you come to harvest that in a year, you know where those rows are. Going on gives them the economic side, I think Gary has done all this work on it. But the way I understand it with the recommendation on the ten tonne per hectare that came out is aiming for a yield somewhere around fifty tonne would save you eight, maybe ten megalitres of water applied per hectare. And, I don't know what the CCS came in but in yield as opposed to the amount of gypsum that was applied. And all of those factors were taken into account and it would be interesting to actually to see those, that book that you've got on gypsum and sodic soils here. I'd like to run through that, but I will get a copy. Yeah. You can take it after Gavin knows anyway. Yeah. I can organise that for you.

I think at that rate there too it will last a crop cycle. Yeah. So that rate there, four tonne to the acre. Yes. It will last a crop cycle? Planned under three or four ratoons. With any touch of luck. We've been doing, it must be for seven or eight years, but on the new soil, ever since they planted. And definitely four years is no problem when you're at four tonne to the acre. But note there seems to be no, the grey area now seems to be what do you do after four years? Do you go back to four, or do you come back to three or go to two? And it appears on what we have been doing if you monitor your paddocks properly we keep on doing the strips and the actual sodic patches are shrinking. Like if you do a patch when you mark it out shallow and then the next year first ratoon, it shrinks. And you treat that piece again. But it appears that two tonne to the acre is ample. Is a good top up. Yeah. It seems to be ample.

Does anyone else want to add to those recommendations? The other one is the basic on soil tests. I mean you should get your soil test from Mitchell before you put your application on. After your gypsum treatment. I've done this with some of them potato growers up here at Majors Creek and they have been able to get away with two tonne applications to knock out their soda. And do results where they have been farming for long periods of time. Clive or Terry, do you have any thoughts on recommended rates at all? No, Perhaps all we put on is two tonne of gypsum. We have been putting two tonne of the earth lime too. But I think I can do a bigger area. I would rather do a bigger area than put four tonne on ten acres, I can put two tonne on twenty acres. But do you get the result Clive? Yeah, we are getting the results. You know we would probably get better results if we put four tonne on. But the results wouldn't be twice as good. Yeah. I think I can get more cane off twenty acres than I could off the ten acres. Graeme, do you have any thoughts on that, on the recommendations? No I just. You have just got to excuse me there for a minute Shane. Yeah.

What are your thoughts, I mean giving that gypsum is pretty expensive and there is bugger all dissolvinators. Is our current production methods on these sodic soils suitable in a, let's say in a long term so that the sugar price goes down. Are we still in a profitable mode managing it the way we are or doing things the way we are on sodic soils? I think it's like, same with everything Shane, I mean what happens if you've got your right farm, you've done your farm clean first. You've got your right farm management where you have budgeted. You see, where most farmers, I mean the new farmers are very good at it because they have had quite a bit of advice from the BSES and the Canegrowers organisation about budgeting. But I guarantee, if you drive around and you see about a hundred cane farmers and you ask them what their budgets are. I think you would be surprised to find that more than two of them would have a budget. A budget is when I've got some money I'll spend it. People like Raymond know exactly how much he's got in that bale, what he is going to do with it, where he is going to spend it, where, I don't know. Maybe even Clive. Clive can you, do you work closer to a farm budget. No, Terry, that's his department. But that, I mean that would be normal Terry like when you come to lasering farms and whatever, what you come across is the same isn't it. I mean the average. Yeah. I don't do that, I try and keep my growing cost, if I exclude wages and return on capital on my investment, I try to keep growing costs below fourteen, or what equates to fourteen cents. But what I'm getting at is if you want to make sodic soils viable with low sugar prices. If you've got \$2.50 now, you should be using that \$2.50 to either reduce your fall on your paddock, better your irrigation, put your gypsum on now so that you only need top ups later on rather than get the bare and have no money. Yeah, I always take the view that after you have got up to certain level you should be taking your dough off the farm and investing it somewhere else in the event that sugar prices do take a severe tumble. Good point. If you do need to continue to use gypsum. If the sodic soils are going to be under yield, which I don't think they will be. If the sugar price falls. Is what we are doing going to be a profitable venture? Probably no. But that's why I am toiling around with the alternative options like trash blanketing. And means that are very, very cheap.

We have noticed like up in the Selkirk area, there are some parts there that without putting gypsum on they won't get a ratoon at all. It'll just die off. It's a good point. I mean if you just took a clause you can't afford not to put gypsum on because the water cost is the same. Yeah. Fertiliser is the same. I realise what you're saying. All the set costs are all the same. Yeah. So the only thing that changes that connects to a point, the only thing that is going to change for you is gypsum, to the point of you cannot afford to drop. That's what I'm saying about budgeting. I mean what happens is the BSES has developed a pan to monitor the water so you don't waste it. I mean you're budgeting your water, your budgeting your fertiliser. If that is, if the treatment of sodic soils is an ongoing cost. I mean really there should be some way of developing it into a farm budget. Yeah. It's got to be budgeted. We always do it up here. I have a, we have to sit down

and find out where our cut out point is. Yeah. If it drops to a certain point. There is a drop in the ratoon. We will have to turn the dissolvinator off for a couple of years until the trigger point comes back again.

Clive was saying before when we were talking about the rates to use. He feels his grows better if it's from applying a small amount over a big area because of the economics of those type of things need to be. You intend to do that year after year Clive, don't you? Yeah. You don't intend to just put it on and leave it. No. Like Clive's intention actually is just a small amount, but more often. Yeah. Not just a smaller amount. I mean that's sort of, you need to clarify that a little bit. Is the end result still the same. Where actually it might have been better. In my opinion it's better to put smaller amounts more often. But that's only my view. I mean everybody has a different view. Do you intend to do that, each year on your ratoons crop? No on the plant cane. Yeah. We're doing it on the ratoons now. Each cycle like? Yeah. And then we try and get into a cycle, then we plant, we will put it on before we plant. So that's once every three years or once every four years? I'm going to try and go to plant and second ratoons. So that's going to be every three years? It will be every four years. Four years? Yeah. So you are going to do an application every four years? Yeah. Going to try it, you know.

What about you Angelo? What do you, what's your? Well in the good years of sugar price you pour it back into your farm. That's what I do. Otherwise you pay it in tax. And then when the price of sugar drops well then you skim a bit. You know I do it on sodic soils, I do it on the level farms I call it earthy lime. I do the whole bloody farm. Four or five hundred tonne and then when the price of sugar drops and you can't afford to put your inputs. I cut back on fertiliser and maybe a little water or saline. But your still getting the crops because your getting the flow on benefits from the good years. So with the sodic soils we pour it on, and then if things go bad well you just skim. But it's there and it's still working. Okay. does anyone want to add to that? With thoughts on profitability? We've covered it pretty well. Does anyone want to say anything. I think it could go for two hours. Yeah. That's a good point. All right.

That brings us up to the last couple of points. And the first one is, we have covered a lot of ground but where is our research needs? Just variety testing I think. I think that research presto and it has to be effectively spent. So I think probably your main area of research needs would be varieties of non sodic soils and possibly doing a pretty good go at varying rates of gypsum and what we are going to get return from those varying rates. That's all I could see. You want the varieties that will grow on the sodic soils you know. We would love a variety where you don't have to use gypsum at all. You could use the top one there for the salty soils like 136. You could manage that? See what happens. Well you know if you could do a wall of varieties and grow them on sodic soils. That's all right if you've got a whole farm of sodic soils. Yeah. A lot what happens is with sodic soils is like Terry said if you have got half plant crop. I wouldn't turn it the other way. Keep your soil types together. You'll have one variety there and another one over there. Initially it's your farm planning, you know. I really think in sodic soils the research needs to be into helping farmers start the right way. If you start the wrong way it's bloody hard to go back. I mean if you you've run all your pipes, once you've laid your pipes and then it's bloody hard to go back. I mean if you can advise the people the right way in the first place, or give them at least, you know, give them an indication on the right way to go on the whole concept, on the farm design. But then really to me you need to manage profitability.

What about those fellows where you haven't got that chance. Where you know you are pulling the wrong way or something. Those can't physically do it. Well those blokes that have got. They have got a situation they can't do a lot with. It's not a new farm. What are the research needs for those? In those types of situations. This is where I am not too sure variety is the way to go. I reckon you, research should be done that the gypsum, like any other way to make bring the soil up so that you can grow sugar, you can grow bloody anything else you want to grow. Yeah. Everyone wants to grow sugar but there is possibly a few that want to go out there growing pineapples or something else. What do you think our best opportunity is Graeme when you say bring the soil up. What's our best opportunity? We've explored the gypsum, lime and other areas, we've spoken about different cultivation practices etc. What are your thoughts on our best opportunity? Well what I was going to suggest that if you're talking about lime and gypsum and you mix the two together and it works and nobody knows the hell why.

What you haven't thought is I don't know where it's going to lead. But it seems to me like we are doing things, practices that are working but there is no at this point in time to explain why. So that means if you

don't know anywhere as much to me you know about what is happening with some of these soils. So what I am suggesting there is I think that the aim of research should be to bring the poor soil up to a standard where you can grow anything. Any variety. Rather than go around and try and find something to grow in poor soils. Do it the other way around. Yeah. Now what that standard ought to be, and that should be done so you know if it is profitable to achieve it on the last go. I mean you guys can do it on small block out here. You spend ten thousand dollars on a small block, but then you have to work out what you can use for it to become profitable. That's what I would like to see research go, If it is possible to bring those soils up to top standard and at what cost. I guess I will come back to that point where that's the objective, the aim is to bring it up to some sort of profitable use. But really what area it gives us you, if anyone in the group sees the faintest opportunity in their experiences, then things would be seen around the place. For us to pursue, I mean Graeme said then he spoke about combinations of the new areas for example. Phil has spoken about possible benefits.....(END OF TAPE 2 SIDE A).

I've got no argument with that. But there should be some research done into it as to whether it should be one tonne or two tonne or three tonne. So we have got some guidelines to work on. I think water is going to be, without knocking the Water Resources too much. I think it is going to be a big issue. I mean, realistically let people have the most economical use out of their allocation. It will become the major issue in the future. Without a doubt. If the cost of water goes up and the price of sugar comes down, you know that margin there is, it's a fixed cost that has the ability to. Just the pan that you fellows have developed now has done huge amounts for the district in that sort of irrigation type thing. I mean, it's just you know a simple thing that's done really well. And if you can use whatever water you have got properly. Whether it means gypsum or trash blanket or ripping or not ripping or whatever. I mean realistically the water seems to be the issue that is going to be the long term increase in fixed costs. Will further rise the pricing structure up and down in the world you can buy second hand tractors, you can make your own implements but you have to give your cheque to the Water Resources. Some people. Water is a fixed cost up here. Water is not so much a variable cost because we have to pay a very large up front payment, we take it or we leave it. Most of us, or all of us take it and then we pay more. But it is like in Mackay and stuff I suppose water is much more of a variable cost. Here it is quite a large container that we just have to come up with each year.

That probably raises the next point that I was going to touch on. Is as strange as it sounds, when you start talking about trickle in cane, like Phil you put up trickle where it was an impossible opportunity. Yep. Is that something that could be a real opportunity in the sodic soils. So it could be worthwhile. Well Gary did a bit of a trial but I never saw any results of it or what happened. That's something, they're obviously looking at it and it probably needs further attention to in conjunction with the manufacturers or suppliers giving their experience as well. Not something you can go out there and do it yourselves. I think that is mainly where they have run into problems. Trying to do it themselves. But you can get expertise coming in from outside to help make sure that the appropriate trial is set up. And I think that, that is the way to go. Water savings, I argue a little bit against that you would be, you would save a little bit on water but not a hell of a lot. To grow a crop you do need a set amount of water. Around about your first three or four waterings. Ah yeah. You've got to big, very big savings because your not flooding your whole field just to grow that small cane okay. That's where your savings are. On certain farms they are very, very difficult to laser to get slope on. Either because they go and then reverse themselves somehow and you have to go and scalp the soil off the top and then move all the subsoil and laser it back on. Or you get these farms which are like that. There is not a lot of them but they do exist.

Now your lasering costs can get upwards of, I don't know, whose, Terry what's about the most expensive lasering cost you have seen? Can it go up around a thousand bucks an acre? Ah yeah. Two thousand, twenty five hundred. Yeah. It can go up that high? Yeah. Now you can put trickle in I think for about eight hundred, a fifth. That's twelve fifty and a half. About twelve four. And that's with your pumps and all. Eight hundred is the field cost. Yeah. So around about twelve hundred all up. So it's actually, in certain farms it can be cheaper than lasering. Plus I think you wouldn't need to use gypsum you just wouldn't have a, you wouldn't really have a sodic problem. You would still need gypsum. It's still a sodic soil. Yeah, it's still a sodic soil. Yeah. It's still vital that you use gypsum to get the water to the plant. It's the main, it's providing that mechanism when the. Yeah. To get that water to the surface the sodicity is still there. We should have actually talked about this before. Sodicity is a problem in two ways. 1.) It is the concentration of sodium ions which may or may not be your major problem. And 2.) Is just the water penetration. And I think my main problem is just straight water penetration. In the Burdekin we have a two way problem.

There is a sodium in breeding soil and the residual sodium carbonate coming from the river water. Yeah. So that' sealing it off in the same token and that is also the gypsum works in there. Especially with dissolvinators. So we have got two fold problem and that has been counteracted.

We might pick up on that point but I could just end the meeting on what Terry has mentioned before about water and as part of the research thing and I know it is a learned opportunity but maybe the idea of mixing a bit of ground water and a bit of river water has a potential. I know it has been talked about and it has been talked about to date. But as a potential mechanism of getting that extra soakage and what, you know the weather hasn't been investigated to it's full potential. If you've got some water. Yeah. Exactly. That comes back to measuring. It's difficult on that because pumps will pump all over the place. It depends on the stream. Like you know, some pumps will pump one hundred and sixty grains of salt and then it will be down to forty grains of salt. Depends on the, I mean you can't see it. It's a, it's sort, of as measurement becomes a problem with that as well.

Gentlemen, time is moving on. Does anyone want to add anymore to the research area? We are going to get our lunch. I don't think I have mentioned what I gather has been a bit of a debate on is the variability in the different trials that are being done and how the, you know perhaps. And probably presumably it is happening we are getting some good basis so that we know what the soils that the trials are done on are represented. So that we can say yeah, that was no sodic this one over here. Yeah. Okay. You know expand a bit of it is it a class three, or is it a class four soil or how sodic was the area being treated? Okay.

Last thing I wanted to come back to was the point that you placed right at the start actually in so far as in the new areas where you have been growing the sodic soils down to a class four. And your comment was, or your question was, is that valid? The point that everyone seems to be saying here today is basically you think that sodic soils are actually going to improve in their productivity over time. Well when you design a farm and you've got a sodic block in the middle, no grower is going to go around it. No. They are going to put gypsum or lime or deep rip it or god knows what. But they are going to farm it as a unit. So that's what you should include I mean the farm plan and also even make them an irritable area. That's another issue, but you know I agree with you. That's a big problem because you know most farms have got ten percent non irritable and the consist of these forms is high class soils. And I haven't seen a grower out there yet. It's not around at the moment. That doesn't bring them up to scratch and go through them or do something. But that's another point. We might put the points in reserve. I doesn't matter what we have got in reserve. That's exactly right.

Has anyone else had any comments on that class of soil aspect? Yes. I think you leave it as a class four. Yeah. But with stipulation's. The other issue we've got with them at the moment is what percentage of class four can you, like can you have in a farm and there's a couple of things I've been thinking about. You know things that Graeme's got. It's probably all class three but it's all sodic soils. And this is probably going to effect our name but everything is class three on that farm but it was all sodic soils. But there is also, blocks of four that you're talking about Angelo. Yes. Now what I have had trouble coming to grips with is say what percentage of those fours can we have mixed with threes given that threes may still be sodic soils. You know. What's a fair profitability on the farm or how do we asses profitability perhaps? Well it starts with sodicity. You're looking at sodicity. Well, just an area I'm thinking about with specific sodicity you've got to look at the depth to where it becomes farmable. Yeah. And also the SAR of that top section. You know, once, it's over ten in my books it's an area where you have to start treating. And so if you get around fifteen or twenty well then it will take longer to bring it into productivity. Basically it relates to the bulk of the cost then doesn't it? Yeah. That's right. Purchase price of course. Yeah. Everything depends on the purchase price. Yeah, that's right.

But it sort of, I have certainly got an area at the moment which is all very marginal soils and we could develop either, I think you could say nine farms as opposed to three farms if we just go for our traditional way. It's quite a large big mis-match between how we would hand, it's not that we could come back and just say well we will open them up if someone puts the inputs in. It's a totally different farm lay out because of it. And it ends up bugging up the whole area. In my mind then and I should be getting a lot more advice I suppose on this one, I'm just trying it out at this stage. Is that, which way do you jump. You can't run that area forever. Not doing it forever but really make it into a. It would be a really odd development in years to come if you wanted to come back to develop it. What do you bite the bullet now and say okay,

it's going to take a long time to ameliorate these soils. It's going to take a lot of inputs. But that maximises our long term production out of this area.

Well I think you might have to go that way but when you saw those farms, forewarning on. Actually read it out at the auction that these farms are classified as severely sodic soils and amelioration may or may not enable you to grow a cane crop. You may or may not have long term soil problems. And you will sell them, believe me. First one, that's only salt water on the user crop. If you sell somebody a piece of ground, he knows it probably may not be producing for five or ten years. I mean logic there states to me. Farmer takes a chance, the Water Resources should take their chances the same way. And only charge them for the water that they use. I'm buggered if I'm going to buy a block of land that is going to cost me a million dollars to develop and I might never use the water on it. Then I should only pay for the water that I use on it. And I really think that that is as long as the allocation is there, it's to everyone's benefit. If the channels have got the capacity and the rest of the farmers will benefit. The farm you buy will have soil benefits. And you develop the farm.

I would like to summarise that and then just and put it into objective to make sure. You certainly can't design your channel first just for three farms and then try and come back to the others after. The shapes would be all wrong and everything would have been laid out totally differently. The roads would be in the wrong spot and all those sorts of things. Then again, I always like to see patches of uncleared ground sort of still growing trees in between the farms. My big worry is you just see a whole landscape where it is just all farms and there's no tree corridors. The thing is the trees that we do leave, the areas we leave and walk away and don't touch any of the trees on it. There must be a few beef puts here and there. Because they are fairly sodic soils. Yeah, it's fairly degraded country too. What's fairly sodic? I haven't got the figures in my head as far as, we are getting changes in that the changes in the PH happening out around about thirty centimetres. You know dramatic changes in the field PH at about the thirty centimetre mark. In conjunction with what sodic level? Yeah, I haven't got those figures in my head I'm sorry. I have got those figures around and I actually thought Nev might have been here today. But yeah they are, the higher they put them up into the proper scale it's just a lot of work.

Who else thinks that it's reasonable to actually design it so these farms could be sold back to. Well there is the potential in the future that those farms could turn out reasonable sort of farms, that's for sure. But it's going to cost. Take a lot of money. Yeah. And some conversation has got to be given there but what they pay up front is, they have got to be bargained with I suppose. As long as you give them that adequate warning. But that has usually got to be discussed by someone higher than you, I don't think you will get anything much of a decision. No. That's right. Well coming to that is that profitability and what is a reasonable expectation of a buyer. Not expectation, but reasonable, our expectation of how much he has got to invest to bring this into production. Well you have got other farms out there that have got the same soil types on. It's a matter of conservation too that tells you in the treatments that they have been doing. Are these class four or fives? No well actually they are sort of classed three point seven. What the biggest problem is, is that they are not falling directly into either or, they are diverging on four. But they lean back to perhaps the sort of the threes that have gone on Graeme's property.

I wouldn't say that would be a big problem if people could buy them at the right price fully aware of the cost they are going to have to spend on them. That's what we discussed before. What is the cost on them. I mean nobody knows. Well surely we agree in hindsight knowing what we know now. You have the money available and you bought sodic soils like your talking about that are marginal, you would probably go through and knife or deep rip these soils before you got the rainy season. Then allow and hope for good rain to break the soils up and leech the sodium down as far as you can. Then you would probably go and put four tonne of gypsum onto these and you would probably grow fairly good cane. But, these are a cost, they are a bit more than the normal start up costs are. Some farmers come up with those costs up front. Barry Harth come up sure. Right up front with that. The whole farm. If you have got the money, or someone will loan it to you, that's fine. But, when I bought, and I'm going back five and a half years now. I mean, you couldn't sell these farms. I bought mine at the reserve price, or just over the reserve price. You couldn't give the BRIA farms away. And the problem was that the banks for the first couple of years weren't loaning dough. I mean it's not assignment recommendations. I got the first one on the assignment. But it was still said that they were going to try and block the assignment. But in those days to go and get a hundred grand off QIDC. you have to sign a form saying you pledge to put your wife out into the streets to

farm them. No truly. Now you're actually growing cane, QIDC. are phoning you up and saying look if you need half a million more, come and see us. Things are obviously looking better aren't they. Yeah.

Okay, look thanks very much for that gentlemen. I guess I would just like to finish off by asking if anyone would like to add anything? Is there anything that we haven't covered? Anything that you think we should? The other issue that has not been made here too it maybe compaction. I think if we get a couple of wet years that's something that might become an issue as well on some of these sodic soils. Compaction could become a problem. It's been dry. On some of them very long blocks with long drills and cutting in the wet. I mean compaction could become an issue too. I know it is up north. I know all up in the Mareeba area, now all the gear has to be low compaction. And it's getting that way that the low compaction is becoming a very major problem. So maybe that is something that needs to be looked at a little bit before it comes into the future too.

Anyone else wish to add anything? Neil is there anything that you got out of. Yeah. One of our major problems with sodic soil around most of Proserpine is the very, very shallow top soil. Historically before, they had been farmed, most of that country has been farmed for thirty, forty and fifty years. And there has been cloud, historically. And some growers are convinced of that too so that it has achieved a marked improvement in the quality of the soil. But now with a top soil, instead of being three or four inches deep it would be eight, ten, twelve inches deep. I would be keen to know what people think. Inversion, are they actually inverting the soil? If you're talking ploughing, that's correct. If you talk square thousand and you use lime, definitely. Because you get a complete inversion with that acid sub soil. I mean it's absolute results straight out. I've seen it with peanuts, I've seen it with white potatoes and that definitely is for sure. I put my left nut on that one.

I see the reverse, I wouldn't like to even see what the six inch or eight inches under the ground come to the surface as. I would be absolutely terrified of the crop. Yeah, I don't know. I got a thirty four acre block there now, I wouldn't mind ploughing it if they reckon it was all right. I thought if you ploughed it you would bring your sodic up onto the top again. You would be back to square one again. Depends on your. You would have to do a test read profile. You just, must have missed the point here. You said down in Proserpine you had been farming for about three or four years. That's correct. Thirty to forty years some of them. And they are adamant that that has created a depth of top soil that has allowed them to farm the country. Where is if they didn't plough that country, they would be scratching around with that much dirt. Isn't that result, I mean what are we discussing here? There's opposites there. I'm throwing it in for discussion.

What's your sub soil base? Your sub soil Graeme, DeZolt's on our soil is acidic. Your's is acidic. So what happens is they build their PH up on the top a little bit, put it underneath. Yeah well it's long. But the roots are actually not there. The roots mostly get through. See. Banana trees fall out and things like that. Purely and simply because the acidity below the ground, the roots won't grow. They just spread out. And so what happens is if you turn your soil upside down the roots actually go down into the soil. And actually grow a lot better crop. We have had much of our country that's also that's going from the PH's of fives and sixes in the top soil. In the sub soils much of it is six to seven and some of it is five to six also. But you know it's more. I'm just simply throwing it in to try and prompt a bit of discussion on the depth of top soil or depth of soil in this sodic country. It's often a major problem. We just don't have enough depth of soil. So I was just keen to try and see if other people had any comments on this cultivation practices that used or like to see used on sodic soils. It makes sense. But it's certainly something that trials would have to be done first I think. A bit radical isn't it. Yeah. For this area. But it certainly, you know if you want to improve your soil and you get the soil the same way you can do it is by ploughing. I mean it's steady, steady process I think. And you will eventually do a bit where you are able to, except you're out working it.

Has anyone else got any thoughts on that? You know the other interesting thing is if you have stuck a hole in the ground for a garbage pit or something. Have any of you noticed really good soils growing under your sodic? I have. I stuck down some holes about four, five feet into the ground. And it was what appeared to be a beautiful black loamy soil down there. I was quite surprised. It's an illusion. Needs inverting. Some farms are. Some of the original tobacco farms up here have been turned upside down. Where Greg Barbagallo lives there. Just up on the Clare Road. They actually turned, they went down eighteen inches

and buried the top soil and planted the under soil. That has happened. I suppose not sodic soil though. It's not sodic soil, no.

I'll just give you thirty to forty years of Proserpine soils they will be putting a lower organic matter back into that soil at that time. Cause they don't burn, they do. That's toned down. Many of them do. So Proserpine is not one hundred percent green cane. Proserpine. Perhaps thirty percent. And it's only increased over the last five or ten years. This year it might be forty five. Proserpine, where I have spent half my time because I think it is such a scenically beautiful place has the most incredible range of harvesting practices I have ever seen. They vary from burning and harvesting to green cane harvesting and then burning everything off after. To what we do here, burning and leaving tops or burning and raking of tops. I can see no reason for. A lot of farmers the last few weeks who green cane harvest and left a trash blanket there and got their cane up about that high and now they are burning their trash blanket off. Is this happening by accident or what? Where are we talking about? Proserpine. Ah no, no that's not a common practice. It's just weird to have your green cane up here in your trash. That's where we might discuss that over a sandwich and a cup of tea I think folks.

Well gentlemen I would like to thank you very much for your time and your input here this morning. It's been very valuable. I guess this sort of exercise is essential for our needs to know exactly where we are at and where our opportunities are. And it's only through input of yourselves that we can get a handle on that sort of information. I think Gavin said at the start just this morning that he was going to summarise today's meeting and he would make it available and send it around to you to give you a chance to have a bit of feedback on it. And make sure we have got what was said. And also give you a second chance to add any comments that you feel are necessary that you want to leave with me. So anyway, to say it all again. Thanks very much for coming along this morning and I think we have got some sandwiches and refreshments outside there too. Thank You. Thanks Shane.

END.