

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

**FINAL REPORT – SRDC PROJECT BSS204
DEVELOPMENT OF AN EDUCATIONAL
PACKAGE FOR CANEGROWERS ON EFFICIENT
NUTRIENT MANAGEMENT**

by

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SD99010

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SUMMARY

The aim of this project was to facilitate responsible nutrient management for the sugar industry by providing extension support in the form of a training course for canegrowers. This educational package will enable growers to develop crop management strategies by understanding and addressing nutrient loss, soil properties and crop nutrition, while at the same time, reduce offsite impacts to the environment.

Three pilot soil fertility courses have been conducted. The first was conducted with Extension/Productivity Board staff in Mackay, the second with farmers in Ingham, and the third with researchers and agribusiness people in Townsville. Participants were asked to evaluate each pilot course. Overall, participants were satisfied with the content and quality of the short course. Each section in the course was evaluated and considered appropriate, with most people stating they had a better understanding of all topics covered. The soil test interpretation and fertiliser box calibration practicals were also considered useful. The majority of participants indicated that they were now able to calibrate their own fertiliser box. Many participants stated that they were more likely to take soil tests to better tailor their fertilising now that they knew how to interpret them.

Much of the feedback was constructive and used to improve the course manual and presentation. Soil fertility courses will be conducted with farmers in all mill areas of Queensland and New South Wales in 2000 after extension specialists in each district have been trained to conduct the course.

This course has been prepared to ensure that growers become more efficient users of nutrients and to prevent long-term environmental repercussions. Improved fertiliser use, balanced nutrition, reduced production costs and environmental awareness will be outcomes demonstrated by farmers as a result of attending this course.

Fertilising needs fine-tuning and an educational package for cane growers on soil fertility and efficient nutrient management is one way to achieve a sustainable cane farming system.

1.0 BACKGROUND

Grower education in nutrient management was highlighted as being a high priority issue at four key industry forums during 1997. Findings from each of these forums are outlined as follows:

A sugar industry Precision Agriculture Workshop was held in Townsville in June 1997. Suggestions were made that precision agriculture will enable efficient use of fertilisers and minimise export downstream. Technology will not benefit the farmer unless it is linked to an understanding of crop growth and the soil resource. Application of regionally calibrated fertiliser recommendations instead of generic recommendations is a further issue, which consistently emerged from discussions.

A Nutrient Management Workshop was held in Innisfail, also in June 1997. This workshop comprised part of the project BS176 – Optimisation of nutrient management in catchments of the Queensland sugar industry. District nitrogen application trials are being conducted in north Queensland to review current BSES recommendations. They may also reconfirm that fertiliser application rates vary with soil type and the local environment. Other actions that have already taken place as part of this project include:

- Fertiliser surveys conducted in north Queensland in 1995 and 1996;
- soil analysis data collected in north Queensland in 1995 & 1996;
- focus group meetings conducted in north Queensland in 1997 with growers, researchers and community groups;
- ‘Save Dollars on Fertiliser’ workshops held in Ingham and Innisfail from 1997 to the present;
- Benchmark Report on north Queensland fertiliser use, and
- posters on nutrient management displayed at BSES Field Days.

A CRC Program 1 Planning Meeting held at Bribe Island in June 1997 suggested that little information is available on the amount of nutrient loss from various land uses including cane. Until such data is available agricultural industries will have little credible defence that they are not having an effect on off-site nutrient loading. Trials conducted by BSES combining placement techniques and fertiliser types showed sustainable and economically viable fertiliser management of sugarcane is achievable.

A CRC Program 2 Planning Meeting held at Townsville in July 1997 stated that Program 2 staff could play an important role in developing ‘short course’ material in the areas of soils, agronomy and crop nutrition. A review of opportunities for improving nutrient supply and use by sugarcane suggests benefits from wider use of soil and tissue testing.

An environmental audit of the Queensland canegrowing industry conducted in August 1996 reconfirms that application rates should be area specific, and organisations like BSES must continue to have regional input into the industry.

Issues raised by these forums and the environmental audit are being addressed by the development of a one-day workshop for farmers on efficient nutrient management, which this project has achieved.

2.0 OBJECTIVES & ACHIEVEMENTS

- (a) To design a course syllabus addressing efficient nutrient management based on the CRC ‘Train the Trainer’ Crop Nutrition Course.

Course material was based on a two-day Sustainable Nutrient Management in Sugarcane Production Short Course prepared by the CRC. The CRC course was first delivered to sugarcane technologists in February 1999. Its purpose was to target

technical advisory personnel responsible for providing advice to those who manage the industry's natural resources; namely BSES and industry extension staff, Cane Protection and Productivity Board staff, and agribusiness technical staff.

- (b) To evaluate the effectiveness of the course manual and training format with the assistance of extension specialists and the CRC Working Party.

Three pilot courses were held. The first was held at BSES Mackay on 7 April with nine BSES Extension and Mackay Cane Protection and Productivity Board staff. General feedback suggested that all of the course content was useful and it was valuable to CPPB staff as a refresher.

The second pilot course was held at DNR in Ingham with twelve participants, (most of whom were farmers). General feedback at this course was also positive. Some of the comments are as follows; it was the best and most informative program I have been to, well put together, very informative, the whole of the course was ok, contained helpful and useful information, it was all useful, I thought it was pretty good. These comments are all very encouraging. (Refer to Appendix 1 for photographs taken at this course.)

The final pilot course was held at CSIRO Davies Laboratories in Townsville with six researchers. Very constructive technical feedback was received and used to improve the course manual and presentation. Comments from the researchers included:

- 'overall structure of the course was very good'
- 'good work Kylie'
- 'the whole of the course is a credit to the course organisers, and I think you have done a good job'.

(Refer to Appendix 1 for photographs taken at this course.)

To prepare the final course workbook for future delivery to canegrowers.

The course manual is in its final stages of editing at the present time. Multiple copies of the course manual will be forwarded to SRDC once printing is complete.

3.0 METHODOLOGY

- (a) The chief investigators were part of the CRC Soils/Nutrition Modular Course sub-committee. Three working party meetings were attended in 1998.
- (b) The Sustainable Nutrient Management in Sugarcane Production short course manual was the primary source of information used to put together the Maintaining Soil Fertility short course manual for cane farmers.
- (c) Course presentation slides were prepared after the first draft of the manual was completed.

- (d) Course material was purchased including an Electroboard data projector, Hodge fertiliser box (photograph, Appendix 1) and other materials necessary to carry out the practical components of the course.
- (e) Three pilot runs of the course were conducted (photographs, Appendix 1) and evaluation sheets handed out.
- (f) Feedback on the course manual and presentation was used to edit the manual and presentation slides in preparation for the final course.
- (g) Compact disks will be prepared containing a copy of the course manual for reprinting and a copy of the presentation slides to be included with the course kit material.
- (h) Extension staff will be trained to enable delivery of the course to farmers in all cane growing areas of Queensland and New South Wales.

Funding to conduct courses will be taken from SRDC project BS176 – Optimisation of nutrient management in catchments of the Queensland sugar industry.

The course will be available for delivery in 2000.

4.0 RESULTS

Technical feedback obtained at each course has been referred to for preparation of the final course manual and final presentation slides, both of which will be available on compact disk.

Refer to Appendix 2 for a copy of the evaluation sheet for the pilot courses.

4.1 Mackay pilot course feedback from extension and CPPB staff

This group felt that the most useful sections were fertiliser recommendations, box calibration, nutrient cycling, understanding soil analysis, and timing and placement of fertilisers. One participant felt that the least useful section was nutrient uptake and loss pathways.

4.2 Ingham pilot course feedback from farmers, BSES agronomists and agribusiness consultants

A break up of responses for each question from the evaluation sheet for the farmer group is as follows:

1A. I now have a better understanding of Essential Nutrients, Balanced Nutrition and Other Factors affecting Soil Fertility

Most participants said they had a better understanding of these topics. However some said they only partly improved their knowledge of Balanced Nutrition, Soil Organic Matter, Soil Tilth, Drainage, Heavy Metals, Pathogens, pH, Salinity and Sodcity. One participant said he does not have a better understanding of drainage and another said he was not sure if he had a better understanding of drainage.

1B. I now have a better understanding of Soil Types and Fertiliser Requirements, Fertiliser Types, Timing and Placement, Nutrient Uptake, Cycles and Loss Pathways, Minimising Off-Site Environmental Effects and Avoiding Risk

Most participants said they had a better understanding of these topics. In particular, all participants said they had a better understanding of soil types and fertiliser requirements. Some participants nominated that they partly had a better understanding of the other categories. No participants said that they did not have a better understanding of the categories mentioned in 1B. However one participant was not sure whether he had a better understanding of Minimising Off-Site Environmental Effects.

1C. I now have a better understanding of Soil Testing, Current Practices/Opportunities for Improved Nutrient Management, Fertiliser Recommendations based on Soil Test Interpretations and How to Calibrate a Fertiliser Box

Most indicated that they had better understanding of these topics. In particular, all participants said they had a better understanding of how to calibrate a fertiliser box. Some participants nominated that they partly had a better understanding of the other categories. No participants said that they did not have a better understanding of the categories mentioned in 1C. No participants said that they were not sure of their understanding of categories mentioned in 1C.

2. The contents of this short course were what I expected

Ten of the 12 participants said the content was what they expected. One participant said it was more than he expected. One participant said it was partly what he expected. No participants said it was not what they expected.

3. Overall, I was satisfied with the quality of the short course

All 12 participants were satisfied with the quality of the short course.

4. Which parts did you find most useful in the short course

This group indicated that the most useful sections were soil types, nutrient uptake, soil testing, nutrient critical values and requirements in the crop cycle, fertiliser requirements, fertiliser types, timing and placement and plant nutrients.

5. Which parts did you find least useful in the short course

Two participants said the least useful section was the fertiliser box calibration. One participant said identification of soil types was least useful.

6. Did you find the soil test interpretation practical session useful?

Ten participants said yes, and two said that this practical session was partly useful. No participants said they did not find this practical session useful. No participants said that they were not sure.

7. Did you find the fertiliser box calibration practical session useful?

Eleven participants said yes, and no participants said that this practical session was partly useful. One participant said that this practical session was not useful. No participants said that they were not sure.

8. Would you take more soil tests now to better tailor your fertilising?

Nine participants said they would take more soil tests now. No participants said they would not take more soil tests now. Three participants said they were not sure whether they would take more soil tests now.

9. Could you calibrate your own fertiliser box now?

Eleven participants said they could calibrate their own fertiliser box now. No participants said they could not calibrate their own box and one participant said maybe he could calibrate his own box now.

10. What suggestions do you have for improving this short course?

Technical feedback was received from BSES agronomists and agribusiness representatives. Other comments from farmers were as follows:

- ‘More concise information on water management in a lasered farm situation’
- ‘Stop long discussions and side tracking’
- ‘Collect a wider range of soil types for examination and classifying’
- ‘I thought it was pretty good’

11. Are there any other comments you would like to make?

General comments from farmers were as follows:

- ‘Site is very good for this type of meeting (DNR Office, Ripple Creek)’
- ‘Well put together’
- ‘Very informative’
- ‘Contained helpful and useful information’
- ‘With soil types if you could identify what was naturally growing on the soil, it would be easier to identify the type of soil in its natural state.’

Townsville pilot course feedback from research staff representing BSES, CSIRO and agribusiness companies

This group felt that the most useful sections were soil test interpretation, fertiliser recommendations and the fertiliser box calibration. They did not feel any of the course was not useful.

5.0 DISCUSSION OF RESULTS

Much constructive feedback was obtained at each of the pilot runs of the course. By holding the pilot runs with three separate groups of industry people the authors were able to receive feedback from varied perspectives for consideration. From the researcher and Extension/Productivity Board groups we have focussed on technical feedback, along with the most useful and least useful sections covered in the course program.

We have included all of the feedback in the results from the farmer group. Complete reporting of results from this group was important, as ultimately this is our target group when this course becomes operational in 2000.

By reviewing a breakdown of all sections covered in the course we found that a few farmers did not grasp a better understanding of drainage or were unsure. One participant also suggested he was not sure that he now had a better understanding of minimising off-site environmental effects.

Initial reactions to drainage suggest that only so much can be covered with this topic in a soil fertility course. A complete workshop on drainage would cover this issue in more detail. Drainage in the Ripple Creek catchment is currently being researched in an SRDC project coordinated by John Reghenzani and Christian Roth.

It is encouraging that all 12 farmers were satisfied with the quality of the short course. Ten farmers stated the contents of the course were what they expected. Another said it was more than he expected, and another said it was partly what he expected.

It was interesting to note that researchers and Extension/Productivity Board staff feel there is a need for farmers to be able to interpret soil tests, determine fertiliser requirements and calibrate a fertiliser box. However two farmers indicated that they found the calibration exercise to be least useful. However the remaining 10 farmers did find the practical useful. One of the two participants who suggested they did not need the calibration practical session was also a fellow who indicated he might not be able to calibrate his own box now. All other farmers indicated that they could calibrate their own fertiliser boxes now.

Most participants agreed that the soil test interpretation practical, and the fertiliser box calibration practical were useful. Nine participants said they would take more soil tests, with

no participants suggesting that they would not take soil tests. The majority agreed that they could calibrate their own fertiliser box now.

Overall, the feedback from each of the pilot courses was positive and constructive. Comments were very encouraging. We are satisfied that the course is answering what is required and meeting the needs of the farming community.

6.0 IMPACTS AND BENEFITS TO THE SUGAR INDUSTRY

It is vital that a complete and consistent message be conveyed by the CRC to technical advisory personnel via the Sustainable Nutrient Management in Sugarcane Production Short Course. It is thus equally important that the Maintaining Soil Fertility Short Course conveys the same messages through to cane farmers.

It is forecast that canegrowers as a result of attendance at this soil fertility course will demonstrate improved fertiliser use and environmental awareness. Reduced offsite impacts associated with more sustainable production will occur if the farming community as a whole adheres to recommended rates.

This course attempts to improve knowledge and understanding by canegrowers of their fertiliser practices and enable them to make informed management decisions on fertiliser strategies. The course addresses soil type requirements through improved fertiliser use efficiency and balanced crop nutrition. The ultimate benefits are reduced production costs and reduced offsite impacts.

A training course such as this is a step forward for the sugar industry to ensure that growers become more efficient users of nutrients and to prevent long-term environmental repercussions. Fertilising needs fine-tuning and an educational package for cane growers on efficient nutrient management is a step towards achieving a sustainable farming system.

7.0 PROJECT TECHNOLOGY

There are no commercially significant developments, patents or licences associated with this project.

8.0 OTHER TECHNICAL INFORMATION

There are no other technical developments or discoveries in methodology or equipment design associated with this project.

9.0 FURTHER ACTIVITIES TO DISSEMINATE THE PROJECT TECHNOLOGY

It is intended that extension specialists will be chosen and trained for course delivery to canegrowers in all mill areas of Queensland and New South Wales. Funding for this training will come from this project, as monies remaining can be allocated toward this.

Funding to conduct courses for cane farmers in 2000 and thereafter will be provided by SRDC project BS176 – Optimisation of nutrient management in catchments of the Queensland sugar industry.

10.0 ACKNOWLEDGEMENTS

The authors acknowledge BSES and the Sugar Research and Development Corporation for funding the Maintaining Soil Fertility Course.

The authors also wish to thank various BSES staff for supplying information and suggestions, proof reading the draft course manual, planning the layout, and printing copies of the manual. They include Rick Beattie, John Reghenzani, Annette Vandermaat, Sally Maher, Yvette Contarino, Anna Marie Di Bella, Graham Kingston and Ingrid Christiansen.

Cartoons were sketched by Harry Bruce.

The authors also wish to acknowledge people who participated in the pilot courses. These include cane farmers from the Herbert River district, BSES, Mackay CPPB, CRC, CSIRO, Growforce, Pivot, Incitec and Summit. The authors appreciate all of their contributions.

The authors also wish to acknowledge Growforce, Pivot, Incitec, Summit and the Queensland Sugar Corporation for their contributions of fertiliser samples and literature for participants to take home from the courses.

11.0 PUBLICATIONS

BSES (1999). Maintaining Soil Fertility compiled by Kylie Webster and Trevor Willcox.

APPENDIX 1



PHOTOGRAPH 1

HODGE FERTILISER BOX



PHOTOGRAPH 2

PARTICIPANTS INTERPRETING A SOIL TEST AT THE INGHAM PILOT COURSE. RICK BEATTIE (SENIOR EXTENSION OFFICER, INGHAM) IS LEADING THE SESSION.



PHOTOGRAPH 3

FARMERS CALIBRATING THE FERTILISER BOX AT THE INGHAM PILOT COURSE.



PHOTOGRAPH 4

PIVOT AND INCITEC REPRESENTATIVES COLLECTING FERTILISER WHILST CALIBRATING THE BOX. GREG SHANNON (EXTENSION OFFICER, INGHAM) LOOKS ON.



PHOTOGRAPH 5

TREVOR WILLCOX (PRINCIPAL EXTENSION OFFICER MACKAY) AND A SUMMIT REPRESENTATIVE PLACING FERTILISER IN THE BOX WHILST A GROWFORCE REPRESENTATIVE TAKES NOTES IN THE BACKGROUND.



PHOTOGRAPH 6

DAVID CALCINO (SENIOR EXTENSION OFFICER, MERINGA) ASSISTING WITH THE CALIBRATION EXERCISE.



PHOTOGRAPH 7

GRAHAM KINGSTON (PRINCIPAL RESEARCH OFFICER, BUNDABERG) MEASURING THE DISTANCE REQUIRED TO CALIBRATE THE FERTILISER BOX.



PHOTOGRAPH 8

PARTICIPANTS AT THE FINAL PILOT COURSE HELD AT CSIRO DAVIES LABORATORIES IN TOWNSVILLE COLLECTING FERTILISER DURING THE CALIBRATION EXERCISE.

APPENDIX 2



EVALUATION SHEET
 MAINTAINING SOIL FERTILITY
 A SHORT COURSE FOR CANE FARMERS

Yes	Partly	No	Not Sure
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(✓ please tick the appropriate boxes below)

1A. I now have a better understanding of:				
Essential Nutrients				
Balanced Nutrition				
Other factors affecting soil fertility -				
Soil Organic Matter				
Soil Tilth				
Drainage				
Heavy Metals				
Pathogens (Pests & Diseases)				
PH				
Salinity				
Sodicity				

** Complete 1A before morning tea **

1B. I now have a better understanding of:				
Soil Types and Fertiliser Requirements				
Fertiliser Types, Timing & Placement				
Nutrient Uptake, Cycles & Loss Pathways				
Minimising Off-Site Environmental Effects				
Avoiding Risk				

** Complete 1B before lunch **

** Complete remainder of evaluation sheet at end of course **

1C. I now have a better understanding of:				
Soil Testing				
Current Practices/Opportunities for Improved Nutrient Management				
Fertiliser Recommendations based on Soil Test Interpretations				
How to calibrate a Fertiliser Box				

2. The content of this short course was what I expected				
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3. Overall, I was satisfied with the quality of the short course				
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4. Which parts did you find most useful in the short course?

5. Which parts did you find least useful in the short course?

6. Did you find the soil test interpretation practical session useful?

Yes	Partly	No	Not Sure

7. Did you find the fertiliser box calibration practical session useful?

Yes	Partly	No	Not Sure

8. Would you take more soil tests now to better tailor your fertilising?

Yes	No	Maybe

9. Could you calibrate your own fertiliser box now?

Yes	No	Maybe

10. What suggestions do you have for improving this short course?

11. Are there any other comments you would like to make?

Thank you for providing BSES with this feedback