

THE WINSTON CHURCHILL MEMORIAL TRUST

CHURCHILL FELLOWSHIP 2007

**INNOVATIVE PROCESSES TO IMPROVE THE HEALTH AND
PRODUCTIVITY OF SANDY SOILS**

**“an hour in the garden is better than an hour in a queue”
Winston Churchill**

Roger Grocock
P.O. Box 484
Bordertown SA 5268
Ph: 08 8754 6025
Fax: 08 8754 6025
Email: grooks@lm.net.au

I understand that the Churchill Trust may publish this Report, either in hard copy or on the internet or both, and consent to such publication.

I indemnify the Churchill Trust against any loss, costs or damages it may suffer arising out of any claim or proceedings made against the Trust in respect of or arising out of the publication of any report submitted to the Trust and which the Trust places on a website for access over the internet.

I also warrant that my final Report is original and does not infringe the copyright of any person, or contain anything which is, or the incorporation of which into the Final Report is, actionable for defamation, a breach of any privacy law or obligation, breach of confidence, contempt of court, passing-off or contravention of any other private right or of any law.

Signed: RHL Grocock

Dated 1/1/2008

CONTENTS

CHURCHILL FELLOWSHIP	1
INTRODUCTION	3
ACKNOWLEDGEMENTS	3
EXECUTIVE SUMMARY	4
FELLOWSHIP PROJECT	4
FELLOWSHIP HIGHLIGHTS	4
DISSEMINATION	4
BACKGROUND	5
FINDINGS	6 & 7
CONCLUSION	8
RECOMMENDATIONS	8

INTRODUCTION

The productivity of sandy soils in South Australia has increased as a result of farmers mixing some subsoil clay into their previously water repellent sandy soil.

As Europe and UK have a much longer history of such activity, the prospect of investigating this subject in these countries is very exciting.

Specific study aspects:

1. Physical improvement in the soil profile.
2. Improved nutrient availability for plants.
3. Biological activity.
4. To learn what products could be mixed in the soil for greater benefit.
5. Machinery for mixing the soil profile up to 1 meter deep.

ACKNOWLEDGEMENTS

I wish to acknowledge and sincerely thank The Badman Family for sponsoring the Winston Churchill Memorial Trust Fellowship which has facilitated an exciting study opportunity overseas. The efforts and willingness of many overseas people to show and share their knowledge with me is much appreciated.

The research persons, Dr Dan Murphy WA, Dr Paul Blackwell WA, and Dr Melissa Cann Victoria, for helping with introductions to researchers overseas, thank you.

I thank my wife Sue, and our family for their enthusiastic support through out the process. To the neighbours and friends who looked after the farm while Sue and I were away, your efforts have been invaluable, thank you.

Thanks also to:

Gardner Willis	Charleston South Carolina USA
Heidi Jorgensen and family	Skibby Denmark
Flemming Lassen and family	Nimtofte Denmark
Stig Andersen	Overgaard gods (estate)Denmark
Hans Gockel and family	Groenlo The Netherlands
Rob Baken and Felix Peters	Imants company Reusel The Netherlands
Geert Van Meensel	DCM The Netherlands
Dr Andy McDonald	Rothamsted UK
Dr David Hatch	Okehampden UK
Professor R.J. Godwin	Cranfield University UK
Retired Professor Gordon Spoor	Cranfield University UK

For their time, hospitality, friendship, and help with co-ordinating visits to local places of interest and people willing to share their wealth of knowledge.

EXECUTIVE SUMMARY

Name: Roger Grocock
Address: PO Box 484, Bordertown, SA 5268
Occupation: Farmer.
Contact: Ph: 08 8754 6025
Fax: 08 8754 6025
Email: grooks@lm.net.au

FELLOWSHIP PROJECT

The Ron Badman Family Churchill Fellowship enabled a very informative study tour to visit and talk with land managers, researchers and machinery manufacturers who have been very successful in innovative processes to improve the health and productivity of sandy soils.

FELLOWSHIP HIGHLIGHTS

1. To see, in South Carolina, seedbed preparation in a single pass by an Imants spader machine, burying 150 mm of high green grass into 450 mm soil leaving a firm soil with only 20-30 mm of loose soil. Thanks to Gardner Willis.
2. To view deep sandy soil, reclaimed from the sea, and hear just how productive it is now, from Stig Andersen, the Director at Overgaard Gods (estate) in Denmark.
3. To observe tillage machinery demonstrations at Oudenaarde in Belgium.
4. To walk over long term trial sites at Rothamsted where there are both grain and pasture trials set up 160 years ago by Lowes and Gilbert. Dr Andy McDonald gave very informative descriptions and examples of the relevance of long term data base.
5. To talk with Professor Dick Godwin and Retired Professor Gordon Spoor at Cranfield University UK about delver tyne design.

DISSEMINATION

Management of four key requirements for plant growth need careful attention. The sunlight and rain we receive, we cannot do much about, but the soil physical condition and nutritional balance and availability we can manipulate, which does have an effect on the other two ingredients.

- Soil pH needs to be in the desirable zone of 6-7.
- Our organic carbon levels could be higher

I was invited to speak to the MacKillop Management Group in early November 2007, and have been involved with the Rural Solutions Field Day in December 2007, at Naracoorte South Australia.

We have imported a soil mixing spader machine which I hope to trial and demonstrate to interested farmer groups in SA.

I will be contributing to written articles in agricultural magazines about my overseas findings and future trials that are planned.

BACKGROUND

This Churchill Fellowship was planned to look at innovations by agriculturalists in Europe, where they are improving the productivity and health in sandy soils.

Between the years 1985 to 1992 we hosted several Agricultural exchange students from Europe and Canada. Throughout their stay with us they talked about their family farming systems and about the soil amelioration activity that previous generations had done. An old saying passed down through generations of Danish farmers is “You lime the country for yourself and marl (clay) it for your grandchildren.”

The development of the delver tyne soil mixing process in the upper South East of South Australia has been very productive. This information came to light in about 1990 after I read some research papers written by G. Spoor and R.J.Godwin from Cranfield University in UK.

Hans Gockel, a Dutch backpacker visiting Australia in 2003, who drove our tractors and soil mixing equipment, suggested there was a better machine for this job in the Netherlands. It was called an Imants Spader.

Wanting to keep improving and keep up with developments in Europe, UK and USA I developed a strong desire to visit and see how those people are dealing with the key constraints to productivity and soil health.

The key constraints dealt with continually are:

1. pH of the soil
2. Nutrition available in the plant root zone
3. Plant available water management
4. Efficient systems while looking forward to maintaining sustainability.

FINDINGS

DENMARK

The sandy soils at Overgaard Gods (estate), which have been reclaimed from the sea, were extremely acid - pH 2.3 to 3, very fine textured sand, and very susceptible to wind erosion.

Stig Andersen, the manager there, says that the amelioration process of lime, deep delving (ripping) as well as adding large amounts of compost material over time has brought this country to a highly productive state.

The regular monitoring of the drainage system to control the ground water salinity was also an integral part of the system.

Production of 8.3 T/Ha of wheat and 6 T/Ha of beans are now being achieved.

The high producing corn crop was fertilized by composted sewage sludge on the farm and this crop will be put into an energy production plant. The gases produced are used for electricity production or heating.

Animal waste treatment plants (to maximize the benefit in disposal) are becoming more common. Gas extraction, then composting the solid waste into fertilizer which is spread over the land by the farmers, completes an efficient system with no waste.

If a farmer wishes to increase the size of his dairy or piggery the Government requires a written agreement establishing where the waste will go before approval is granted.

Burning baled straw for heating, using a heat exchange system to heat a large number of houses, was interesting but not applicable to Australia. The large amount of animal manure compost replaced the organic carbon lost in the straw removal from the paddock. The focus was to use what is local but still maintain the organic carbon level in the soil - this is closely monitored. This is also relevant to Australia.

This system was well illustrated in Nimtofte, Denmark where a local farmer and contractor, Kristian Thorsen, built the plant for the local community. A community board controls the distribution system for the village.

The attention to detail in feeding the livestock intensively produces composted material which has a good balance of nutrients. Manganese was one element of concern. In the past over use of some elements has caused some pollution on farms and waterways.

Danish soil testing at Flemming Lassen's farm was detailed and done to a grid pattern. Direct comparison with the last test done was viewed as important. Low pH areas were identified and applications of lime per hectare were adjusted by variable rates via the GPS system.

Short term 2-4 years forestry (Christmas tree market) was an interesting alternative land use, effectively spelling some land from pasture, wheat, corn rotation while still giving good profits.

THE NETHERLANDS and BELGIUM

Once into the Netherlands / Belgium area, meeting farmers, machinery manufacturers and farm advisors at a huge field day at Oudenaard gave an insight into how serious

the Dutch are about physical properties of the soil and what they do about plant water management. Drainage with minimal nutrient loss is a big issue. Many implements able to bury manure or compost were on show.

The spader machine's ability to effectively mix straw, green material and/or fertilizer evenly throughout the profile depth of cultivation up to 400 mm deep was impressive. One of these would be useful in Australia especially for clay incorporation.

The field day was very well set out with lots of demonstrations and static displays.

The latest innovations for agriculture were enthusiastically displayed, and also energy generation industry was a strong focus.

Talking to a company representative who renovates sports grounds, the spader was an important tool to mix added soil ameliorants, aerate the soil, give future drainage and promote quick turf growth, minimizing time out.

A dairy – cheese making enterprise set up to cater for tourist and local visitors had many interesting activities to entertain and help educate the public about dairy farming.

UNITED KINGDOM

While visiting the Churchill Museum and Cabinet War Rooms in London we saw a special display and memorial to the food production by the people of London during the war." Dig for Victory" was Winston Churchill's initiative during the war. He encouraged everyone to grow as much food as possible, and by 1942 there were 1.4 million garden plots and over one million tons of vegetables were produced each year, successfully transforming agriculture in Britain from dependency to self sufficiency. Sir Winston Churchill's quote "An hour in the garden is better than an hour in a queue" had a big impact. The people felt useful and the fresh food improved the health of all the people.

Moving onto Rothamsted, UK where Dr. Andy McDonald gave a very informative. Andy spoke about the benefits of having 160 years of detailed soil and plant samples. As testing techniques have developed, today this facility is used by scientists throughout the world checking environmental impacts on soils of world events and farmer long term practice. Illustrations given:

- Sulphur pollution from industry and its effect on soil.
- Liming effect on production
- Stabilizing soil pH at 6-7, then recording the differences in production and plant species survival. This could be of interest to Upper South East farmers.

At Okehampton UK, where there are long term permanent pasture drainage trials, David Hatch gave a summary on what has been discovered about water management in a 1200mm rainfall area. Timing of fertilizer application between rainfall events and ground cover (grass height) had been shown to be crucial to control nutrient removal with water. The research showed that the benefit of tile drains was doubtful.

The research effort by IGER – North Wyke is also looking at energy production and efficiency. It will be interesting to follow the progress. Examples are:

- Biofuel production from a perennial plant source.
- Biogas for agriculture
- How energy production is going to impact on food production – potentially better outcomes for farmers.

Meeting with Retired Professor Gordon Spoor and Professor Dick Godwin at Cranfield University UK was short but very valuable. Their research many years ago into delving tyne design has been incorporated into machinery design here in Australia. Discussions on improvements to delver tyne shape was valuable and requires further investigation. The aim is to improve sub soil movement and mixing within the soil profile to a depth of 0.5 to 1 meter without extra power required. The simple approach of doing the treatment then digging up the soil to observe what has happened was impressed upon me. This is something I've been doing for years and it was good to have its value confirmed by the professionals!

CONCLUSION

Exchanging contact details with these wonderful people during the six week study tour will maintain connections into the future.

Some people expressed a desire to visit Australia and experience our agricultural environment.

People value the connections with Australian research effort.

Some environmental and community regulations are a risk to efficient and profitable farm business. Farmers need to be involved at all levels of discussion.

The challenges of pro-active, sensible innovation and adoption for agriculture will be exciting. The delver and the spader both have a useful place in mixing the soil.

The importance of maintaining the soil pH in the ideal range of 6-7 which helps biological activity and nutrient availability. It is also important to monitor the organic carbon levels.

Farmers have a great role to play. We need to communicate a professional approach to advancing agriculture while being environmentally sustainable into the future.

RECOMMENDATIONS

- 1 Help farmers better understand the physical and chemical properties of their soil profiles.
2. For farmers to record the pH and carbon levels in the soil to track progress and to develop a practice of measuring the nutrient balance of the produce that leaves the farm.
3. To investigate what soils would benefit from mixing the soil profile to depth, enhancing soil health and production.
4. To investigate how the application of nutrients to the soil will improve nutritional value through to the end user (humans).
5. Farmer bodies need to draw together agricultural science and medical science to promote Healthy People from Healthy Food from Healthy Soils.