



Australian Nuffield Farming Scholars Association

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Subject:

**ZERO TILL FARMING
TECHNOLOGY AND INNOVATION**

by

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**1997 AUSTRALIAN NUFFIELD FARMING
SCHOLAR**

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THE ASSOCIATION'S MISSION

The Australian Nuffield Farming Scholars Association promotes excellence in all aspects of Australian agricultural production, distribution and management through the adoption of local and international best practice and the continuous development of a unique network of industry leaders and innovators.

ACKNOWLEDGMENTS

To begin with I would like to thank my wife Liz, for encouraging me to apply for the scholarship, at a time when we had just discovered that we were about to start a family.

Fortunately, little Lucy arrived 6 weeks early, so that I could spend some time with them, before seemingly deserting them for an adventure that would take me off round the world for a period of five months.

I seem to spend my lifetime thanking my family for the opportunities I have been given, and once again I thank my brother Gordon and his wife Anne for allowing me to leave the business for an extended period, all the while knowing that it is in excellent hands. Without them this trip would never have been possible.

There are many others to thank for their hospitality in England, France, USA and Canada. The group of Nuffield scholars that I travelled with made the trip mind stimulating and at times heaps of fun.

In addition I need to especially thank the sponsors of my scholarship, being QANTAS who provided my air travel and PIBA, Gresham Partners and Wesfarmers who provided cash contributions to fund my travels. The Nuffield Scholarship is not something you learn it is truly a unique experience.

THE STUDY

My wife Liz and I are involved in a family partnership with my brother Gordon and his wife Anne. My parents who initially set up the business are now silent partners and are pursuing other interests.

We are predominantly grain producers, with some beef. Our farm is managed under a zero-till farming system, which by definition means no tillage. The only time that we disturb the soil is to place a seed into it, to grow the next crop.

Zero-till was first attempted in the 1970's, when chemicals for complete weed control were virtually non-existent, planting machinery was the old converted combine, the sprayer was one that Granddad bought, and the nozzles in it were the ones out of the gas burner. This was also the time that the only fertilizer required was an extra cultivation pass, which used to add a bag to the acre of yield.

The early innovators were laughed at, but with persistence and improved technology, mainly chemicals, fertilizer, and planting technology, zero-till has become the most sustainable farming system that we know today.

Erosion control was the original motivator on our farm, in conjunction with strip cropping, and a strict cropping rotation. As time has gone on, many other benefits have arisen from the system, such as better utilization of moisture, build up of organic matter, an increasing number of earthworms and other microorganisms, and general improved soil health. This in turn has led to higher yields in good rainfall years and average yields in poor rainfall years. It is a system that works with nature and not against it.

With this in mind, the purpose of my study was to look at the zero-till systems of the countries I visited, and also to look at any technology that they may be using that is advanced to ours.

I visited France, Hungary, the United Kingdom, the USA and Canada specifically to study their zero till farming systems. This report attempts to give a brief summary of what I saw and how I believe it can influence our farm and the wider community.

ZERO-TILL: ENGLAND AND FRANCE

"Necessity brings about change, and when you are being paid @ \$ 250.00 AUD per acre just for trying, then why change? And when you've grown up with a system that keeps you financially secure no matter what you do, then you just keep doing what you have been doing"

This comment is probably unfair to a percentage of English and French farmers, but in the main it is accurate.

The European Union farms under a system of acreage payments and a guaranteed minimum price for whatever they produce. This guaranteed price is supposedly being phased out under Agenda 2000. This is the new policy drawn up in conjunction with the World Trade Organisation. This means that they must now operate on the world price. I believe this will lead to two reactions:

1. The innovative farmers, of whom I met many, will be looking at farming better and more cost effectively.
2. The other farmers will be putting their hands out for another payment of some sort.

Zero-till in the UK and France, for reasons stated above, has been stagnated. There are no major erosion problems, and little or no moisture problems, but in saying that, soil structure decline, compaction, and rising input costs are all issues that will need to be addressed. They currently farm on a very high input system, and maybe this will have to change under world market prices and environmental considerations.

Some farmers are experimenting with direct seeding of Canola with the combine harvester. That is the seed is spread with the header on top of the ground, covered with fine straw from the chopper, and then it needs rain. In Scotland one farmer told me that even heavy dew was enough to germinate the crop. I saw some excellent crops seeded this way and I also saw some ordinary crops. It is a bit hit and miss, but it saves two passes over the field, and puts the crop two weeks forward of conventionally planted crops.

Some wheat has been direct drilled in the past, but has not yielded as high as conventionally tilled. Slugs have also been a problem but there is thinking now that slugs like living in loosely tilled soils so under a reduced till system perhaps they wouldn't thrive as much. Another aspect is the community's acceptance of chemical farming, considering that farming in England is like farming in the main street of town. To give an example of this, prior to defoliating of potatoes the farmer has to advertise by signs his intentions. This invariably leads to a string of complaints.

The French on the other hand have been running zero-till trials and are starting to have positive yield results on wheat over conventional cultivation. Many French researchers have spent time in Canada looking at their farming systems and machinery.

ZERO-TILL U.S.A.

The United States used to be the role model that Australian farmers judged themselves against. It was always the leading light on innovation, both in conventional farming and zero- or minimum-till. I believe we are catching up fast and in some areas we have overtaken them.

One American has been quoted to say that "If God had wanted us to zero-till then John Deere would have built me a drill!!!"

This statement is even more relevant today, with the machinery manufacturer virtually dictating to American farmers how their farming systems will progress. John Deere has now built a drill but it has done it through sufferance. The machinery companies see zero till as a threat to sales of conventional cultivation equipment.

The USA, being so vast, runs at least three different zero-till systems. From corn and beans in Iowa/Illinois cornbelt region, which is without doubt one of the simplest and sustainable farming systems that I have ever seen, to wheat/sorghum or corn in the states of Kansas, Nebraska and Missouri. The corn belt system which includes a legume as well as utilising the hog manure as a form of fertiliser is low cost and then they have a winter that freezes the ground supposedly repairing compaction and meaning that weed control by chemical means is minimal. Further west in the dryer areas the system is a traditional 3-year rotation with 2 crops in three years with the wheat stubble being kept after harvest through to the next spring. Conventional cultivation via offsets and secondary cultivation take over from the end of the summer crop (corn/sorghum). Work is currently being done to incorporate a legume into the system to grow 3 crops in 3 years.

Some questions need to be asked about the motives of zero-till in the States, because it is directly linked to the farm programme. You either have to adopt the farming practice, or you are ineligible for the area payments (around US\$40/acre).

There seems to be a reliance on residual herbicides, locking them into a particular crop, mainly because the patent has not come off Round Up, so they are paying around US\$40 per gallon, which is around AUS\$14 per litre. In Australia we pay around AUS\$6.50 per litre. There are no generic brands of Round Up in the USA. They mainly use 360 Round Up at a minimum rate of 1.2 litres to the hectare, with at least 80-100 litres of water to the hectare.

Thinking hypothetically about the WTO and the reduction of the Export Enhancement Program, grain farmers in the United States may have to look at lower cost farming to survive with their current operations. But as shown recently politics can interfere with agricultural policy at any time.

Monsanto's answer to the patent coming off Round Up in the year 2000 was to alter plant varieties so they are Round Up resistant. To grow these crops farmers need to sign a legal document to say that they will only use Monsanto Round Up and at the rates on the agreement regardless of weed density and spectrum. Many farmers

saw that the only way to Zero till was with Round Up Ready crops. Monsanto gets the marketing prize for this one.

From my perspective the longer farmers in the United States continue to farm the way that Grandad did the better off we will be here. Currently Kansas produces more wheat than all of Australia, under improved farming systems who knows how much grain they would produce. Using our yields as a gauge and the percentage increases since moving to a zero till system, the Kansas wheat crop could increase by between three and six million tonnes. Not a positive scenario in today's over supplied world.

ZERO-TILL CANADA

Zero-till in Canada came about due to climatic conditions. Dry seasons, wind erosion, torrential downpours and water erosion saw the land in Saskatchewan virtually disappearing with no residue to protect the soil from the wind and water.

This led to farmers retaining their residues after harvest in the fall, to help reduce both wind and water erosion. Depending on the farming system, i.e. whether the farmer is a 50/50 farmer, meaning he only grows one crop every two years, or as most are now they run at around 80%, so they have some summer fallow to help break weed and disease cycles.

The zero-till winter fallow is where they are gaining the most benefit, by catching the snow in the winter and keeping it at an even depth. This does two things:

1. If the snow comes before the freeze it helps to insulate the ground therefore the ground does not freeze as deep, and
2. Because the snow is even on the ground it helps even out the infiltration of the moisture into the soil.

The cost of the fallow is minimal, because the cold fixes most weeds, disease, insects' etc. The only real cost comes through the summer, but still the weeds only have 120 days to grow, so the fallows are very cost effective, compared to those in Australia.

There is also a serious commitment from the Federal and Provincial governments to fund various agreements in relation to Soil Conservation and sustainable farming practices.

Machinery companies have moved with the times, through innovation and from farmers selling their ideas to larger companies (Flexi-coil, Bourgault etc). This has led to a wide range of zero-till equipment that works well in small amounts of residue and has reasonable depth control. Canada has moved in the same direction as Australian zero-till farmers, because they have to get better at how they farm just to be profitable. Like Australia, zero-till has led to many more benefits rather than just soil erosion. Any environment where moisture is the limiting factor should be using zero-till farming systems.

Crop rotation has also played its part in the advancement of zero till in Canada, with the introduction of more specialised crops such as field peas, lentils and linseed. These crops have become even more important since the Canadian government has removed all grain freight subsidies (previously known as the crow rate). In the past the government had subsidised the transportation of bulk grains to the ports.

The latest information to come out of Canada regarding zero till is a push for carbon credits from the manufacturing industry. There is ample evidence that residues kept on the surface absorb carbon from the atmosphere, so there is an aim to either extract a monetary payment from manufacturing firms or gain similar support from government. It is all linked with greenhouse gasses and global warming.

SPRAYING

Spraying technology is moving along as zero-till continues to expand. Also, a lot of general farming technology can be adapted to fit the zero-till farming system. For instance in England they are looking to achieve greater coverage of plant tissue with fungicide. This has led to the development of Airtec spray nozzles, which mix air and water in the nozzle. This reduces drift and increases coverage because the droplets are hollow and they explode on impact. Normal hydraulic nozzles lose about 50% due to run-off from the target. This reduction of drift and better target application are both benefits for zero-till.

As well as this there is also a whole range of venturi type nozzles that suck air into the nozzle body itself. Some are designed for low pressure, some for high pressure, but as a rule they all mix air with the liquid to create hollow droplets that are heavier, and explode on impact giving better coverage on the leaf. Also due to the droplet size and weight these nozzles help to substantially reduce drift. Any nozzle that leads to greater coverage is an advantage, to allow optimum efficiency in the chemical.

On discussion with Dr. Paul Millar in England, who has tested all the latest nozzles, he believes the Airtec is the most adaptable system to agriculture. But like all technology, it has to be weighed up against economical return. The newer Venturi nozzles only cost slightly more than the conventional hydraulic nozzles, and according to Dr. Tom Wolfe, of the University of Saskatoon, Saskatchewan, they will do just as good a job as the Airtec.

He believes the Turbo Drop XL nozzle, manufactured by Lurmark, to be the best at coverage and reducing drift, especially when using just Round Up.

Dr. Wolfe has done a lot of research into nozzle droplet behaviour, and made the comment that fine droplets will tend to float, with no inertia, and they usually find it easier to attach to upright surfaces. Fine droplets sprayed into a broadleaf crop will tend to float around and between leaves. On the other hand coarser droplets tend to attach better to broadleaf crops, and not as well to upright grass type crops.

I also investigated the Energised Spraying Process (ESP) which has been developed by Spra-Coupe. This is a system that enables 4 times the coverage on the top side of the leaf and 3 times the coverage on the bottom side of the leaf than conventional nozzles. It has two areas that require further comment: Firstly, the droplets are quite fine, and even though they are charged, they will not attract until they are within 0.5 – 1.0 cm of their target. Prior to this the droplets are as prone to drift as any other nozzle droplet. Secondly, plants have the ability to produce their own charge, which can be used to repel any charged droplet heading their way. This is known as the Corona effect and at slow spraying speeds has affected results. The upside is that work also done by Dr. Wolfe has shown that chemical rates can be reduced by two thirds. This can lead to substantial savings.

Without a doubt the most exciting spraying technology that I saw was Patchen Weed Seeker spray system which has been developed in Silicon Valley, California. This technology is very similar to the Detect Spray system that was developed in Australia in the late 1980's. The fundamental difference is that the Patchen uses an artificial light source, meaning that the system can be used at any time of day, in the dark or even under hoods for selective shielded spraying. As well as this it has the ability to detect smaller weeds than the detect spray system.

We own a Detect Spray system now and are very aware of the beneficial savings to be gained if you only spray the green weeds. Using the Detect Spray in our farming system we have saved up to 85 % of the chemical we would have used if we had used a conventional sprayer. It works by emitting thousands of light beams a second, and just as quickly reads their reflection to "see" the chlorophyll in the weeds. If it "sees" a weed it will send a message to the solenoid, which then turns on to spray the weed.

The importance of this technology cannot be overstated. There is nothing else on the market at the moment that has so much to offer the zero till farming system. Benefits are:

1. Chemical cost savings
2. Sustainable use of agricultural chemicals, and
3. A reduced input farming system.

Technology like this is expensive, but the paybacks far outweigh the initial capital cost. Farmers as a rule spend a lot of money on machinery that from day one of purchase begins to devalue, this technology will not increase in value but will conservatively reduce chemical costs by between 40 and 70% annually.

LONG TERM TRIALS

One of my most comforting meetings was with a Research Scientist at North Platte in Nebraska. Gail Wicks has been doing zero-till trials and demonstrations on the same block of land since 1962. They did a comparison of conventional versus no-till (eco-till) for 18 years, and the experiment still continues to this date. That means the field has now been under zero-till for 36 years, using only chemicals to control weeds in a rotation of wheat, sorghum, and fallow.

The results were that the no-till plots yielded higher for wheat and sorghum, they had higher residues left on the surface and lower weed yields. The only thing to change in the soil throughout the time was the soil surface pH in the no-till plots was significantly lower than in the tilled, mainly because the soil was not being mixed. This is also caused by the increased use of N fertilizer. The pH in the 0-15 cm band decreased from 7.2 in 1962 to 5.5 in 1985.

This may have ramifications for Australia generally, and on the Liverpool Plains where the soil pH is alkaline, it will need to be watched closely.

The interesting point on soil organic matter was that there was no increase or decrease in any of the treatments. This is something that needs further research on Australian soils, especially considering the comments to come out of the research in that there was visibly more surface residue. The prevalence of earthworms in the soil was also exciting and encouraging.

On meeting with another long-term no-tiller in Kansas, Virgil Simson, he told me that he has seen no problems with 30 years of no-till, but he is using a full disturbance planter. This is partly as he has some very hard to kill grass weeds, and he also likes to have the wheat evenly spaced, not in rows, so he spreads it under 16 inch sweeps, deflecting off a PVC fitting bent out of shape. This also helps to spread the fertilizer from the seed.

To expand on the full disturbance for weed control, he did say that Round Up would kill the grass, but only at very high rates, which at the price they have to pay for Round Up is uneconomical, unless they could use some type of spot sprayer.

An interesting comment, also from Gail Wicks, was that most of the weeds in the zero-till plots were "volunteer" plants from the previous crops. This is also a common problem in rotations in Australia. An interesting sideline to this is the availability of what is known as "killer gene". What this means is that this can be bred into the seed, so that that seed can only germinate once at the time of planting. This also has some rather large negatives, being that we could only use new seed, no farmers would be able to keep home-grown seed, and the risk of spreading to other flowering crops and rendering the seed useless. But if it were available it would reduce weed control in the fallow substantially. Existing hybrid crops could definitely be a possibility, because we have to use hybrid seed anyway.

Apparently Monsanto Ltd. Are the only company so far to have access to this gene. On the topic at large chemical companies, Monsanto etc. and the influx of "genetically matched" crops to chemicals. This is something that zero-till farmers will have to watch with anticipation and caution in the next 5 to 10 years, because if Round Up ready crops become the norm, we will have to make sure there are other chemicals available so that we can control volunteer growth. Round Up or Glyphosphate is the key to zero-till farming in Australia, and the world for that matter, so it is important that it does not become our only chemical, otherwise resistance and other unknown problems may occur.

Another interesting topic to arise was the use of nitrogen fertilizer, and maybe more importantly, the actual type of Nitrogen fertilizer used. There have been a lot of rumours about different forms of Nitrogen fertilizer and their effects on the soil. Kansas State University did a trial over 20 years using granular(46%N), liquid(28%N), and Anhydrous Ammonia(82%N) and there was no difference in soil structure, plant growth, pH, microbial activity or organic matter. The conclusion to the study was that Nitrogen did have an effect on the soil, but it did not matter in what form it was applied.

AGRICULTURAL SUBSIDIES – THE COLD WAR OF AGRICULTURE

One cannot visit Europe, the United Kingdom, and the United States and visit farms in all areas, and not develop an opinion on agricultural subsidies.

To begin with, the Common Agricultural Policy in Europe has very little to do with Agriculture, and more to do with peace. The word "common" is the key word. Agriculture was the only thing that all European countries had in common. History shows us that friendship and a general peaceful existence in Europe has been unheard of for centuries.

Since the end of World War II, this has been the longest period of peaceful co-existence in the member nations' history. Agricultural subsidies are here to stay. There is talk of attempting to decouple payments from production, through the already existing area payments for grain crops. I find it difficult to see. If you will be paid so many dollars per acre to grow wheat then you will grow wheat, regardless of the market potential.

At a meeting we had in Brussels, the head of the Farmers Union of Europe said to us, "What will we do with all these people if we let farms get bigger and more efficient, where will they work?" Thus, the Agricultural Policy is keeping the peasant society alive. They have just enough to survive, so in that case it is also becoming a social policy.

One wonders about the CAP – even though it makes no logical or economical sense, if you could abolish it what would you do with all the people?

To continue, there are 370 million people in the Common Market. They can afford the subsidies, so why not keep them? My point of view is simple; they can have all the subsidy payments they want if it was all kept in house. The problem we have is when this so called surplus that is decoupled from production has to be dumped on the world market, prices suffer globally.

One French farmer told me "we cannot survive without support, it is the US that is creating the problems, we would not be profitable". He farms 600 hectares, which is a large farm in French terms. His machinery inventory filled three barns 80 feet by 50 feet. Estimated value of AUS\$1.8 million, he had two 36 metre self-propelled boom sprays. In two 10-hour days, he could spray the whole farm twice, using 150 to 200 litres of water to the hectare. Machinery manufactures are very much in favour of Agricultural Subsidies.

Some would argue that Ag payments only add to the cost of production, and in some cases I do agree with this. Input costs in the United Kingdom are higher for some products than in Australia. An example of this is the price of a John Deere 6400 tractor made in Germany is the same landed in the UK as it is in Australia. Products are priced at what the market will bear.

The English and European farmers are in a very high input system, with, in our terms, exceptional yields of 3-4 tonnes per acre. This has come about for a number of reasons, but in reality it is costing them between 3-4 tonnes per acre to grow. I was told on countless occasions by UK grain farmers "that the only profit I will make this year is the subsidy cheque"

In the US the Freedom to Farm Legislation has had a dramatic influence on what crops are now planted and where, and this is having a considerable effect on world grain markets. In effect, what is happening is that the cornbelt is shifting westwards and northwards. No one had exact figures, but there is a substantial acreage of corn being grown in Kansas this year, a traditional wheat state.

This is what happens when governments' control is relaxed. This is a good thing, but it will take a number of years to level out. This in turn will make it increasingly difficult to market our Australian grain, due to huge fluctuations in the market place.

Because of support, the majority of farmers in subsidised farming environments don't really understand that you need an end user for your product.

BUSINESS CONCEPTS

I applied for a Nuffield Scholarship on the premise of looking at zero till and the technology associated with it. The beauty of the organised tour, travelling with a group is that we looked at agricultural businesses that I would not have visited otherwise, and with other people there, questions were asked that I would not have asked.

This in turn led me on a voyage of discovery on trying to understand what made those businesses work. These businesses ranged from a farm shop to a dairy product packaging and distribution company with a turnover of 192 million pounds.

As I investigated this further, it amazed me that there was no nuclear science to this, just a simple list of common sense principles which every business should adopt.

These were ;

- Know your market
- Understand your market
- Do what you do and do it well
- Respond to customers needs
- Control your business ,Cash planning etc.
- Know your business
- Have a business plan and a clear direction
- Work on your business as well as in your

business

- Level platform of management
- Staff fulfilment, encouragement and
- responsibility
- Have excellent lines of communication
- Attention to detail
- Job sheets and multi skilling
- General flexibility and ability to change

Some examples of these concepts in action are as follows:

We visited Robert Wiseman Dairies based near Glasgow in Scotland after listening to Robert talk at a conference. He had a very simplistic approach to what he called putting the white stuff into cartons. Robert Wiseman Dairies under the direction of Robert and his brother, Alan have taken the business from a 10 million pound turnover to a 192 million pound turnover and since 1979 they have either acquired or taken over 59 different companies. They currently have only 3 % of the entire UK milk market.

Everybody in the business wears a tie, from the delivery man to the guys stacking milk cartons. There is a poster with a picture of Robert in all the staff rooms with a phone number on the bottom of it that staff are encouraged to ring if they have any problem ranging from getting a hard time from fellow staff to an idea that would make the business work better. This system seemed to work well and it gave staff a sense of ownership and belonging to the business. They have an annual party where staff awards are presented for work ethic and innovation.

They are great believers in adopting technology to streamline operations. They were the first company in the UK to use Tetra Paks that gave the consumer a one litre milk container that fitted neatly into their fridge, taking up about the same amount of room as a 600 ml bottle. Simple stuff, but it increased their market share.

They had an excellent understanding of the market place they were operating in so if an opportunity arose they could act immediately. This was crucial to their growth.

Finally their business attitude was have a clear vision of where they were heading (in their case it was to control the UK milk market) and don't ask why an idea won't work, find a way to make it work.

I also visited Simon Beckett of Becketts Farm Shop near Birmingham. This business grew from selling a few eggs out of the back of a barn to an alternative to the super markets providing farm fresh food on site. A brief history of their business is that Allan, Simon's father travelled to the United States on a Nuffield Scholarship looking at Dairy herd management, came back to the UK and set a laying hen operation and then bought a farm a year for ten years. Simon also won a scholarship to the US studying staff motivation and came home and implemented changes. The key factor in his business is staff and their approach to customers so he has spent a lot of time encouraging them.

In the farm shop, he has different departments where the member of staff who is in charge is entirely responsible for that department. Therefore Simon is the General Manager and then he has a flat level of management below him. This system worked very effectively as it let the business operate without all the decisions having to go through Simon. The department heads all had clear sales goals and these were monitored and compared with actuals. The key point is that everybody was accountable and through this they all had a sense of ownership.

Tim Brown was my Host farmer during my stay in the UK. He currently rents 6500 acres at Lower Langford in Gloucestershire and he owns 14000 acres in Hungary. Tim spends a great deal of time working "on" his business, not "in" his business. He has three farms in the UK, with managers on them. Tim does all the budgeting, marketing, purchasing and does not do any of the physical work at all. Being a first generation farmer, he has a very definite attitude that farming should be done from the brain not the heart. He has no emotional attachment to land so if he is offered the right price for the land in Hungary he will sell it and move onto his next challenge. The way that Tim ran his operation is a lesson that every farmer could learn from. In essence what he has done is remove himself from the operational level and concentrate on the strategic level of the direction he wants his business to go.

We as farmers get very involved at the production end of our business but tend to neglect other matters that in many cases are more important. Tim Brown covered all aspects of his business.

One final example of business management was at Mackie's Ice Cream in Aberdeenshire, Scotland. This was an excellent example of value adding a product that was actually produced on the farm. They had a standard milk producing dairy herd in which they have changed the focus to producing milk for the production of premium ice cream. This involved a herd change from Friesians to Jerseys and also the development of an ice cream factory on the farm. The milk is simply piped from the dairy to the factory.

What I found the most interesting about this business was the continuous improvement program that was staff driven. This gave the staff an opportunity to be involved in the direction of the business and they were encouraged to think about what they were doing and why instead of just doing the job because they were told to do it. They also had job description cards that explained the process of how to go about a particular task. This virtually

enabled anyone to do any task in the entire factory. As part of this the staff rotated around the factory, so nobody could get set in their ways and become "stale" in the job.

These are just some of the examples of the concepts mentioned above, but I believe that many of these are concepts that can be applied to our farming business.

CONCLUSION

The Nuffield "Experience is unique. There are very few occasions, when you can remove yourself totally from your business, be exposed to new ideas, and think very objectively about them.

It has laid down new challenges, in the area of business management, staff fulfilment, motivation and organisational management.

On the practical level, I am actively pursuing spot spraying technology in conjunction with the Department of Agriculture and the manufacture, Patchen in the United States. Planter modifications are being made to improve our production system.

The issue of land ownership and additional property purchase is also being grappled with. The time away has taught me that land acquisition is not just an emotional decision, it is a business decision. Farmers all round the world lease and rent land to farm. This is a concept that Australian Farmers should adopt. You do not need to own land to be a farmer!

Without doubt the most significant aspect of my whole trip, was the exposure to excellent business people who could look objectively from the outside and see things that perhaps I had dismissed as the norm or as unimportant. It opened my eyes and I believe it has given me a new air of confidence to tackle the ever-risky agricultural environment.



THE AUSTRALIAN NUFFIELD FARMING SCHOLARS ASSOCIATION

ACKNOWLEDGES WITH THANKS THE RECENT SUPPORT OF THE
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