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Global Potato Production

Helping Feed The World

A report for the New Zealand Nuffield Farming Scholarship Trust

By Paul Olsen

January 2015

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Executive summary

New Zealand potato growers produce on average 50tonne/hectare in the current farming system which on a global level within the potato industry is within the top spectrum. (www.fao.org)

For New Zealand to move up the ladder and raise the bar in terms of production, further investment into technology and advanced farming systems not commonly used in New Zealand to date is required.

One technology that could benefit the industry significantly moving forward is Genetic Modification (GM) of varieties. This could aid overcoming pest and disease pressures and allow growers to further maximise yields. The most important opportunity for farmers offered by GM is to drive some cost out of production and therefore increase the grower's profit margin.

Research and development conducted to date in this area globally, GM has resulted in the development of varieties tolerant to the likes of blight, which does not only reduce chemical use (and the cost associated with this), but also makes the crop more environmentally friendly.

The identification of the Tomato and Potato Psyllid (TPP) in 2006 in New Zealand has resulted in a considerable increase of insecticide chemical use throughout the growing season to keep the crop clean and decrease processing defects. The use of

GM could help by developing varieties to overcome such issues and further decrease the chemical use.

GM is not used in New Zealand to date commercially, and it will require education by industry for the consumer, and further research to prove GM is not harmful. I believe embracing the potential of GM crops would be beneficial to the potato industry in New Zealand, and increase New Zealand Export Income as a result.

The other technologies that will help potato production dramatically will be the use of variable rate fertiliser, especially nitrogen. Intensification of other farming systems in New Zealand is putting pressures on the environment and impacting the clean-green image we as a nation are currently renowned for. By using variable rate input technology we can manage fertiliser inputs based on potential outputs of the crop resulting in better efficiencies and returns to the grower.

Variable rate irrigation in-conjunction with GPS and yield monitoring will be another technology that could play a major role in potato (and other edible crop) production in New Zealand in the future. Although some of this technology is already available and is being used currently, it is not used as standard practice in Primary Industries as yet in New Zealand.

With increased data collection and more precise use of inputs we are likely to see a direct outcome of better utilisation of crop inputs resulting in increased efficiencies and possibly yield increases. Importantly this data and efficiency will play a role in meeting customer demand for food production with high environmental awareness

(especially if marketed effectively on an industry scale), and demonstrate best farm practice and decisions made as a result of increased knowledge.

With global regulation so stringent and only likely to get more challenging we need to be at the forefront of quality assurance programs, meeting regulatory requirements within current farm systems and leverage off our historical “pure” clean and green image to maintain our competitive advantage as a primary exporting nation.

The aims of this project were:

- To seek out industry opportunities that could assist potato production in New Zealand.
- To make recommendations on how Mew Zealand Potato Growers can lift their bottom line by executing new practices.

Method:

Just less than five months travel through Australia, Philippines, China, Canada, United States of America, Netherlands, France, Germany, England, Wales, Scotland, Ireland and New Zealand.

During my studies, I visited Farmers, Growers, Merchants, Processors, Trade Shows, Research Institutes and spoke to a large number of consumers.

Target Audience:

This report is for anyone associated within the Primary Sector and has an interest in agriculture as a whole.

It will be of particular interest to growers who are open to adopt change, keen to move forward as an industry and add longevity to the potato sector.

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Scholar Contact Details:

Paul Olsen
496 Okuku Road
RD 4
Opiki
Palmerston North, 4474
New Zealand

Email: olsenp21@gmail.com
Phone: +64 (0) 63627648

Nuffield New Zealand Contact Details:

Desley Tucker - Administration
Email: admin@nuffield.org.nz
Website: www.nuffield.org.nz
Address:
Po Box 69071
Lincoln 7640

Disclaimer

Preface

Growing up in a rural community where potato production was a main focus has motivated me to develop a passion and enthusiasm for the agriculture industry. It was strengthened throughout my time at Lincoln University studying farm management and primary production and on graduating in 2004 there was no question where my career focus was to lie.

Working hands-on within the agriculture and being lucky enough to be associated with New Zealand Young Farmers for some years has exposed me to some of the opportunities and challenges that exist within our Primary Sector here in New Zealand.

Over the last decade we have seen increased production and yields by intensifying farm systems which is well demonstrated within the New Zealand Dairy Industry. More inputs and higher stocking rates are resulting in an increase of production and increasing the farmer's bottom line.

Within the potato industry we have and continue to lead some of the global yields which are on average above 50 tonnes per hectare (www.potatoes.co.nz) but for the last few year's yields have leveled off and there has been an increase in production cost with the likes of inputs such as insecticides.

Continuously we hear in the news about food security, environmental regulation and what the consumer demands. The more affluent consumer is demanding a uniform product for a fair price and wants the environmental and sustainability boxes ticked along the way.

After being actively involved with New Zealand Young Farmers for a number of years and benefitting from industry exposure I was lucky enough to be successful in my application for a Nuffield scholarship. Over the last year this has enabled me to step back from the nuts and bolts of our family business and look at the bigger picture of Global Agriculture, and how this affects not only my business but also the New Zealand Economy as a whole.

Despite considerable research into what a Nuffield Scholarship involves when applying, I was not prepared for what a life-changing experience it would actually be. My outlook has changed dramatically from somebody who could have been considered quite inward focused and culturally inexperienced to somebody who has a much broader outlook, appetite for information and a greater understanding of the multicultural world we now live in.

I have traveled and researched throughout the last twelve months looking at Global agriculture, focusing on potato production wondering where next for the New Zealand Industry. I have benefitted from a whole range of experiences. For this report I have focused on looking at new technologies being practiced around the world and challenges hindering success globally.

Figure 1: Paul Olsen, Visiting International Rice Research Institute (IRRI) Philippines, June 2014 (The competition)

Paul Olsen
29 January 2015

Acknowledgements

It is with the deepest gratitude that I thank New Zealand Nuffield Farming Scholarship Trust for their faith in selecting me as a 2014 New Zealand Nuffield Scholar.

The Nuffield Scholarship has been a very humbling experience, it has been both character building and mentally challenging to say the least. It has provided me with an international network of industry contacts and new friendships, which I am sure, will develop into lifelong friendships. The fond memories and experiences will be something I reflect on for years to come and look forward to building on in the future.

Thank you to the New Zealand Nuffield team, Julian Raine (Nuffield New Zealand Chairman) and the other trustees along with Richard Green (Director of Nuffield New Zealand) and Barbie Barton (Secretary for Nuffield New Zealand) for your support and guidance throughout my travels and scholarship experience.

None of this would be possible without the on-going sponsorship of our Nuffield partners; Agmardt, Dairy NZ, Beef & Lamb NZ, and FMG, who continue to proudly invest in Nuffield and New Zealand Agriculture.
Also our supporting sponsors Foundation for Arable Research, Mackenzie Charitable Trust, Meridian and Farmlands; to all of you I am enormously grateful.

Thank you to Nuffield Australia, especially CEO Jim Geltch for allowing me the opportunity to be a part of the Global focus program, which was an absolute highlight of my Nuffield journey. The program was fantastic with an action-packed itinerary

and an amazing cross-section of industry visits in multiple countries. I was privileged to be part of fantastic #chinagfp2014 of Nicola Mann, Tania Chapman, Justine Dutduth, Finola McCoy, Greg Gibson, Steven Wolfgram, Aubrey Pellett and Nigel Corish, thank you for the great company, brilliant laughter and sharing the amazing experience.

Thank you to everyone I visited and stayed with, the hospitality and warm welcome was really appreciated and added to the Nuffield experience. To everyone that took time out of their busy schedules to meet and show me through their businesses, I am sincerely grateful.

Lastly, I would like to thank my friends and family for their encouragement and support throughout my Nuffield journey. Special thanks to my brother Shaun, my Mother and Uncle who covered for me and looked after the farm and did a fantastic job in my absence.

Objectives

- To study best farm practices within the potato industry globally
- Establish common themes resulting in reliable profitability in a challenging global market
- Look at grower constraints in countries visited to identify common themes
- To look at the viability of these farms and alternative practices to help increase the businesses bottom line
- Look at environmental regulation that is in place in the potato industry in different countries and the constraints growers are farming under.
- To investigate technologies that are being implemented globally to assist in better meeting environmental regulation
- Evaluate what further research and development needs to be carried out within the potato industry

Introduction

The global population is estimated to reach nine billion people by 2050, resulting in a growing demand for producing safe, sustainable and environmentally friendly food. The growing regulation farmers are facing to produce this food in response to demand, the declining rural population, increasing constraints farmers are producing within and then on top of all the above the increased input costs and volatile prices currently being experienced by producers, highlights the challenges global agriculture faces in the coming years.

Starvation continues to rise, with the United Nations Food and Agriculture Organization (UNFAO) estimating one in eight people in the world suffers from chronic undernourishment. With developing countries so reliant on primary-producing nations to produce more food from an ever decreasing landmass, efficient food production has never been as important as it is right now!

There is also an increased global demand for renewable energy with biomass becoming a popular option the world over. This adds to the increasing competition for land use whilst at the same time the available farmable area decreases as urbanization also gains forward momentum and claims land from agriculture for building ground for accommodation and urban sprawl.

The New Zealand Primary Sector has the ability to access rich fertile soils, friendly growing environment and favorable resources; we are ideally placed to contribute to the growing global demand for food production.

Given our excellent resources, The New Zealand economy has the ability to “make hay while the sun shines” and build on this advantage to enable us to reach our potential as a primary producing nation and align ourselves with favourable global markets.

The New Zealand Potato Industry has seen a decline in grower numbers over the last decade because of pressures on land use and opportunity with the record dairy boom currently seen on a global stage. The growth curve for land area for potato production has plateaued with similar area being grown now as has been seen historically – around 10,500 hectares (www.potatoesnz.co.nz). The Potato Industry contributes over 500 million dollars to the New Zealand Economy annually. (www.potatoesnz.co.nz)

Case Study - James Fretwell – Doncaster – UK

James is farming within a family operation on two separate blocks but run as one operation. The business was growing around 480 to 500 hectares of crops annually with approximately 100 hectares being potatoes.

In-conjunction with the land owned they also rent land to give them a lengthy rotation. James and his family try and keep a rotation of one in nine years for potato production, which is a lot longer than the average grower but this has helped decrease soil borne diseases and some chemical inputs.

Potato supply has been up and down over recent years; a large number of growers are still growing on a free market (not aligned with a contract) so this does add risk to their individual businesses.

Over the last few year there has been large volatility in returns with the 2012 season alone being 25% down in yield within the UK because of being extremely wet and prices as a result being in excess of £500 better per tonne. The current 2014/15 season price is below cost of production in most instances and price is sitting at anywhere from £100+ per tonne because of a supply and demand mis-alignment.

While James has a good growing environment 90% of his potato area is still irrigated and the usual cultivation practices are being carried out including the use of de-stoning.

The Fretwell operation have invested heavily over the years in storage and had the capacity to house a large percentage of their potato crop. This was particularly interesting when comparing it back to the New Zealand Potato Industry as a large proportion of crops are ground stored and harvested throughout the year reducing the capital investment required.

They have supply mostly the fish and chip market in bags, enabling them to full orders and distribute potatoes for almost 10 months of the year.

A big opportunity that was available to the operation was to look at growing some process potatoes for the likes of french fries or crisping market as the location of the potato production was close to the factories. With obtaining a process contract this would entail having a set price and could add some certainty to the business when planting, rather than being vulnerable to the free market with no certainty over price.

Grower Constraints:

- Regulation and red tape was a concern moving forward for this operation given the regulatory bodies regulating the use of both chemical and slug bait on crops grown for human consumption.

- With the Potato Cyst Nematode (PCN) active in this growing area it was a significant issue moving forward increasing costs further for the production of potatoes. In some instances the crop losses in the local area was 50% of potential yield because of PCN.

- Subsidy re-form has driven a three crop policy on leased land in the area heightening concern as it is driving growers into growing mixed crops on every block of land they are farming. This is always going to be challenging given the different soil types and growing conditions needed for each different crop but is environmentally driven.

- There was growing competition for land, as there were a number of anaerobic digesters in the area that needed crops such as maize to fuel them for full potential energy production. As the anaerobic digesters are heavily subsidised this is placing financial pressure on local farmers and growers.

Figure 2: Potato crop affected by Potato Cyst Nematode (PCN) on a potato operation in the UK

Case Study: Nelson County Potatoes (NCP) Norfolk, UK

Nelson County Potatoes is a tailored growers group to supply Kettle Foods Ltd, a luxury crisp company set up in 2009 by three founding growers.

The visit was a highlight because the business was consumer focused. They work very hard on building a sustainable and durable business model that was not only profitabe but also was well ahead of any industry regulation.

With the crisping market demanding less growers but continued supply Nelson County Potatoes was set up to give scale and help vertically integrate their business. This gave some power back to the grower group as producers, but also gave stability to the processer in the form of good reliable and consistent supply.

The Norfolk-based NCP growers produce in excess of 65,000 tons of potatoes annually, a large proportion of which go into making Kettle Chips at the Kettle Foods Ltd base in Norwich.

The Nelson County group looks after everything in the growing process from growing seed to shelf by having a team of agronomists, supply chain coordinators, lab technicians, office staff and field support workers.

Working in with the companies supply program NCP now have 12 growers aligned to help supply and grow potatoes to help meet continued demand for 365 day supply to Kettle Foods Ltd.

Areas County Potatoes are working on and developing:

- Carbon footprint is a key driver for the business, assisting sustainability aspects so growers are kept within a close 40-mile radius of the factory to meet future expectations within this window. An active environmental plan is a big part of the continued environmental regulation within the growing area.

- Research and development into long term storage is being carried out by NCP to meet continued environmental regulation but also reduce the use of growth inhibitors commonly used in the long term storage of potatoes

- With the continued cropping NCP is doing a lot of work with cover crops and natural manures to increase organic matter and decrease the chances or increasing soil borne disease pressures.

- Investment into irrigation with both irrigation equipment and storage is a large focus for a sustainable water management plan.

North West Potato Day 2014 – Landcashire, UK

Looking at ways to improve efficiencies from soil preparation through to plant establishment was an important message as an outcome from attending one of the British Potato Council's Grower Days in the UK.

With the evident intensification of cropping rotations and potato production in the UK the demonstration site presented examples to mitigate soil compaction, illustrating the benefits from using Nematicides and options to improve organic matter with the use of cover crops.
With potato production being so strong in some areas of the UK, the need to plan ahead and get crop rotations in order, building in the use of cover crops to firstly condition the soil but also to try and minimise or eradicate soil born pest and diseases is essential.

The demonstration site illustrated the impacts different cultivation practices can have on the soil but also the end result in the form of crop yield losses.

Soil compaction can easily reduce yields by 10 percent or greater and can lead to water and soil quality degradation due to increase runoff and soil structure destruction. (Soane, 1994)

With the presents of Potato Cyst Nematode (PCN) in the Potato Industry in the UK there was a large focus on not only trying to implement treatment practices but also trying to mitigate ongoing effects. The use of nematicides is a common practice and this was illustrated by different treatment rates and application methods.

Figure 3: An example of Soil Compaction –Lancashire Potato Demonstration site – UK. July 2014

Case Study – Cavendish Farms – Peter MacLellan Prince Edward Island (PEI), Canada

Cavendish Farms grows 875 hectares of potatoes on Prince Edward Island in conjunction with running two large processing factories and everything in between.

It would be fair to say it is a totally vertically integrated business on the Island but also within wider Canada.

Peter MacLellan manages the farming side of the business that employees 50 staff in the peak of the season where they can harvest anywhere from 65-70 hectares of potatoes per day.

The average growing costs sit around $7,500 (Canadian) per hectare and on average they are yielding 35-37 tonnes per hectare.

Cavendish Farms have multiple enterprises starting at the seed supply, full agronomy services, fertiliser, chemical supply and then the processing of the finished product.

In 2009 Cavendish farms seeking new opportunities to reduce their environmental impact built a Bio-gas facility. They now convert raw solid potato waste residues from the factory to bio-methane gas via an anaerobic digestion process. The remaining waste is then spread on cropping ground as a soil conditioner and natural fertiliser.

Figure 4: Cavendish Farm Bio-Gas Facility built in 2009 Prince Edward Island - Canada

Grower Constrains:

- Average potato grower on PEI is 60 years old causing some concern within the succession window.

- 50% of PEI is infested with wireworm causing yield and crop losses along with increased chemical costs.

- Water for irrigation is very limited on the Island with regulation hindering any irrigation expansion, as the public perception is very poor within the need for irrigation water for cropping. Private investment is needed in the form of personal water storage and irrigation schemes currently if this is to move forward in the current environment. There is an opportunity to develop and set up a grower water scheme as seen in other countries for irrigation water.

- Distance from the market place is very large given Prince Edward Island's location compared to central Canada and America, which is the main market location for the finish processed produce.

Potatoes Europe – Hannover, Germany

Looking at the new technologies on offer at Potatoes Europe in Germany was interesting to say the least. With a focus on the whole progression of potato production from storage of seed through to the finished product being delivered to the customer, technology was a common thread with a focus on improving efficiencies throughout the whole process.

As is often found in European countries, new technology is present wherever possible and this was no different. Looking at cultivation/planters/bed formers all in cultivation pass was leading edge with multiply manufactures present demonstrating their brand. Everyone is trying to align themselves to maximizing throughput while decreasing cost and time.

With the latest technology present within industry from variable rate fertilizer, soil mapping and the use of checking crops with drones this was all displayed but further more with good industry results and data to back up the decision process.

In Europe with the window of opportunity often short the machinery has developed to have more throughput driving efficiency but also allowing the produce to be properly managed and delivered in the best possible quality.

With the importance placed on getting the crop harvested in a timely manner the storage infrastructure plays an instrumental part on completing the process.

Looking at different markets within Europe when it comes to the Potato Industry, it is interesting that only one in four potatoes grown in Europe actually gets eaten by people. Almost half end up being fed to livestock with the remaining quarter used as raw material in the production of alcohol and starch. (GMO Compass)

With this in mind Europe still produced 124 million tonnes of potatoes in 2009. (FAO)

Technology and efficiency for potato handling in the form of packing and distribution was also a large focus at Potatoes Europe. With the reliance on labour in the past for packing and grading of potatoes there has been a large shift into automation. With the increased demand to meet consumer's needs the industry now has large manufacturers producing machinery for the whole process including the use of robots. Some of which are not utilized in New Zealand yet.

With the growing demand for smaller packaging while maintaining potato packing efficiencies the computerized and increased technology will hold the industry in good stead looking forward.

Case Study: Seed Potato Production – Wuchuan County, Hohhot – China

Traveling through China looking at primary production was inspiring when you consider the logistics of getting the produce to the consumer or end market, given the lack of infrastructure.

I travelled out from Hohhot on small narrow roads, which climb to 1600 meters in altitude where I was able to identify a change in climate from down town city temperatures (in excess of 30 degrees) to more moderate temperatures in the high teens.

Ultimately the local government owned the potato operation that I visited, but it was managed and run by a local company. The seed potatoes were grown in rotation with wheat on a total of 400 hectares with 200 hectares of potatoes grown at any one time with the balance in wheat. This means the crop rotation is one in two years in potato production. During the winter/ colder months there was nothing grown given the harsh environment.

Figure 5: Lab producing the seed cultures in the early stages of propagation – Hohhot – China, June 2014

The seed production started in a government owned operation with seed cultures grown in a nearby laboratory where they grew for 4-6 months before being planted out into a controlled tunnel house environment.
Once this process is complete the seed is then harvested and distributed for re-planting at the farm I visited.
This could be described as the Chinese equivalent to what we call certified seed in New Zealand.

If the harsh environment wasn't enough to hinder growing success in Wuchuan County the rainfall in the area is also a challenge, with only 110mls per year. Consequently the use of irrigation is essential to reach optimum yields. The irrigation water is sourced from a 130-meter deep well, which is said to be some of the best quality water in the area. Centre pivot irrigation is used with some t-tape/drip irrigation also used in the fields.

Fertiliser is used at reasonably high rates with a total of 1500kgs/hectare; this does however include a broadcasting rate of urea (N) of normally 100+kg/ha before molding. The balance of the fertiliser make up at planting is determined by the soil needs and is determined by the use of soil tests.

Current yield statistics we were given on our visit didn't align with historical data but the common yields in China of 15 tonnes per hectare would be achieved in a good growing season.

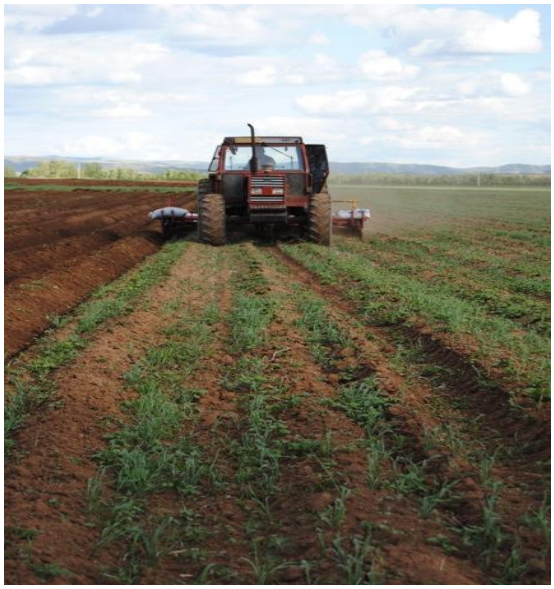

Figure 6: Molding of the seed crop illustrating the weed pressure currently challenging the crop- Hohhot – China, June 2014

There appeared to be a major weed problem in the paddocks we visited with what appeared to be no weed control from planting to molding. It was explained to us that if any weeds persisted after molding the crops were then weeded by hand so this could possibly be a challenge going forward as labour availability and cost increases.

After harvesting and grading the seed was bagged, and then stored in potato sacks in government owned underground cool stores nearby. There were two stores with the ability to house the total operations seed potato harvest.

The seed was then sold on and distributed to local potato growers for a cost of equivalent $500 per tonne. The government subsidised 20% of the total cost of the seed.

Visiting food producing businesses throughout China, the government backing I witnessed in the form of subsidies there is second to none. For an example all machinery and tractors are given a 30% deduction in the purchased price in the form of a subsidy. This gave the growers assistance in maintaining the machinery in good condition.

This strengthens the message of China's priority by both central and local governments to secure a safe food source to align with both growing demand and population. The main aim of the seed facility was research and development for the industry to help align them with better genetics to further lift potential potato production yields for the future.

Figure 7: The loading of seed into the planter, Grimme 4 row planter – Hohhot – China

There is still a lack of technology present within the primary sector in China. With the minimum wage still ranging from $1.61 to $3.66 per hour (Wikipedia) it still allows rural communities to utilize human labour over mechanization of operations, which allows the Chinese to achieve a lower cost of production.
This is likely to change long-term considering the trends seen in recent years with rural wages rising dramatically since mid 2000's which is a direct result of higher wages being paid in the manufacturing sector.

China's Potato demand

As China's population continues to grow, it is said that the demand for food is predicted to rise by fifty million tonnes in the next five years. This will threaten and may put intolerable strain on the country's food supply.

Up until now, China has done a remarkable job of feeding 20% of the world's population on just 8% of the world's available arable land and only about 30% of the world's available fresh water. (http://www.ibtimes.com/chinas-food-challenge-demand)
China only became an importer of rice, wheat and corn in 2011 and self-sufficiency in grain remains a cornerstone of Chinese Government Policy.
With the demand for food rising by the day and the need for an extra 10 million tonnes per year, China will have to increase yields considerably if its food supply is to keep up. If it is unable to meet this challenge, food prices around the world will be certain to rise in the coming years.

It appears that potato production will play a key role in the government's plan to safeguard China's food security. China has plans to double potato production from 5 million hectares to 10 million hectares in the future. Potatoes are expected to become China's fourth 'staple food' meaning that potato production will fall in line with rice, wheat and corn in the form of government priority and subsidies.

The key attraction of potato production to China is that it can survive some cool, dry and unproductive environments where grain cultivation isn't possible. In a country such as China for continued demands on good water sources this will play a huge advantage. This is only available given the low expectation internally around potential yield, where other countries wouldn't risk the harsh environment.

If 5 million hectares of extra land can be brought into production, and if potatoes can be successfully cultivated, then even at China's current average yield for potatoes of just 15 tonnes per hectare, this would provide more than 75 million tonnes of the extra food that will be demanded by 2020.

If China can develop the expansion in potato production, the big obstacle will be technology in terms of processing the crops and turning them into China's traditional foods. This will place large pressure on agricultural research and development as an industry in China in the coming years, however it creates opportunities for international processing companies to capitalise on the knowledge and experience they already possess of the potato industry.

However, looking at the urbanization that has already taken place in the last 20-30 years and is set to continue in the coming years there will be extra pressures on land use.

Currently, China does not allow market access for fresh potato imports. However it is forecasted that frozen french fries (FFF) imports alone will rise to 133,000 tonnes for the 2013/2014 year which is a 12% increase from the previous 12 month period.
As the demand for the western diet increases the trends will continue and favor the imported products.

Variable Rate Fertiliser

After visiting the Farm Progress Show in Iowa, United States in August it became apparent for the need to identify farm historical data and create up to date records around soil mapping, crop yields, fertiliser use and irrigation. Being exposed to this technology for the first time (although it has been available) was a real eye opener. It is something that will play a vital role in the future of potato production in New Zealand and abroad in years to come.

With continued environmental regulation and consumer demands the more data and information growers can collate and demonstrate will strengthen the relationship with the end consumer and help with education throughout.

The benefits of variable rate fertiliser include increased productivity, improved nutrient use efficiency, reduced nitrogen leaching and ultimately increase grower profits.
Once you have built your paddock base data layer foundation, programs will identify the appropriate opportunity for adding a sound variable rate nutrient program for each individual paddock.

The program doesn't necessary offer a quick fix; instead it focuses on continuous improvement of yield productivity through a precise system approach.

By accurately producing yield productivity areas from advanced data, variable rate fertiliser nitrogen and other nutrients can be calculated to maximize inputs and increase yield potential.

When combined with both variable rate planting and variable rate irrigation, yields can reach maximise levels in each and every hectare planted.

This technology is largely used in grain production around the world with significant savings made especially with the use of nitrogen as the larger farms have so much variance in soils and growing conditions.

Figure 8: The cost savings using variable rate N application in the US

Approximate annual Nitrogen cost savings for different farm size and area						
N cost savings	Farm size, acres					
$/acre	$500	$1,000	$1,500	$2,000	$2,500	$3,000
5	$2,500	$5,000	$7,500	$1,000	$12,500	$15,000
10	$5,000	$10,000	$15,000	$20,000	$25,000	$30,000
15	$7,500	$15,000	$22,500	$30,000	$37,500	$45,000
20	$1,000	$20,000	$30,000	$40,000	$50,000	$50,000
25	$12,500	$25,000	$37,500	$50,000	$62,500	$75,000
30	$15,000	$30,000	$45,000	$60,000	$75,000	$90,000

Source: University of Florida, www.edis.ifas.ufl.edu/ae487

If we were to adopt the use of variable rate base fertilisers in potato production in New Zealand with a saving of 100-200kgs per hectare at the current prices $885 per tonne for Nitrophoska 12-10-10 (www.Ravensdown.co.nz, 25/1/15) this would make considerable savings to the cost of production over a period of time if research proved it was beneficial.

As we progress and have to meet more stringent environmental regulation this will help with the decision process and also the accountability around fertilizer use.

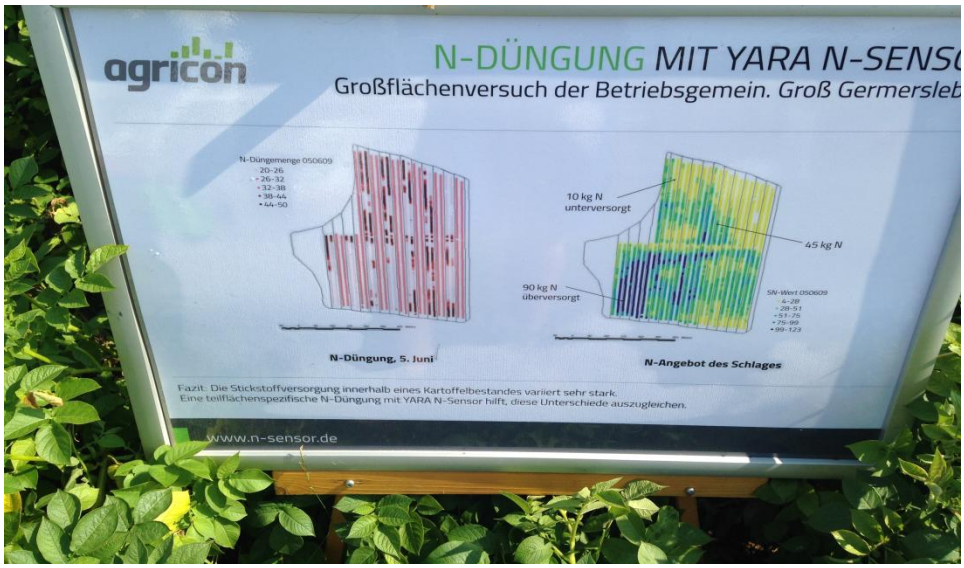

Figure 9: An example of a soil map for the use of Variable rate Nitrogen at Potatoes Europe – Germany (Agricon), August 2014

Meeting consumer demands

While traveling through various countries and visiting farmers markets, supermarkets, farm shops and wholesalers, it was very easy to draw conclusions on consumer behavior when looking at potato and associated products.
Markets are a very interesting topic as you can have all the produce in the world but if you are not aligned with the consumer demands you are never going to be successful.

The consumers identified during the travels, when looking at the fresh sector, seem driven by quality and reliable products that are going to be available next week and the other 51 weeks of the year. Building trust with an end consumer is more important than the price the product is being sold for, however we are dealing with only one demographic here.

Talking with many different groups of people the price ranged down the list after, convenience, continued availability, quality and branding/labeling. With the average working class consumer now working longer hours and time poor they want to be able to call into a local distributor and pickup dinner on the run and have a meal produced and ready within a minimal time frame.

Visiting Ireland it was evident there has been a large surge in purchasing products such as microwave ready to cook bags, mash direct products and other easily accessible partially prepared meals.

Figure 10: Robert Mckee and Paul Olsen, Ireland, Comber Potatoes

If we are to be successful within the potato industry in New Zealand, similar trends could follow as we tend to see large differences on the shelves today compared with historically in supermarkets.

Share Farming Model

With the increase in land values and demand for land use especially in the heavily populated dairy areas in New Zealand the share farming model as seen in the UK could just be the answer when it comes to succession within the potato and cropping industry.

With increased land value especially over the last decade it is getting harder for the younger generation to get a start if they aren't lucky enough to be part of an existing operation. However the industry is heavily reliant on good well educated, positive and enthusiastic people and this is where the opportunity lies.

With the average New Zealand farming age now climbing our industry is in great threat if we don't start being proactive getting the younger generation on to the land.

We have seen increasing numbers of equity partnerships especially in the Dairy Industry in New Zealand with great success. Exploring business structures in both potato growing operations and wider cropping operations in the UK presents real opportunity for the share farming and contracting farming model.

Looking at a few operations in the UK especially where some businesses specialised in running share farming/contract farming models with them providing the equipment, labour and professional expertise along with developing markets to distribute the product have been very successful.

In the UK this then entitled both the farm owner and share farmer to receive a share of the profit while letting the farmer/ joint venture holder build capital and effectively develop their own business.

If the Potato Industry in New Zealand develops more cohesion and develops collaboration on a whole as is present in some grower groups set up within New Zealand there would be more ability for smaller farmers or individual farmers to progress and achieve the end goal of a successful business model.

Genetic Modification of Potatoes

The potato is a crop that has had extensive developments in terms of genetic modification in recent years globally.

The largest implication with any crop being genetically modified comes from the public and consumer perception around food safety, but concerns could be reduced by increased awareness and education of the end consumer. Scientists of late have tried to provide information around the benefits of GM to the consumers as well as growers and processors in order to prepare people for a future where the potato industry can benefit from GM technology.

British scientists at the John Innes Centre and Sainsbury Laboratory in Norwich, UK have done extensive trials since 2010 around blight-resistant potatoes.

The blight disease has plagued farmers for generations and is what triggered the famous Irish Potato Famine in the 1840's, which had drastic implications on the Irish population.

With growing regulation around chemical use in crops such as potatoes, globally the use of genetically modified varieties or traits could be the silver bullet the industry is looking for. In a normal growing season growers can apply anywhere up to 15 blight sprays, which long-term is not going to meet environmental regulation, or help with the profitability of potato growing.

In a case study of genetic modification scientists have successfully boosted the resistance to blight. Using a wild American gene crossed into Desiree potatoes resulted in creating a variety with resistance against blight.
During 2012, in the last year of the trial at John Innes Centre/The Sainsbury Laboratory (TSL), all the non-GM potatoes became infected with the late blight, while the modified potatoes remained fully resistant to the end of the experiment.

Figure 11: (Left) Genetically Modified potato plants, (Right) Non-GM potato plants, a month post-blight infection.
Source: The Sainsbury Laboratory (TSL) – Norwich, UK

There was a notable difference in the yield between the varieties, with the GM variety producing double the tubers as the non GM potato plants.

With the need for regulatory approval for the new variety in Europe being challenged because of the time it takes for approval by authorities, researchers have licensed the technology to Simplot in the US who will grow the crop allowing further data collection and information to be used industry wide.

Unfortunately the problems in the current European regulatory process, which is expensive and extremely slow, means that this advance by UK scientists is far more beneficial to other countries than it will actually be to the UK industry immediately.

With the law in the UK stating that all GM produce has to be labeled, critics of GM crops believe regardless of the potential environmental benefits this scientific break-through achieves, consumers will not be prepared to purchase the end product. In order to capitalise on this important break-through in genetic modification, a large amount of research into consumer implications is going to have to be carried out in countries such as the UK if this crop is ever to achieve regulatory approval.

Key Messages/Conclusions

The Potato Industry needs to be at forefront of meeting environmental requirements and regulation, sustainability messages and not only be fully traceable but incorporate this into labeling that is clear, consistent and easily understandable by the consumer.

The biggest threat globally to potato consumption is consumer's perception of the industry. Further education is required to show that potatoes are a healthy, potassium rich, safe, and residue free ingredient produced using best practice production methods. A considerable proportion of the UK potato levy is spent on marketing and consumer awareness and education, which is a lead that should be followed by New Zealand.

Export markets could be explored more fully and there is a need to maintain existing relationships and build new export agreements to future proof export markets. New Zealand's low population density can only consume a limited quantity of potato products and domestic production outweighs consumption. Statistics indicate that Ireland (a country typically associated with potato production and consumption) expects consumption will fall from 162,000 tonnes per year currently to less than 100,000 tonnes by 2023 if the current consumer trends continue. (www.independent.ie)

Share Farming Models and Contract Farming arrangements are something that could be explored in New Zealand more fully. As a nation we are well known in the Dairy Industry for successful Joint Ventures, Equity Partnerships and growers could benefit from similar type agreements. This in turn could provide solutions to succession challenges and a route to enter the industry for younger farmers, or new entrants who are not lucky enough to inherit a horticultural business.

Collaboration and machinery syndicates also provide vehicles for cost sharing, increasing buying and selling power, allows quicker uptake of new technology, lower capital outlay on the expensive equipment required for potato production and can also build greater working relationships in the industry with the view to reaching a common end goal for growers – maximum profitability.

Growers who have invested in infrastructure and aligned themselves with a specific marketplace tend to be benefiting from greater business stability, and vertical integration of businesses. The UK showed greater profitability and were more protected from price volatility where vertical integration occurred between businesses. However, competition creates a healthy trading environment and examples of growers who were monopolised by only one customer/processor buyer (as is often seen in the industry) had considerable risk to their business and became price takers rather than price setters.

In a number of countries visited both innovation and progression was being restricted by subsidies or similar schemes. The different subsidy schemes have different drivers and as a result tend to reflect in farmer behavior, attitude and ultimately the output of individual businesses, in some instances taking away any opportunity for the business to really reach full potential.

Genetic Modification will continue to be a hot topic within New Zealand and globally although a large quantity of research is still needed before we can commercially rule out GM and maximize the technology. The opportunity is great and will be achieved as we evolve as a primary sector.

We are lucky enough in New Zealand to have rich fertile soils, a friendly growing environment, good natural resources and a reputation that holds us in high regard as primary producer. Being a lower populated country with little threat of urbanization creep we have the potential to dramatically develop and flourish.

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Appendices

Figure 12: China Global Focus Program Group, #chinagpf2014 Beijing, China (Meeting a few Locals)