LEARNING FROM THE WORLD TO IMPROVE OUR GRAIN RETURNS

When 2006 Nuffield Scholar Bruce Thompson returned home in 2007 from his international travels, continuing dry conditions only heightened his concerns as to how Australian grain growers would cope with the dramatic changes occurring in agriculture locally and worldwide.

Bruce spoke to Kellie Penfold (Coretext) about how Australian farmers can learn and benefit from overseas developments and technologies.

Nuffield Scholar Bruce Thompson.
(PHOTO: Kellie Penfold, Coretext)

"I'm still analysing what I've seen overseas, and where Australia fits in a changing agricultural world," says Bruce, who runs a 5000 hectare grain-growing and sheep production enterprise at Temora in southern NSW with his wife Leanne, parents Neville and Catherine, brother David and David's wife, Jenny.

"It has been said the influence of the demand for energy is the biggest thing to hit US agriculture since the Industrial Revolution. The flow-on impact on Australian agriculture has to be pretty big as well," he says.

Bruce, whose Nuffield scholarship was supported by the GRDC, spent 17 weeks travelling through New Zealand, the US, Brazil, Argentina, Mexico, Canada, China, France and England researching what Australian growers could embrace to remain competitive. Interested in how grain growers gain efficiencies in a competitive market, Bruce focused his research on two areas:

- The use of agricultural robotics in reducing labour inputs; and the,
- Opportunities genetically modified (GM) varieties offer for achieving better performing crops.

Gaining a critical farming mass

"Every country has its own agricultural issues. In Australia it has been coping with climate change, in New Zealand it is market access and in California it is retaining a cheap labour force in illegal immigrants," he says.

"But overall the emphasis is on gaining critical mass in farming – how do you produce more from less land with less labour units. It appears it is difficult to gain economies of scale in livestock. There are no handpieces or drench guns that will do 10 sheep at a time, but efficiencies can be gained in cropping."

In the past few years in Temora a number of people have left to take up jobs in the mining sector. Although many of these people were not working on farms, they were the mechanics, electricians or plant operators who are important in supporting agriculture. Bruce saw a similar trend in Canada where the oil and gas sector was attracting a lot of the people and "most shops had a staff-wanted sign on the window".

Driverless machinery

But Bruce believes Australia's mining boom could go some way to solving the country's agricultural labour shortage through the mining industry's financial support for the development of robotic or driver-less machinery (see accompanying article).

"Aviation and mining are leading the way in robotic machinery – 'dozers without drivers to work on unsafe ground and robotic dump trucks. The technology exists to do the same with tractors and other farm machinery but there are some problems such as legal wrangling over intellectual property rights and patents as well as safety issues. We also have the unfortunate fact that the agriculture sector isn't worth as much to the developers of these machines."

But Bruce sees much potential in robotics for Australian agriculture and envisages a day when one operator can manage three or four machines in a paddock at one time.

"An example is a fully loaded header communicating with an unmanned chaser bin to pull up alongside, maintain direction and speed so the header can unload, and then return to the storage area.

"Scenarios like this are being talked about by machinery companies. They are not unrealistic when you think about the robotics that are already at work in farming – such as travelling or centre pivot irrigators that were developed years ago and originally had all sorts of hassles," says Bruce.

GM potential

As well as investigating the possible production efficiencies offered by robotics, Bruce looked into the likely gains that could come through planting GM varieties.

He says it is time for Australia to embrace the potential they offer, especially in keeping pace with a changing global market demanding more grain for food and biofuels. He believes Australia is limiting its opportunities by taking a cautious approach.

"The way to come up with the varieties to meet these changing demands will be through genetic modification. I'm pretty sure the debate we are having now can be compared to the wide-comb dispute that took place in the wool industry."

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UNMANNED FARM MACHINERY (ROBOTICS)

In Australia the mining sector – on the back of a world wide energy mining boom – is drawing on workers and out competing other sectors including the farming sector. This is making it harder for agribusinesses to obtain seasonal or permanent staff, and also to hold onto existing staff.

This is also a factor in countries such as Canada, where the booming oil and gas sector impacts heavily on the labour market.

With the above in mind I researched the theory of driverless farm equipment to alleviate the seasonal pressure of labour.

Developments in unmanned operations

The aviation and mining sectors are already trialling and using unmanned systems. The military is using unpiloted planes (drones) for high risk surveillance and operations while mining is in the early stages of trialling driverless equipment in unsafe work situations.

For example, the earth moving company Komatsu is trialling unmanned dump trucks which climb out of pits on pre-determined paths. Obstacle avoidance systems determine if the obstacle is stationary or moving, if it will clear the path and whether the truck will need to take evasive action.

Significant research has been done on systems to complement satellite guidance and positioning, given the restrictions of satellite coverage in underground mining situations.

Farming applications

The next level of technology uptake on farms could be for auto-steer guidance systems that do not just steer the machine. The next step could be a system which records all movements the machine does in a given paddock – such as avoiding obstacles and turning at the end of the run – and then can repeat the task without an operator.

The cost of the systems needed to run the machinery could be partially offset by the removal of the cabin, which for a tractor is between 15 to 25 per cent of the cost, depending on the size of the machine. Many of today's new machines have the brackets, wiring and components needed for auto steering as standard.

The space available from the removal of the cabin could also be used for extra fuel, and the addition of cameras, antennas, radar and other equipment required for driverless capabilities.

The more technology and complexity applied to an unmanned system the more expensive it becomes. For example, obstacle recognition, and/or radar technology to cater for unplanned invasions of the field, and complications to vehicle operation when attachments are added, all come at a high price.

Generally, most manned equipment today has protection systems that will stop the vehicle if it gets too hot, low on oil or something is outside a set range.

This concept of protection systems can of course be extended to unmanned equipment to protect from risks and/or overloading of an operation by more than a certain percentage. And technology now allows for unmanned systems to be monitored or adjusted from a distance with UHF radio, satellite technology, mobile phone networks and fixed cameras.

Cost concerns

There are concerns about the ability of the agriculture sector to afford unmanned farm machinery technology in comparison with the aviation and mining sectors. But it should become more affordable over time as technologies developed for other sectors are adapted to agriculture.

The market may also take into account the capacity of different sectors to pay for such technology – for example, the mining sector currently pays three to 10 times more for exactly the same guidance systems used in agriculture.

Unmanned technology could lead to alternative approaches for large scale production. Instead of having larger machines moving faster and more efficiently, one person will monitor multiple smaller machines at the same time doing the same job, or possibly doing complementary activities such as sowing while the boomspray is working alongside.

Leaving equipment to work for extended hours or to do a little more after you go home for the night would be a big efficiency. Working at slower speeds and having the ability to turn itself off independently or remotely should make for a safer environment.

Autonomist machinery

While in the US I discussed the future of autonomist (independent) agricultural machinery with Mitch Torrie (Autonomous Solutions Inc.)

Mitch has systems currently working for the US army and mining companies. He has also been working with John Deere on autonomist tractors for seven years.

A major part of his work has been on tractors for the Mexico market, where there is not a labour shortage, but farmers are looking to operate the tractors 24 hours and only staff them during daylight hours.

Mitch believes that the farming sector will buy these machines. He expects commercial release in about five years.

– Bruce Thompson

This autonomist 80 hp John Deere tractor was trialled for 1000 hours, and gives an idea of how tractors could appear in the future.