With the assistance of a GRDC travel grant, Malcolm Sargent and Ashley Wakefield from the Southern Precision Agriculture Association (SPAA), attended the 9th International Conference on Precision Agriculture (PA) held in the US in July 2008. Malcolm and Ashley also visited various PA equipment manufacturers and met with US farmers to gain a better perspective of the adoption of PA in North America and what opportunites could be identified to help increase adoption rates in Australia.

MAKING PRECISION AGRICULTURE PAY ON AUSTRALIAN FARMS: SOME LESSONS FROM THE US

By Malcolm Sargent and Ashley Wakefield, SPAA

The adoption of Precision Agriculture is at a similar stage in the US as it is in Australia. Some farmers have fully integrated PA into their farming operation whilst others are still using a summer fallow/wheat rotation and little new technology.

Groups like the Nebraska Agricultural Technology Association (NeATA) and the Kansas Agricultural Research Association (KARA) have been formed by innovative producers, researchers and industry suppliers to make agriculture more productive.

In southern Australia, SPAA has been able to achieve similar or greater success through linking with growers and obtaining external funding.

Many and varied studies were presented at the 9th ICPA with the majority focusing on nitrogen management, crop sensors and PA management.

There is a great opportunity to validate this technology to suit our climatic conditions. PA groups and farmer bodies need to educate farmers on the use and savings that can be made by trialing this equipment and getting the results to farmers as soon as possible.

Malcolm Sargent (left) and Ashley Wakefield (centre) with Nebraskan farmer Arnie Hinkson, inspecting a variable rate liquid fertiliser system used by Arnie. An exchange of information with farmers and researchers from countries such as the US, is an important factor in increasing the adoption rate of PA.

Recommendations for the Australian industry

After meeting many researchers and farmers at the conference, and seeing PA in action in the commercial context in Nebraska and Kansas, PA adoption rates in Australia could be improved by the following:

- PA needs to be integrated into university agronomy courses;
- There needs to be specialist PA education for producers, graduates and industry;
- We need to encourage the exchange of information between Australia and overseas; and,
- We need to continue to lobby North American manufacturers about the requirements of Australia's broadacre small grain producers who, generally, are more receptive to new technology.

Malcolm and Ashley also met up with Dietrich Kastens who farms near Herndon, Kansas. Dietrich is a board member of the Kansas Agricultural Research Association (KARA).

CONFERENCE AND OTHER VISITS

The 9th International Conference on Precision Agriculture, held in Denver, Colorado, had over 450 participants from 43 countries presenting 250 papers on Precision Agriculture.

Malcolm Sargent presented a paper on the economics of PA adoption in the Australian context to the ICPA. The paper was co-authored with fellow SPAA member, Matt McCallum (see a summary of the presentation on the opposite page).

Other highlights of the study tour included visits with Case IH and John Deere – major manufacturers of farm equipment with PA systems.

Malcolm and Ashley also met with representatives of similar organisations to SPAA in Nebraska (NeATA) and Kansas (KARA).

THE ECONOMICS OF ADOPTING PA

By Matt McCallum and Malcolm Sargent, SPAA

There has been a rapid adoption of Global Positioning Systems (GPS) guidance and autosteer in Australia in the past five years. Around 30 per cent of broadacre crops in Australia are now sown and/or sprayed using GPS technology. But other PA technologies such as yield mapping and variable rate is less common with less than one per cent of adoption across cropping regions in Australia.

One of the major reasons for this is the lack of evidence that the investment in variable rate technology (VRT) can provide sound financial returns to farmers.

Our study quantified the economic benefits of PA on eight farms across southern Australia. The PA technology evaluated included yield mapping and VRT, as well as GPS guidance and autosteer.

How we did the study

Eight farmers were interviewed from different cropping regions of southern Australia and with varying levels of PA experience ranging from two to 11 years. Information was collected on:

- Area of cropping program, crops grown, crop yields, gross margins, rainfall, soil types;
- Variable input costs (fuel, fertiliser, seed, pesticides, machinery, labour) per hectare;
- GPS equipment purchases and purpose;
- Evidence that PA is working on their farm in regard to less overlap, VRT etc; and,
- Other benefits of PA, for example, conducting own trials.

TABLE 1: Costs and benefits of PA adoption

Farmer	Cost of PA equipment ($/ha)	Annual benefit ($/ha)	Payback period (years)	
			Yield monitor and VRT equipment	Autosteer and guidance
1	23	11	1	4–5
2	62	13	10	1–5
3	27	21	–	1–2
4	15	15	6	1
5	12	10	–	5
6	62	37	9	3
7	104	19	–	2–7
8	44	19	–	2–5
Average	**44**	**18**	**7**	**3**

Breakdown of PA benefits ($/ha/year)

Farmer	Savings in overlap	Fertiliser savings using VRT	Increased production using VRT	Other production benefits*
1	4	–	7	–
2	5	5	–	3
3	3	–	–	18
4	5	10	–	–
5	2	–	–	–
6	10	9	8	18
7	19	–	–	–
8	6	–	–	19
Average	**7**	**8**	**7**	**15**

*Inter row sowing, reduced soil compaction, shielded spraying.

How we looked at the economics

A relatively simple economic approach was used. The total cost and annual benefit of GPS equipment for each farming operation was calculated and expressed as a total and in dollars per hectare. From this, an equipment 'payback period' was calculated.

This is a function of the annual benefit relative to the initial cost of the GPS equipment and the time taken for the benefit to be instigated. The quicker the payback period, the better the investment.

The total cost of equipment for each farmer was simply calculated from the original purchase price (GST exclusive).

Savings on input costs were based on reduced overlap using GPS equipment. This was calculated using the farmers' figures on the individual paddock area that was sprayed, fertilised and so on before and after GPS equipment was used.

Savings using VRT were calculated from comparing variable rate fertiliser application with a previous blanket rate of fertiliser used before PA was employed. Production increases from VRT were calculated from higher yields achieved by increasing fertiliser rates on low fertility areas of paddocks. On-farm trial data was used for this purpose.

Production increases from inter row sowing were estimated using trial data. Actual farmer data on grain prices and input costs was used in the majority of calculations.

What we found

For all cases the annual benefit from cost savings and increased production was enough to cover the cost of guidance and autosteer equipment within an average of three years (range of 1–7 years).

The payback period for yield monitoring and VRT equipment was longer – around an average of seven years (range of 1–10 years).

There were two main reasons for this:

- The initial high price of yield monitoring in the mid to late 90s before the equipment became standard on most modern harvesters; and,
- For most farmers it was some years before a VRT program was implemented because farmers were not confident to go full VRT until they had evidence it would work.

Involvement with organisations such as SPAA was important in verifying potential returns from PA. Farmers looking to adopt PA in the future are better positioned to make VRT pay within two to three years because of access to lower cost equipment.

Funding provided by SAGIT and GRDC, and the co-operation from the farmers involved in this study, is gratefully acknowledged.

For more information contact SPAA on 08 8536 3958 or visit www.spaa.com.au