Grains Research
UPDATE
Research Information for Farm Advisers from the
Grains Research and Development Corporation (GRDC)
Northern Region

GRDC
Grains
Research &
Development
Corporation

WINTER 2008

The economics of precision

PA (Precision Agriculture) technology has been available in Australia for more than a decade. A recent GRDC survey shows that the number of growers using GPS guidance systems has increased from 15% in 2006 to 36% in 2008 (IPSOS survey, 2008).

According to a GRDC-supported, CSIRO Sustainable Ecosystems/APSRU research project that measured the economic impact of PA, farmers are reluctant to invest seriously in the technology without knowing if it will return a profit.

The project aimed to expand previous studies that looked at the economic benefits of tramline farming and guidance for chemical application into the areas of variable rate technology (VRT) and zone management.

The team analysed PA on six wheat belt farms covering a range of agro-climatic regions, cropping systems, farm sizes, soil types and production levels. All six had invested in guidance and were practicing some form of VR fertiliser management, but only some were using auto-steer and tram-lining. One was using NDVI (Normalised Difference Vegetation Image) and another, the GreenSeeker technology for in-season nitrogen management.

The level of capital investment in PA varied from $55,000 to $189,000 (Table 2), typically at the medium to high end of investment for Australian grain growers.

Capital investment per hectare cropped varied between $14 to $44/ha, with estimated annual benefits from PA varying between $14 to $30/ha. In all cases initial capital outlay was recovered within 2-5 years and in four cases, within 2-3 years (Table 1).

Benefits from fertiliser VRT ranged from $1 to $22/ha across the six farms (Table 2) and, on a per paddock basis, between -$28 to +$57/ha/year.

Table 2: Summary across six farmer case studies of benefits ($/ha) of precision agriculture technologies, in total and separated into categories.

Farmer	Total	Reduced overlap	Fertiliser management
A	21	5	16
B	22	13	7
C	21	12	1
D	30	8	22
E	24		20
F	14	7	7

Table 1: Summary across six farmer case studies of capital investment in precision agriculture technologies, estimated annual benefits and year when initial investment is recovered.

Farmer	Region	Size of cropping program (ha)	Capital Investment in PA		Annual estimated benefits to PA*	Years to break even
			Total $	$/ha	($/ha)	
A	West	2,600	90,000	35	21	4
B	West	5,800	189,000	33	22	2
C	West	3,400	65,000	19	21	2
D	North	1,250	55,000	44	30	2
E	North	3,430	95,000	28	24	3
F	South	4,000	56,000	14	14	5

** excluding capital costs*

According to Dr Michael Robertson, the variation in monetary benefits from farm to farm could be explained by whether or not starter fertiliser – and not just topdressed nitrogen – was varied, and the degree of within-paddock yield variation.

"Savings from reduced spraying overlap were typically around 10%, while other benefits nominated by the farmers were less fuel use, less soil compaction, less hired labour requirement and more timely sowing," Dr Robertson says.

"Intangible benefits listed by farmers were the ability to conduct on-farm trials, increased knowledge of paddock variability, increased confidence in varying fertiliser rates, and better in-crop weed control due to shielded spraying."

GRDC Project code: CSA00010

Note: A new GRDC-supported SPAA publication 'PA in Practice' contains over 24 case studies of which 14 grower studies look at the economics of PA. Copies of PA in Practice are available for $10.00 plus postage and handling from Ground Cover Direct on 1800 1100 44 or email: ground-cover-direct@canprint.com.au

Further information:
Dr Michael Robertson 08 93 336 461/0417 721 510; Michael.Robertson@csiro.au

Nematodes survive the drought

According to DPI&F, Leslie Research Centre (LRC) pathology researchers Kirsty Owen, Tim Clewett and John Thompson: "root lesion nematodes (*Pratylenchus thornei* and *P. neglectus*) are very good at surviving drought and long, bare fallows. Populations can quickly rebuild, particularly when sown to susceptible crops or varieties."

They survive dry times efficiently by waiting in a state of suspended animation ('anhydrobiosis'), often deep in the soil, until rain and new plant growth sends a signal for them to infect new crop roots.

Then, when populations reach damaging levels, they cause significant yield loss in susceptible and intolerant crops, such as wheat and chickpea varieties.

"Some summer crops are good hosts of root lesion nematodes – mungbeans for *P. thornei* and grain sorghum for *P. neglectus* – and, although crops may not suffer yield loss, nematode population buildup under them can be quite dramatic.

"It can be difficult to know if a paddock has a root lesion nematode problem, as symptoms, which may include lesions on roots, poor growth and stunting of plant tops, often resemble nutrient deficiency or moisture stress," Tim Clewett says.

The good news is trials have shown that management and planning can reduce crop yield losses from nematodes.

Populations of *P thornei* increased 10 to 12 fold under successive susceptible crops – such as wheat followed by mungbeans – compared to successive resistant crops such as canary seed followed by millet (except White French millet).

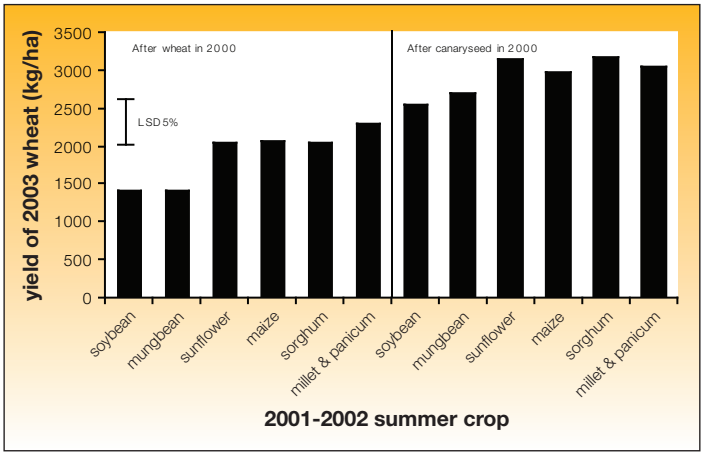
Those changes in populations of *P. thornei* over the experiment demonstrated the importance of careful crop selection for maintaining low nematode levels.

Best management practice is to rotate with resistant crop species, as this limits nematode reproduction in crops like wheat and chickpeas. Choosing tolerant crops is the best way to maintain good yields.

Resistant varieties are imperative for a lasting solution to nematode problems.

The real economic impact of these nematode populations was clearly demonstrated in the final year of the trials, when a susceptible wheat crop was planted on all plots.

Figure 1: In the final year of the P. thornei crop rotation experiment, yields of the susceptible wheat cv. Strzelecki(1) were doubled in plots previously planted with resistant crops, such as canary seed followed by millet or sorghum



This research shows management of root lesion nematodes requires:

- Accurate identification of nematodes in paddocks; which species – *P. thornei, P. neglectus, M.brevidens*:
- Where root-lesion nematodes are not present, farm hygiene is needed to avoid contamination by infested soil or machinery, and
- Where the pest is present, rotate to resistant crops and select varieties on tolerance and resistance.

And a final word: it is important to note that there are differences in resistance and susceptibility of crops for each nematode species. Information on varietal tolerance can be found at www.nvtonline.com.au

The confirmation of the stunt nematode, *Merlinius brevidens*, in Australia's northern grains region, in 'remarkably greater' numbers than found in studies in the USA, has led the LRC pathology research team to question the potential threat of this nematode.

Research from the USA found that *M. brevidens* increased after wheat. Yield losses have been observed in wheat and are generally more severe in barley and oats.

M. brevidens is a root-grazing nematode that causes symptoms of stunting, chlorosis and root malfunction.

There is also some evidence in the literature of an interaction between *M. brevidens* and the soil borne fungus, *Olpidium* spp. in wheat.

The LRC researchers' concerns began in 2007, when agronomists in the Mungindi and North Star districts of northern NSW observed patchy, yellowing, unhealthy growth in paddocks of wheat, barley and oats.

Crop damage was evident early in the growing season and became more apparent as the season progressed. Soil samples revealed very high populations of *M. brevidens* (up to 60,000/ kg soil).

Merlinius brevidens is widely distributed in cropping soils of the northern grain growing region and is routinely identified and counted in research trials and farmer samples, but it has been rarely encountered in such high populations.

The impact of this nematode on grain crops in this region is largely unknown.

Further information:

Tim Clewett 07 4639 8846, timothy.clewett@dpi.qld.gov.au

GRDC Project code DAQ107

Big choice on summer crops at Dalby Update

A big range of new ideas and information on profitable summer cropping will be discussed at the GRDC's 2-day Dalby Summer Crop Update on August 19th and 20th.

Targeting the latest information for growers and advisers, the 2-day format has six concurrent sessions – so participants can target the topics of greatest interest to them.

"While sorghum is king with several sessions devoted to it, other crops are not forgotten, with concurrent sessions on irrigated grains, mungbean, maize and sunflowers," said John Cameron, Northern Update Coordinator.

"Also of interest will be the session on premium grains for livestock markets - an area where there has been significant research on the value of different grain types in feed rations. Wouldn't growers like to know of a new NIR process to determine if weather damaged grain was actually of higher digestible value to a feedlot than undamaged grain?

"There are also sessions on ergot, insect management, interpreting head damage symptoms, as well as latest on breeding, low tillering varieties, stay-green, nutritional strategies, and more" said Mr Cameron.

Further information:

To register, go to http://www.icanrural.com.au to download a registration form, or call John Cameron or Erica McKay on 02 9482 4930 Early bird discount closes on 11th August 08.

GRDC Project code: ICN6

Business Management Updates provide the questions

Updates to be held at the Royal Hotel Goondiwindi (August 27th) and Quirindi RSL (August 28th) will break the mould and will not address quality agronomic research that has been the hallmark of Updates to date. Instead, these two Updates will focus on 'Questions for Business Management in Grain Production'.

Leading specialist consultants and growers will be presenting their thoughts and case studies on different aspects of business management, including:

- Profit, capital ownership and farm size - Simon Fritsch (Agripath Consulting)
- Managing farm labour - Isobel Knight & Sarah Roche (ProAgTive)
- Succession planning 12 steps - Isobel Knight & Sarah Roche (ProAgTive)
- Managing capital - Chris McDowell (SCU), Chris Fry (NAB)
- Grower case studies from Tim Grellman, David Carter and David Brownhill
- Managing price risk and grain marketing – Brett Stevenson (AgRisk Management)

Those yearning for more quality agronomic content will be interested in the 2-day Summer crop Update at Dalby (19 & 20th Aug), and the Bellata Agronomy Update (Aug 26th). Agendas available at http://www.icanrural.com.au

Further information:

Or to register, call John Cameron or Erica McKay 02 9482 4930, updaten@tpg.com.au

GRDC Project code: ICN6

Crown-rot and yield

Research by the NGA (Northern Grower Alliance) and NSWDPI is telling us more about crown rot's effects on the yield of winter cereals, on different varieties of barley and wheat and on how well variety resistance ratings reflect yield losses under crown rot pressure.

NGA CEO Richard Daniel cautions that while 11 trials in 2007 showed clear results, more work is needed to confirm the consistency of results in different seasons:

- crown rot caused an average 20% yield loss (~360 kg/ha) in barley over the 11 trials (range 0 to 53%) but had little impact on yield between all barley varieties;

- the % yield loss in barley was similar or slightly lower than that recorded by both wheat and triticale;
- crown rot caused an average 25% yield loss in wheat (~340 kg/ha, range 3 to 55%) with durum yield losses averaging 58%, more than double the other winter cereals under the same conditions (~900 kg/ha, range 14 to 90%);
- Sunco returned the lowest average wheat yields, either with or without added crown rot;
- the levels of yield loss are in ADDITION to any yield penalty suffered through moisture limitation in 2007 and can be attributed directly to increased infection by crown rot;
- assuming equivalent grain prices, EGA Wylie(ф) and EGA Gregory(ф) resulted in an additional $110-180/ha benefit compared to Sunco in the presence of added crown rot;
- wheat yields in the presence of added crown rot did not strongly reflect current varietal resistance ratings, and
- the consistently significant yield losses for durum varieties prompted the research team to recommend the rating scale for durum should be entirely different from bread wheat.

Further information:

Steven Simpfendorfer 02 6763 1261, steven.simpfendorfer@dpi.nsw.gov.au

Richard Daniel 07 4698 7983, richard.daniel@nga.org.au

GRDC Project codes: NGA00001, DAN00109

Subsoil constraints cost northern region growers $112 million annually

According to Yash Dang – soil scientist with the Combating Subsoil Constraints project (SIP08), subsoil constraints cost growers around $80/ha in forgone income over 1,400,000 ha in the Northern Grains Region.

In 2004 the project team conducted a number of action learning workshops throughout Queensland and New South Wales. These helped advisers and growers to identify and understand the level of impact that subsoil constraints have on water extraction and grain yield

Recent research that evaluates different management options for soils with subsoil constraints will be presented in a new series of workshops that have been designed to provide knowledge and skills to identify, interpret and manage subsoil constraints.

Seven workshops are planned for 2008 in Northern New South Wales and Queensland. Grain growers and advisers interested in attending a workshop should express their interest by contacting the relevant contact person from the table below. These workshops are part of the national subsoil constraints strategic initiative supported by GRDC.

Further information:

Yash Dang 07 4688 1048, Yash.Dang@nrw.qld.gov.au

GRDC Project code: DNR00004

Dates and contact persons for the 'Maximise Gain by Managing Subsoil Constraints Workshops'

July
22 - **Banana** Contact: Stuart Buck 07 4992 9187
23 - **Emerald** Contact: Stuart Buck 07 4992 9187
29 - **Roma** Contact: Bede O'Mara 07 4671 6716
30 - **Goondiwindi** Contact: Bede O'Mara 07 4671 6716
31 - **Dalby** Contact: Yash Dang 07 4688 1048
August
6 - **Bellata** Contact: Brooke Phelps 02 6752 5888
7 - **Walgett** Contact: Myles Parker 02 6828 0126

Pestlinks – Integrated Pest Management (IPM) information on the web

The Pestlinks site page on the GRDC's website brings together web based information on research, development and extension on IPM. The site has a broad range of useful links on insect management including resistance management strategies, vertebrate pests, identification, chemical control, other useful links and key contacts for each state.

Further information: **http://www.grdc.com.au/pestlinks**

VISIT AUSTRALIA'S GRAINS RESEARCH WEB PAGE www.grdc.com.au

Editor: John Cameron Ph: (02) 9482 4930, PO Box 718, HORNSBY NSW 1630

Research writers: Bernie Reppel, John Cameron and Erica McKay

Layout and design: Lightning Designs Ph: (08) 8274 1648

(ф) *Varieties dispalying this symbol are protected under the Plant Breeders Rights Act 1994.*