What does this mean?
Some of the key points:
Despite the soil being in a freshly cultivated condition, it took only 4 minutes to surface seal the soil and 6 minutes for runoff to commence. This was due to the rainfall
Impact energy on the unstable surface soil that rapidly slaked (melted) to form a surface seal. Where the 4 tonne of stubble per hectare (100% ground cover) was left, the rain was not able to impact on the soil surface and seal it as much. This resulted in an infiltration rate of only 18.5 mm in the ploughed plot and compared to the stubble plot of 57.5 mm.
When the subsequent rainfall events were applied, runoff from the sealed ploughed surface commenced in around 2 to 4 minutes. This time depended the period allowed for the soil drain and dry before the next rain event. This is the reason for the differences between the runoff collected from different storms.
When a steady runoff rate was obtained during a rain storm event the runoff rate was close to the rainfall rate from the ploughed plot (>90%). This means that there was virtually no rainfall infiltration in the ploughed plot when the soil became saturated and ponded from the rain.
The soil loss from the ploughed plot was significant. Once the soil settled in the collection containers there was on average around 2 mm of sediment on the bottom. There was no sediment from the stubble block just slightly discoloured water

How much money did we loose?
Using the calculation of $4.50 for every millimetre of rain stored as soil water then the money or potential productivity loss from the ploughed block compared to the stubble can be estimated from two aspects:
If the rain was received in the fallow period and using a fallow efficiency of 30% then the potential production loss was

39mm X 0.30 = 11.7mm X $4.50 = $53 per hectare
If the rain was received in crop then potentially all of the rain can be used……
39mm X $4.50 = $175 per hectare

These calculations do not factor in the nutrients lost in the sediment. Studies from similar settled soil conditions and soil type have had soil losses of 1.8 tonnes per hectare from the same rainfall rate applied for 40 minutes. This would represent a soil loss of greater than 4 tonnes per hectare for the 90 minutes of rain applied. For a sandy loam soil this figure would be more than 9 tonnes per hectare over the same period. To estimate the loss of nutrients the results from a severe storm in 1992 at Cowra can be used. The rain event was 81 mm of rain in 45 minutes with an average rainfall intensity of 108 mm/hour and a peak intensity of 360 mm/hour for two minutes. It was estimated the soil loss from the ploughed plot was 360 tonnes per hectare which contained > 300 kgs /ha of nitrogen and >15 kgs/ha of phosphorous as well as other essential elements. Using this as a guide then for every tonne of soil lost a conservative estimate would have been between 4 – 9 kgs/ha of N and 1 -2 kgs/ha of P. Remember this estimation is for the relatively gentle application of 64 mm rain over a 36 hour period. Storms well in excess of this have been received in the summer of 2008 and losses would have been much higher.

Therefore potential production losses just from runoff alone was greater than $50 per hectare if the rain was received in the fallow period and greater than $170 if received in the growing period. Realistically the cost of the nutrients lost should be factored into these costs as well as the devastation of losing soil from sheet erosion. Soil is a non renewable resource and cannot be replaced.

The maintenance of stubble on this soil significantly protected the soil from raindrop impact and subsequent soil surface sealing. Over time with reduced soil disturbance and return of residues soil by adopting no tillage practices soil matter and structure will further improve infiltration and also provide protection from raindrop impact when the stubble cover is low.

As a final note have you measured how much of the water has been stored in your soil profile? Although the infiltration rate is dependent on soil type and condition, this demonstration does highlight that a majority of the rain received in this wet summer period may have been runoff and the soil may have relatively little stored water.

For further information
Ian Packer
Catchment Co-ordinator, Lachlan CMA, Cowra NSW
Ph: (02) 6341 9321
Email: ian.packer@cma.nsw.gov.au

ROW DIRECTION, ROW SPACING AND STUBBLE COVER EFFECTS

Alison Frischke and Jon Hancock
Research Officer, SARDI, Minnipa Agricultural Centre

Key messages
- Mean grain yield has been 8.4% higher with north-south over east-west sowing over the last four seasons.
- Grain yield has been higher with narrower row spacings when stubble has been retained.

Why do the trial?
Since 2005, a trial has been running at Minnipa to investigate the effects of row direction, row spacing and stubble cover on grain yield and quality. North-south sowing has improved grain yields in the past and the trial was sown to wheat in 2008 to determine whether a yield response to north-south sowing could be maintained for yet another season.

How was it done?
A trial at Minnipa Agricultural Centre has been sown with identical treatments from 2005 to 2008. The trial has three treatments, sowing direction (north-south vs east-west), row spacing (18, 23 and 30 cm) and stubble cover (retained vs burnt). Crop type has changed over the time of the trial with Yitpi wheat sown in 2005, Wyalkatchem wheat sown in 2006 and Maritime barley sown in 2007. In 2008, the trial was sown to 60 kg/ha of Clearfield Janz with 60 kg/ha of 18:20 on 23 May. The trial was sprayed with 900 mL/ha of Midas on 22 July.

Plots were harvested at maturity and grain samples were retained for quality analysis.

What happened?
To improve the robustness of data analysis, grain and grain quality data were analysed across all years to determine the effects of row direction, row spacing and stubble over the long term. In each year of the trial, there was a positive grain yield response to north-south sowing which culminated in an overall increase in grain yield of 8.3% over east-west sowing (Table 1). Grain yield increased with the narrower row spacings (18 and 23 cm) only when stubble was retained (Table 2).

Table 1 Effect of row direction on grain yield (t/ha) at Minnipa, 2005-2008

Year	Row Direction		Yield Advantage of Sowing N-S	
	N-S	E-W	(kg/ha)	(%)
2005	1.50	1.43	71	5.0
2006	0.31	0.25	64	25.7
2007	1.26	1.16	99	8.6
2008	0.91	0.84	71	8.5
2005 - 2008	0.99 a	0.92 b	76	8.3
LSD (P=0.05) (2005-2008)	*0.06*			

Table 2 Effect of row spacing and stubble on mean grain yield (t/ha) at Minnipa, 2005-2008

Row Spacing (cm)	Stubble Retained	Stubble Burnt
18	1.03 a	0.95 b
23	1.00 a	0.92 b
30	0.91 b	0.93 b
LSD (P=0.05)	*0.05*	

Grain protein declined from 11.2% with E-W sowing to 10.8% with N-S sowing. There was also an interaction between row spacing and stubble retention which reflect differences in grain yield with a protein penalty for higher yields.

Table 3 Effect of row spacing and stubble on mean grain protein (%) at Minnipa, 2005-2008

Row Spacing (cm)	Stubble Retained	Stubble Burnt
18	10.8 bc	11.3 a
23	10.7 c	11.1 ab
30	10.9 bc	10.9 bc
LSD (P=0.05)	*0.3*	

Grain screenings were not affected by any treatment and averaged 1.9% over the time of the trial.

What does this mean?
Data from all years of the trial has shown a positive yield advantage from sowing in a north-south direction. The mean grain yield increase of 8.3%

with north-south sowing over east-west sowing, or 4.2% over a 50/50 mix of north-south and east-west sowing (i.e. round and round) makes north-south sowing the preferred sowing direction. Growers need to assess how this fits in with other factors such as paddock orientation and the orientation of sand hills when making the decision of which direction to sow.

The benefit of stubble retention to grain yield has also been demonstrated in this trial and is encouraging for growers in stubble retained, no-till systems. The benefits of stubble in reducing soil evaporation, increasing organic matter and promoting disease suppression are well documented. The decline in yield with 30 cm row spacing in the stubble retained system shows that wider row spacings must be used for other reasons than just grain yield, for example increased herbicide safety, better trash flow and reduced power requirements.

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Category: Try this yourself now
Location
Minnipa Agricultural Centre
Rainfall
Av Annual: 325 mm
Av GSR: 242 mm
2008 Total: 251 mm
2008 GSR: 139 mm
Yield
Potential: 1.21 t/ha
Actual: up to 0.91 t/ha
Paddock History
2007: Barley
2006: Wheat
2005: Wheat
Soil
Red sandy loam

Jon Hancock
Research Officer, SARDI, SA No-Till Farmers Association, Minnipa Agricultural Centre
Ph: (08) 8680 5104

Alison Frischke
Research Officer, SARDI, SA No-Till Farmers Association, Minnipa Agricultural Centre
Ph: (08) 8680 5104

HIGHLIGHTS FROM THE LOW RAINFALL COLLABORATION PROJECT

Nigel Wilhelm and Geoff Thomas
GRDC funded: Low Rainfall Collaboration Project.

Background
The initial low rainfall collaboration project (LRCP) commenced in 2003 with funding from GRDC to link the low rainfall farming systems groups more effectively and help them learn from each other.

GRDC supported a second round of funding from 2006, with a revised structure which had Geoff Thomas as Project Manager (50% FTE), Dr Nigel Wilhelm as Scientific Consultant for 75% of his time and additional expertise contracted as required. It supports five Farm Systems Groups/Projects – Eyre Peninsula, Mallee Sustainable Farming Inc, Central West Farming Systems, Upper North and BCG.

The project has just commenced a third round of funding (until 2012) with strong support from GRDC and the FS groups again.

It seemed timely to now provide a summary of what the project has been doing over these past few years and perhaps, even more importantly, where it is going into the future.

Maintain a Newsletter
The project produces a newsletter 4-6 times a year to communicate new developments and current conditions to all the groups and to a long list of interested groups and complementary organizations. It serves not only as a useful means of sharing info but also in building esprit de corps.
As well as the newsletter a Calendar of LRCP and other important events is produced and has resulted not only in better communication but in avoiding clashes.

Conduct an Annual Workshop
Workshops are organised in conjunction with one of the groups (Condobolin, Upper North and Birchip in the last 3 years). Each workshop is a mix of group reporting, field visits, technical sessions, group process sessions, informal discussions and having fun. These are a very useful vehicle in providing mutual support which is importance when things are tough.
Visits by Farmer Groups
The LRCP supports groups of farmers visiting other project or regions for their mutual benefit. Guidelines have been established which require goal setting, planning and feedback/reporting.
Because of the seasons the demand in this area has dropped off and the program is now more targeted to younger farmers and attendance at specific events such as the Adviser Updates.

Sharing of Materials
This has been a real area of growth in the project with many articles being prepared and published for the benefit of LR groups. For example, the LRCP produced the "GRDC 2008 Planning Guide for Low-Risk Farming" and the "2009 Planning Guide for Farmers with Limited Finances.", which were printed and distributed widely in Ground Cover by GRDC.

Research and development support
A major component of the LRCP is to provide research support to the groups. It does so in a number of ways:
- Bringing expertise together to address issues and provide direction such as in WUE, soil biology and crop nutrition.
- Identifying and meeting research needs including securing funding, eg.
  - Summer weed control using PA
  - Canola for low rainfall areas
  - Deep fertiliser placement
  - Lucerne establishment
  - Feeding summer lambs
  - Crop sequencing
  - Crop growth workshops
  - Profit/Risk workshops
  - Providing input into G&G review in preparation for phase II.
- Provision of expert statistical support in the planning and interpretation of projects.
- Involvement in setting R&D directions with research agencies and industry funding bodies eg (in soil biology, plant improvement, crop sequencing and NVT).
- Direct assistance to groups in planning and conduct of their program, especially Upper North and Eyre Peninsula.