Article

Harvest Efficiency

The 2010 harvest is still in the mind of many farmers as a result of the frustrations with logistics and grain handling that it caused. It has led to many farmers thinking and planning about how they can better manage on-farm harvesting and logistics operations.

Risk Management

There are many risks that need to be managed during a grain harvest. Risks such as unseasonal rainfall, mechanical breakdowns, OH&S management, fatigue, contractor risk and misclassification risk are all examples of risks which need to be managed during harvest.

We recently obtained some information in regard to the probability of unseasonal rainfall across three locations within South Australia. Significant rainfall events during harvest can quickly lead to grain yield and quality losses. The information is shown below:

Period through harvest	Probability of at least 50mm in 7 days		
	Karoonda	Naracoorte	Jamestown
Years of records	77	108	111
1 Nov – 8 Nov	1%	2%	2%
1 Nov – 15 Nov	1%	4%	5%
1 Nov – 22 Nov	1%	6%	6%
1 Nov – 1 Dec	3%	7%	10%
1 Nov – 1 Jan	8%	12%	17%

Source: Rainman Streamflow

Interestingly, the 17% probability of receiving at least 50mm in 7 days between 1 November and 1 January at Jamestown is exactly the same as the probability of such a rainfall event occurring in Moree.

The following strategies can be implemented to manage some of the risks associated with harvest proactively:

- Increasing harvesting capacity (contractor, 2nd harvester, larger capacity equipment)
- Improve field efficiency
- Use of chaser bins
- Use of mother bins, silo bags, sheds, vertical storage
- Harvesting earlier and using aeration drying
- Growing some earlier maturing crops in your rotation
- Employing more trucks in the system during harvest

Logistics Forecast

Modelling work rates and harvest logistics prior to harvest using an Excel template can provide useful insights into potential "bottlenecks" in your system such as:

- Small pick-up fronts restricting the capacity of large machines
- Trucking and freight capacity
- Harvester capacity
- Significantly higher yields (2010)

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The following example shows how logistics modelling can provide insights into where these 'bottlenecks' may occur, giving you the ability to plan ahead on how they will be managed.

Logistics Forecast

Plausible Yields

Commodity	Area	Weighted Average Yield	Total Tonnage	Average Payload	Total Loads	Work rate(ha / hr)	Total numbers of hours	No of days @ 12 hours / day	Work rate t/hr	Tonnes per day	Total Loads per day	Loads per day per truck	Average loads per day per truck in 2009
Canola	644	2.1	1,352.40	27.50	49.18	6	107.33	8.94	12.6	151.2	5.50	2.75	2.67
Beans	460	3.2	1,472.00	27.50	53.53	5	92.00	7.67	16	192	6.98	3.49	2.67
Wheat	1405	4.2	5,901.00	27.50	214.58	4	351.25	29.27	16.8	201.6	7.33	3.67	2.67
Total	2509		8,725.40		317.29		550.58	45.88					

The key with modelling harvest logistics is to use realistic work rates based on true historical performance. Realistic work rates for trucks for example, should be calculated by dividing the total number of loads moved by the truck by the total number of days between the start and end of your previous harvest. It is likely that this number will be significantly lower than what you would initially consider an "average day" to involve. The above modelling demonstrated that a "two truck" scenario would not keep up during harvest.

Field Efficiency

Understanding field efficiency can also help improve overall productivity.

Calculating work rates for different operations is a useful way to look at how efficient an operation is being undertaken.

The formula for calculating a machinery work rate is:

$$\text{Work rate in Ha / Hr} = \frac{\text{(Speed (km/hr) x width (m)) x efficiency \%}}{10}$$

If harvesting a crop at 5km/hr and using a 14m harvester front while operating at 80% efficiency, this farmer should be able to harvest a crop at 5.6ha/hr.

The formula for calculating field efficiency is:

$$\text{Field efficiency \%} = \frac{\text{Time spend operating the machine in crop x 100}}{\text{Total time spent in the paddock and in transport}}$$

Total time spent in a paddock generally includes emptying the grain, travel, fixing breakdowns, turning, overlapping and undertaking maintenance. Field efficiency can be a highly variable factor between farms.

The table below demonstrates the impact of field efficiency on work rate.

Speed	Width	Efficiency	Work Rate Ha/Hr
5	14	80%	5.6
5	14	70%	4.9
5	14	60%	4.2

Across a 2,000ha harvesting program, field efficiency can have a significant impact on time of harvesting. If operating for 10 hours per day the difference between running at 60% efficiency and 80% efficiency is 14ha per day. This could potentially result in an additional 12 days of harvest. Factor in any potential weather delays and the length of harvest can easily increase significantly. This principle flows across all major farm operations like spraying and sowing.

Some tips for improving field efficiency include:

- Preventative maintenance of machinery
- Increasing paddock size
- Chaser bins (30% improvement in harvest efficiency)
- Block farming crops
- Staff training
- GPS – autosteer
- On farm storage to keep grain away

By increasing field efficiency through paddock shape and block cropping generally allows a larger area to be farmed with the same size plant. It is also important to recognise that time saved at harvest is cumulative and that every day saved at harvest is another day that can be used within your business to prepare for seeding or take a well-earned break to recharge for the year ahead.

Applying a robust logistics management and planning approach prior to harvest can be a valuable strategy to improve overall harvest efficiency.

Fact Sheet

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