MACHINERY INVESTMENT AND REPLACEMENT FOR AUSTRALIAN GRAIN GROWERS

January 2022

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GRDC contact details:
Ms Maureen Cribb
GRDC Integrated Publications Manager
PO Box 5367
KINGSTON ACT 2604
Telephone: 02 6166 4500
Email: Maureen.Cribb@grdc.com.au

Design and production: Liz Rowlands rowmeld@optusnet.com.au

COVER: Machinery investment and replacement decisions can have significant financial implications on farm.
PHOTO: Ben White, Kondinin Group

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GLOSSARY

Balloon: The final payment in a chattel mortgage or lease financing arrangement. Balloon payments are typically between 20 and 50 per cent of the equipment purchase price.

CANBUS: Also known as ISO 11783, CANBUS is defined to be the universal standard for tractors and machinery for agriculture and forestry serial control and communications data network.

Chattel mortgage: Also known as equipment finance, a chattel mortgage is a formal term that refers to a finance agreement to provide funds to purchase an asset and the finance provider accepts the financed asset as the security for the credit.

Depreciation: The proportional reduction in value of equipment over time. Typically, depreciation is highest immediately after purchase of new equipment.

GIP: Gross income potential. As defined in the GRDC Kwinana West machinery investment project (2016) as an farm production potential index calculated by multiplying cropped area by long term average wheat yield and a nominal grain price of $300/tonne.

Instant Asset Write Off (IAWO): An Australian Taxation Office (ATO) taxation governed financial stimulus incentive allowing businesses to write-off 100 per cent of the value of tax-deductible items in the first year of purchase as opposed to a depreciation schedule.

Powertrain: The powertrain consists of the source of propulsion and the drivetrain (including transmission) system which transfers this energy into movement.

Roading: Transporting equipment between paddocks, machinery storage sheds, fill points or other farms.

Sectional control: The ability of wide equipment to selectively activate distinct sections of the operating swath in operation. Sectional control can be used to minimise overlapping with automation of the sections to avoid activation over already covered areas of a paddock.

Variable Rate Technology (VRT): Technology used to vary the rate of application of inputs over a paddock during operation. Typically, VRT applies inputs at rates prescribed using a zone map defining areas in a paddock.

Zone map: A paddock or farm map with defined zones used for VRT. Zone maps are often generated using historical and soil test information.

LITERATURE REVIEW AND BENCHMARKING DATA ANALYSIS

Introduction

This publication aims to explore benchmarks and decision making around machinery investment on-farm. It includes a consolidation of industry resources, collates machinery investment level benchmarks and is designed to assist growers in determining machinery, maintenance and labour investment levels relative to peers.

Kondinin Group worked together with three consulting groups spread nationally to compile the data in this publication: Agripath, Pinion Advisory and Farmanco.

The case studies have a geographic spread and were selected to compliment the benchmark data. They provide examples of the range of machinery investment approaches taken by growers around the country.

Industry information consolidation

There are numerous industry resources on machinery investment including regionally specific papers and rules of thumb relating to total machinery investment as a ratio to total farm income.

A summary of these investment ratios is shown in Table 1.

Table 1: Suggested machinery investment ratios – Australian published papers and literature

Researcher	Year	Location	Machinery investment ratio to total gross farm income
Wilson et. al.	2005	Australia	Weak >1.2 Average 0.8 – 1.2 Strong <0.8
Barry Mudge (Groundcover)	2013	South Australia	0.8 – 1.2
ORM (ORM00004)	2014	South Eastern Australia	1.0
Alexander and Hagan (DPIRD) – Utilising Planfarm / Bankwest data	2015	Western Australia	North (low rainfall) 0.51 (medium rainfall) 0.52 (high rainfall) 0.47 South (low rainfall) 0.68 (medium rainfall) 0.75 (high rainfall) 0.63 Suggested benchmark: 0.6
Planfarm (ORM00017)	2016	Western Region	0.6 – 1.1 (Average 0.7)
Hillcoat – Rural Directions data (ORM000015)	2017	Southern region	0.8 – 1.2 Suggested benchmark: 1.0

Alternative approaches to benchmarking machinery investment looked to normalise grower income potential based on long-term wheat yields and a nominal average price for wheat. The normalised income was referred to as the Gross Income Potential or GIP in the Kondinin Group research conducted for the Kwinana West port zone Regional Cropping Solution Network (RCSN) in 2018. Total investment in machinery was then plotted against the calculated GIP. This approach was used in the ***Kwinana West focused Machinery investment and replacement options for growers in the Kwinana West RCSN port zone*** research project.

Repairs and maintenance influence figures

Previous published research and resources have placed a focus on the level of investment in equipment without consideration for the maintenance and labour aspects of owning farm machinery and operating plant.

The exclusion of maintenance and labour costs however can skew machinery investment figures by masking the true cost of machinery ownership. Private farm business consultants usually include these figures in their calculations around farm business performance.

Low levels of machinery investment can be offset by higher repair costs, particularly where there is skilled labour on-farm, for example owners or staff have diesel mechanic skillsets.

Conversely, investment in new machinery or machinery with low hours will have a higher depreciation cost, particularly in the early stages of ownership.

Data collation approach

Kondinin Group worked with geographically spread consultants to gather machinery inventory and value data as well as operational data, identifying cropping specific machinery utilisation rates along with contractor costs, labour, repairs and maintenance costs for each operation.

Data was categorised into consultant-nominated agro-ecological zones (AEZs) and a blanket depreciation rate of ten per cent was universally applied for machinery.

Because labour was identified as a cost that could offset a machinery inventory outlay, this was identified for each operation in the analysis. While not included in other analyses of machinery investment, it was recognised that some low hours machinery inventory operations may be supported by high levels of labour, or higher levels of expenditure on specialist labour skillsets, for example, diesel mechanics on staff.

Contracting and applications for machinery utilisation outside cropping were identified and discounted where appropriate. While a more cumbersome and time-consuming approach, this ensured higher levels of confidence in the data analysed.

A similar approach was used for equipment specific to hay production although where equipment was part-used for hay work and this could be identified, it was excluded from the dataset.

Other approaches to benchmarking machinery ownership have been analysed for comparison, but variables not included in these approaches do raise questions over their universal applicability and application when benchmarking machinery investment. Exclusions in alternative benchmarks include contracting, labour, repairs and maintenance costs which can vary depending on the investment in machinery for an operation. These are all captured in the Total Plant Labour Maintenance and contracting (TPLM+C) figures.

Outliers including those with cropping income less than $100,000 and exceeding $10m, were excluded from the dataset to preserve relevance for the majority of growers.

Summary of findings

Data was analysed on a regional basis with average figures by region calculated in Tables 2 – 6.

Table 2: Averaged figures nationally and by region - operational scale metrics

Location	Average Effective Area Farmed (ha)	Average Cropped area (ha)	Average Long-term wheat yield for this area (t/ha)	Average Gross Farm Receipts (p.a.)	Average Cropping income (p.a.)	Average Total current investment in machinery	Average Depreciation Rate
NATIONAL (n=480)	**4,077**	**3,146**	**2.41**	**$2,430,955**	**$2,078,752**	**$1,853,142**	**10%**
WESTERN (n=312)	4,865	3,767	2.20	$2,725,127	$2,371,867	$2,132,077	10%
SOUTHERN (n=109)	2,300	1,781	3.08	$1,727,481	$1,398,989	$1,517,489	10%
NORTHERN (n=59)	3,145	2,230	2.16	$2,053,912	$1,634,647	$959,650	10%

Table 3: Averaged figures nationally and by region - contractors and labour

Location	Average Total annual spend on contractors (p.a.)	Average Total annual spend on maintenance (p.a.)	Average Total annual spend on labour (p.a.)	Average Total FTE labour units including Family Members and Casual Labour (p.a.)	Equivalent Wage for Family Members on Drawings (p.a.)
NATIONAL (n=480)	**$48,246**	**$132,816**	**$134,644**	**3.2**	**$151,968**
WESTERN (n=312)	$46,784	$157,249	$139,973	3.2	$149,544
SOUTHERN (n=109)	$29,024	$72,107	$93,645	3.5	$161,313
NORTHERN (n=59)	$88,589	$112,381	$178,400	3.2	$139,672

Table 4: Averaged figures nationally and by region - machinery utilisation

Location	% area regularly cropped for hay or cotton production	Average Tractor value / Total Plant	Average Implement value / Total Plant	Average Spraying value / Total Plant	Average Harvesting Value / Total Plant	Average Grain Handling Equip. / Total Plant	Average Hay Equipment / Total Plant	Average Trucks Value / Total Plant	Average Irrigation Equip. / Total Plant
NATIONAL (n=480)	**4.8%**	**20.7%**	**15.6%**	**13.2%**	**18.0%**	**8.2%**	**1.1%**	**8.2%**	**0.3%**
WESTERN (n=312)	3.1%	20.4%	15.7%	13.3%	18.7%	8.2%	1.0%	8.0%	0.1%
SOUTHERN (n=109)	8.3%	19.6%	11.1%	5.2%	17.8%	3.9%	11.4%	19.1%	0.0%
NORTHERN (n=59)	8.0%	22.4%	14.9%	13.0%	13.8%	8.5%	1.7%	7.7%	1.5%

Table 5: Averaged figures nationally and by region - other machinery

Location	Average General (Utes etc) /Total Plant	Average Livestock Machinery Value	Average General Machinery Value	Average Crop
NATIONAL (n=480)	**11.2%**	**$29,344**	**$200,231**	**76%**
WESTERN (n=312)	11.1%	$27,770	$199,632	76%
SOUTHERN (n=109)	10.4%	$41,613	$256,290	74%
NORTHERN (n=59)	13.1%	$46,597	$193,843	69%

Table 6: Averaged figures nationally and by region - Total investment and ratios

Location	Average TPLM (Combined Plant Maintenance/Repairs and Labour)	Average GIP	Average Gross Farm Receipts (p.a.)	Average Ratio TPLM: Gross farm income	Average Ratio TPLM+C*: Gross farm income
NATIONAL (n=480)	**$711,204**	**$1,730,428**	**$2,430,955**	**32.6%**	**34.5%**
WESTERN (n=312)	$795,697	$1,957,118	$2,725,127	31.1%	32.8%
SOUTHERN (n=109)	$542,525	$1,274,864	$1,727,481	36.2%	37.9%
NORTHERN (n=59)	$560,346	$1,254,860	$2,053,912	31.8%	35.2%

(* Total Plant, Labour, Maintenance and Contracting)

ALTERNATIVE BENCHMARKS: Machinery investment to gross farm income

Machinery investment to gross farm income ratio arrived at the lower end of the figures presented in Table 1 with a national average machinery investment ratio to total gross farm income of around 0.73. See Figure 1.

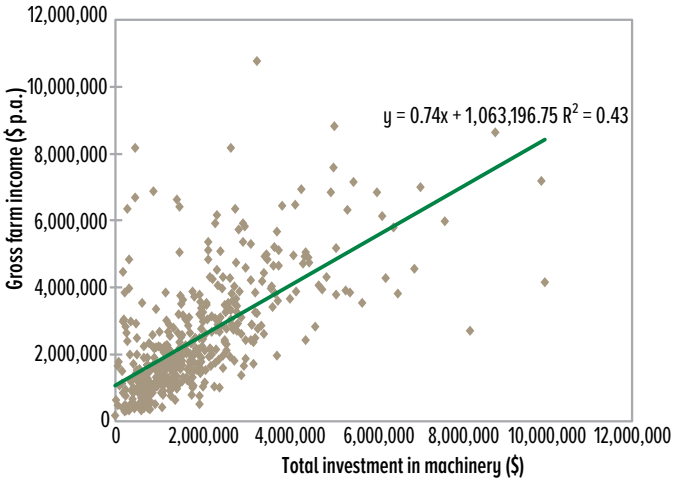

Figure 1: Total investment in machinery vs gross farm income (national) n=469.
Source: Kondinin Group 2020

ALTERNATIVE BENCHMARKS: Machinery investment to cropped area

While this benchmark can provide a useful regionally specific machinery investment ratio by area cropped, it does not capture labour, repairs and maintenance. Contractor input is also excluded from these figures, potentially skewing the data. See Figure 2.

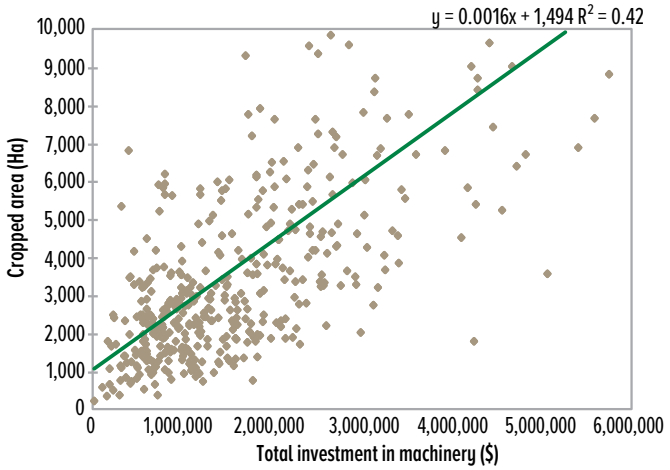

Figure 2: Total investment in machinery vs cropped area (national) n=469
Source: Kondinin Group 2020

Figure 3 illustrates the range and spread of machinery investment by area across the sample. The average investment in machinery per hectare on a national basis was $680.

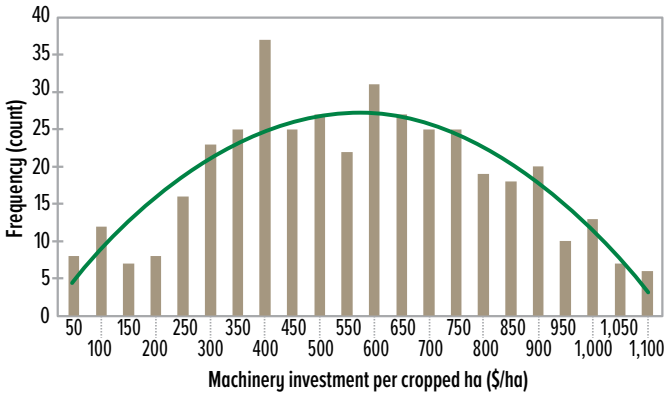

Figure 3: Frequency histogram: Machinery investment by cropped area $/ha (National: n=411)
Source: Kondinin Group 2020

ADOPTED BENCHMARK: Ratio of total plant, labour, maintenance and contracting to total gross farm income

Accounting for plant, labour and maintenance as well as any contracting input (TPLM+C), the ratio of machinery related expenditure to gross farm income was around 0.34 on a national basis. This applied the nominal depreciation value of 10 per cent to the value of all plant as an average depreciation cost. It could be argued that depreciation varies significantly from this figure as equipment ages (see Figure 4) but an average figure was recommended by collaborating consultants and applied as an assumption for the analysis.

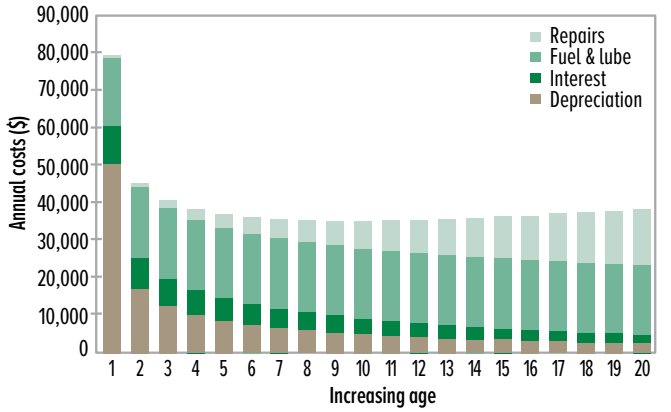

Figure 4: Annual costs for a 250hp tractor
Source: IA State 2017

Figure 5 (A) illustrates the relationship between total plant, labour, maintenance and contracting to total gross farm income and suggests that as a rule of thumb, the following formula could be used as a benchmark for evaluating investment in machinery:

$$\text{TPLM + C Ratio} = \frac{\text{(TP + L + M + C)}}{\text{Gross farm income}}$$

Where TPLM is the **T**otal value of **P**lant (multiplied by 10% depreciation), **L** is farm labour costs* and **M**aintenance costs incurred plus **C**ontracting costs.

(*note: Labour costs should include a financial acknowledgment of family input as follows: a management role =1, an operational role = 0.75, applying total management units X $80,000 + 1% of turnover)

TPML+C is a ratio that indicates the efficiency of owning and operating machinery. The national average is 0.34. High efficiency businesses have a ratio of less than 0.3 while poor efficiencies are greater than 0.4.

Figure 5 (B) illustrates the spread of regional variances for this ratio with the western region running at the lowest average ratio of TPLM+C to Gross farm income of around 0.32 while the southern and northern regions had average ratios of 0.38 and 0.35 respectively.

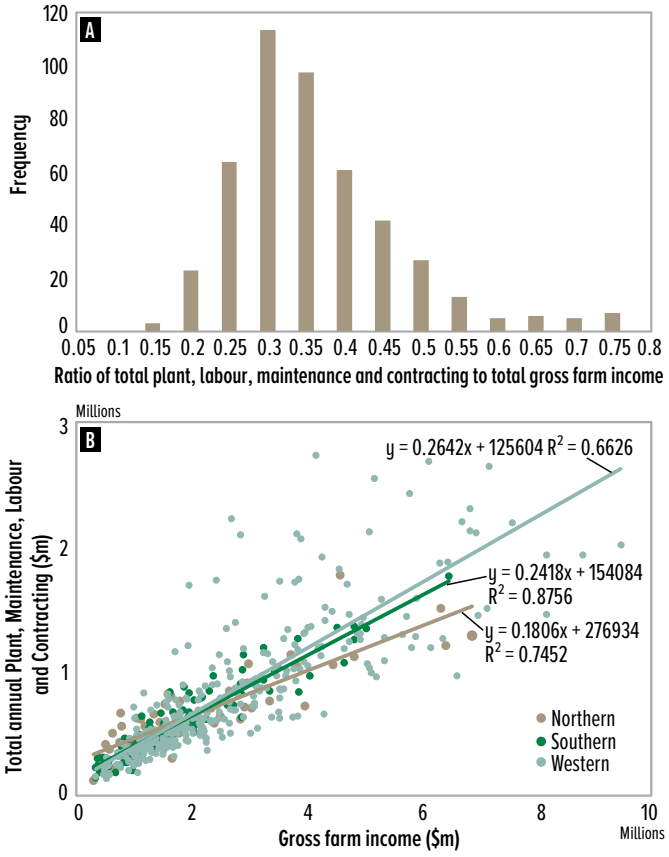

Figure 5: (A) Frequency histogram: Ratio of total plant, labour, maintenance and contracting to total gross farm income (National: n=411)
Source: Kondinin Group 2020
(B) TPLM+C vs Gross farm income by GRDC region
Source: Kondinin Group 2020

Breakdown by GRDC cropping region

Where sufficient data could be gathered, an analysis of TPLM+C was conducted to look for any regionally specific variances in machinery investment ratios. These are illustrated in Figures 6, 7 and 8 for the western, northern and southern GRDC regions respectively. Dataset count figures for the three regions were 312, 59 and 91 respectively.

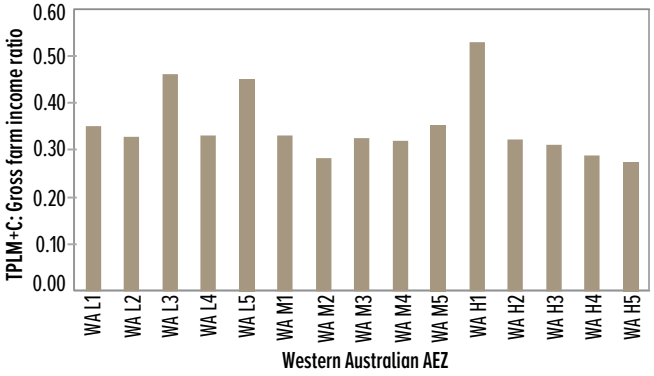

Figure 6: Ratio TPLM+C: Gross farm income by AEZ (West)
Source: Kondinin Group 2020

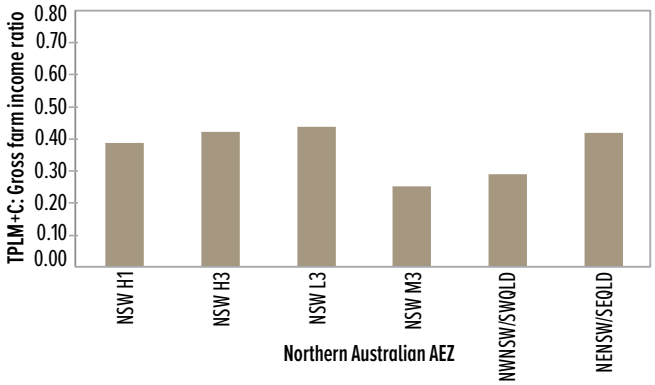

Figure 7: Ratio TPLM+C: Gross farm income by AEZ (North)
Source: Kondinin Group 2020

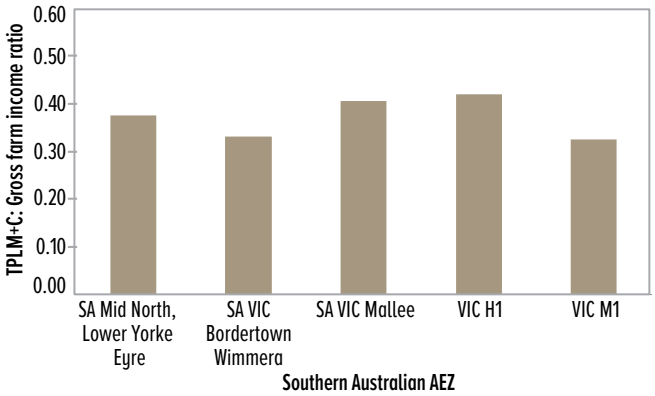

Figure 8: Ratio TPLM+C: Gross farm income by AEZ (South)
Source: Kondinin Group 2020

Keeping the wheels rolling

Maintenance costs on an annual average tally around 9 per cent of the value of the total investment in machinery, but there was a significant spread of maintenance costs. See Figure 9.

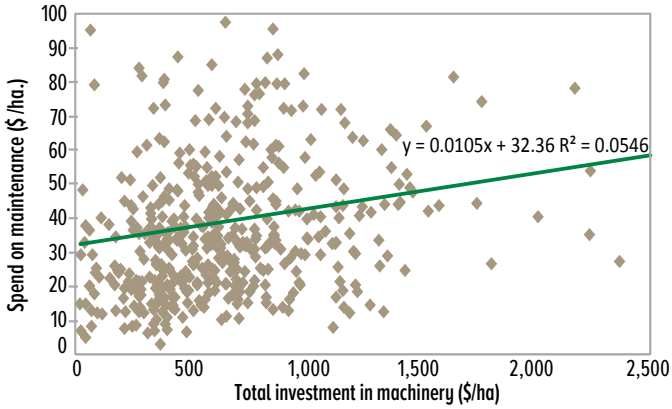

Figure 9: Machinery investment total vs total annual spend on maintenance (National: n=469)
Source: Kondinin Group 2020

Machinery replacement variables

There are a number of variables to consider when it comes to machinery replacement strategies. Debt repayment, seasonal conditions, grain prices and expansion plans.

Machinery replacement selection is usually driven by:

- Hours or age of equipment when purchased
  - New
  - Used with low hours
  - Used with higher hours
- Abilities and attitude to repairs and maintenance
  - Access to skilled staff, dealers, parts
  - Warranty preferences
  - Potential for production risk
  - Residual low-cost backup machinery
- Phase of the business
  - Expanding – need additional capacity
  - Comfortable – have cash to invest in machinery
  - Under pressure – need to reduce costs

Machinery selection and turnover is usually governed by machine hours or area covered. Older machinery can require increased repair and maintenance regimes, but costs less to operate on a per hectare basis. See Figure 10.

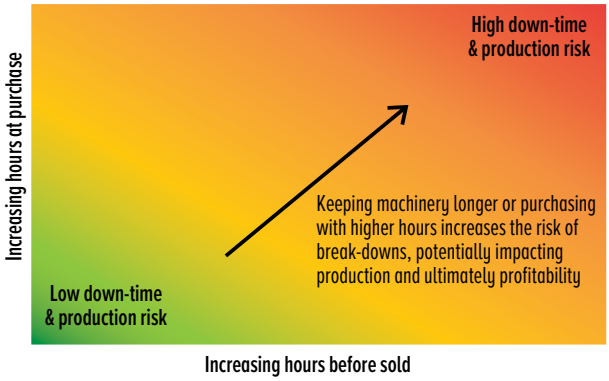

Figure 10: Machinery purchase and retention: depreciation cost
Source: Kondinin Group 2016

Conversely, the value of machinery can fall rapidly, reducing the ongoing depreciation cost of running the machine. See Figure 11.

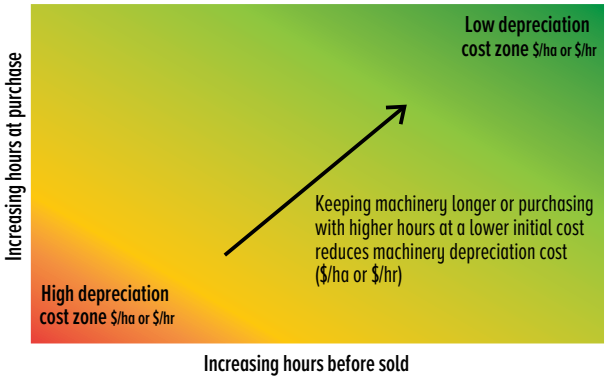

Figure 11: Machinery purchase and retention: depreciation cost
Source: Kondinin Group 2016

Farmers across Australia have varied attitudes to machinery purchases. Farm consultants will typically argue that farm machinery investment levels are too high. It could also be argued that the potential risk to production caused by a breakdown could be very expensive.

There is a compromise position which can vary in the context of all of the variables listed previously.

This report aims to look at the options for machinery replacement, assisting growers with some financial benchmarks to make the right choice regarding turnover timing.

Financing and payment ratio

According to consultants ORM, financing machinery and routinely replacing it has seen machinery costs become a fixed overhead. They suggest as a proportion of farm income, this figure averages 11 per cent nationally.

To put this in context, using the average investment in machinery according to the data collated, is $1,880,000.

Payments on this level of debt at a nominal chattel mortgage rate of 4 per cent, equates to annual payments of $306,000 when applying finance over a 4 year term with a 40 per cent balloon.

Again, referring to the data collated and assuming:

- a $280/tonne wheat price,
- the national mean long-term wheat yield of 2.5t/ha
- an average holding of 4000ha,
- farm gross incomes average $2,800,000

The $306,000 in annual payments for servicing machinery investment as above confirms that as a fixed overhead basis, machinery payments annually align closely with the quoted ORM figure of 11 per cent of gross income.

Getting more from machinery

Running equipment for longer reduces the equipment depreciation cost, one of the primary machinery cost components when it comes to the combined cost of production. A 2013 Planfarm report commissioned by the GRDC, suggested that one third of farmers preferred “good second-hand machinery”, 48 per cent “purchased new and kept to long hours” while the minority (19 per cent) preferred to change machinery over on a more regular basis.

Calculating depreciation costs requires monitoring the resale value of owned equipment. Growers in the case studies for this project identified a wide array of methods of determining used equipment prices with sources including newspapers, auction results and social media channels in addition to word of mouth. Applying a market value for a piece of equipment can assist with determining the cost of equipment operation on a per hectare of per operation-hour basis.

Evaluating depreciation cost

Figure 12 is a real example of the depreciation cost per hour over the life of thirty, used John Deere 8030R series tractors.

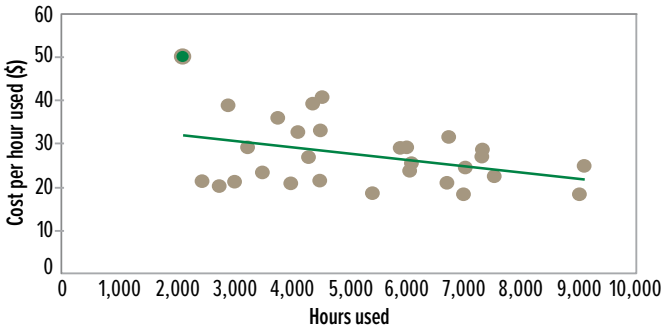

Figure 12: Depreciation cost of John Deere 8030R series tractors
Source: Kondinin Group 2020

To calculate the depreciation cost per hour since new, the advertised secondhand price was deducted from the recommended retail new price with this result then divided by the hours of operation. As expected, the more hours on a tractor, the lower the average depreciation cost per hour becomes. All things being equal, the machine indicated by the red dot is the cheapest for its age. But condition and maintenance must be inspected to verify a like-for-like comparison.

Aiding purchasing decisions using depreciation figures

The variation among the lower hour tractors seen in Figure 12, can be used to help identify the better value tractor if buying secondhand. The same equation can be used when looking to buy a secondhand, machine with moderate hours. This approach will determine better value, provided model and specifications and condition are similar.

When purchasing secondhand, growers should look for the machine that has incurred the highest depreciation cost per hour of use. This is the machine that offers the lowest cost base relative to the number of hours on the clock.

A similar plot can be constructed by gathering specifications, operating hours and pricing of a range of comparable machines and identifying where machines sit relative to each other.

In Figure 12, dots above the line of best fit represent machines that are more favourably priced and the red dot represents the best-value lowest-hour machine on the market, as it has seen the largest drop in price for the hours operated and also has low hours.

Seeding equipment and technology

Keeping equipment for longer can increase timing, technology, repairs and maintenance risks. These risks of keeping equipment longer vary depending on equipment type and operation. The primary risk with seeding equipment is arguably capacity. Bar width or tank size may not deliver optimal field efficiency, that is, the proportion of time spent actually seeding, not refilling or roading. Ultimately, capacity and resulting field efficiency needs to be sufficient to meet the required seeding window.

Keeping seeding machinery for longer may see out-dated machinery technology or insufficient capacity to complete the seeding operation in an optimal window. Delays can increase the risk of weather influences including frost. Seeding technology risk is centred on improving application efficiency. Reducing overlap, with seeder sectional control and variable rate application are two examples of input optimisation delivering demonstrated savings of up to 13 per cent.

Technology – Seeding equipment

Variable rate application and section control are the two big technologies that may be able to generate rapid returns.

Section control has the ability to minimise overlap when travelling over already covered areas of a paddock.

Variable rate input applications are driven using paddock zone maps which are created using multiple information layers including yield maps. Variable rate applications can be used to reduce or optimise input costs by reducing input placements where the input is not yield-limiting. Conversely, additional product can be placed in areas that will drive additional yield.

From a technology perspective, the primary consideration for seeding equipment is compatibility between the implement and the air cart. Implement integration and control with machine telemetry utilising standardised CANBUS on ISO11783 protocol, should be possible with most tractors built in the last ten years. Adapters, hydraulic string blocks and wheel sensors can often be used to bridge the technology gap.

Tractors

Retaining tractors for longer hours, risks higher repair and maintenance costs and, in most cases, relies on the availability of suitably skilled personnel to undertake repairs.

Tractors also need to be power-matched to implement requirements. This can vary significantly with soil type, depth of operation and ground engaging tool selection. Tractors with insufficient power per meter of implement operating width, could see inadequate seeding operation depth, reduced field efficiency or risk extending seeding into non-optimal seeding windows.

Fuel use can also increase if operating outside optimal engine speeds to achieve the desired ground speed. However, tapping into additional power can substantially increase the upfront cost of the machine. Particularly for large articulated 4WD tractors. Prices can increase by around $400 per kW despite having the same powertrain configuration. While it could be argued this is generally recouped when trading in on newer machines, this can vary between makes and models.

Improvements in tractor fuel efficiency

Fuel efficiency has also improved over the last decade with later-built, more efficient engines and transmissions offering specific fuel consumption 5 – 12 per cent lower than equivalently powered older models. As an example, a circa 2007 New Holland TJ480 tractor used 307g/kW.h at 75 per cent of maximum pull at maximum power. A 2019 New Holland T9 530 tractor uses 280g/kW.h at 75 per cent of maximum pull at maximum power. Over a typical seeding season of 400 hours this could equate to a difference of 2,500 litres of fuel. However, fuel savings alone are unlikely to warrant a replacement for seeding tractors but could be a contributing factor.

Spraying equipment

Keeping spraying equipment for longer periods to reduce depreciation costs can risk field efficiency and technology. Although spraying equipment should be sufficiently sized to complete a spray programme without overly risking application timeliness.

High levels of field efficiency are rarely achieved when spraying. There are additional engine hours used moving between paddocks, refilling, and overlapping already covered ground. Therefore, spraying field efficiency can be improved by reducing non-spraying time. Analysis of a wide range of self-propelled boom spray telemetry data recently revealed that as much as 50 per cent of the engine hours on an SP sprayer can be attributed to travelling between paddocks on larger-scale farms and fill points as well as when filling with product.

Increasing the scale of the sprayer width and tank capacity is one method of reducing refill times but nurse tanks, supplementary fill-points and a chemical batching plant will almost certainly reduce roading and refill times. A chemical batching plant will significantly improve field efficiency when spraying, regardless as to whether a trailing or self-propelled boom spray is employed.

Technology – spraying

Sectional or individual nozzle control can demonstrably reduce spray application volumes by as much as 10-15 per cent in highly irregular shaped paddocks.

OTHER MACHINERY

'Other machinery', for example, specific hay equipment investment can be significant. While this equipment has been excluded from this study, it can be shared across business enterprises.

Other machinery costs however, varied from 3 per cent of GIP to nearly 25 per cent for one operator who had a greater hay focus in the business and as a result, significant investment in machinery for that enterprise.

OPPORTUNITY COSTS OF MACHINERY

Identifying the total machinery investment can be a daunting task when looking to calculate the opportunity cost of equipment.

This calculation assumes the return on investment (ROI) to be 5 per cent, which is the average overdraft rate paid; any cash (equity) therefore tied up in gear effectively costs 5 per cent, as it could alternatively have offset other debt.

FINANCE AND OWNERSHIP MODELS – OWNING VS LEASING

The instant asset write-off (IAWO) has changed many accountant's perspective of the best ownership model to acquire machinery. Leases are unlikely to be popular again until after the IAWO concludes.

OWNING MACHINERY

- **Benefits**
  - Depreciation for a tax deduction.
  - Depending on scale and use, may deliver a lower cost per hectare
  - Owner free to do as many hours as required
  - Freedom to modify machine if required (warranty pending)
  - Ability to buy/own older, lower-cost machines
  - Can sell and buy another machine whenever cash flow or opportunities arise
  - GST on the machine value is claimed up front at time of purchase
- **Disadvantages**
  - Equity gets tied up in equipment
  - Repayments may be larger than cash flow allows
  - Ownership risks are carried – for example: repairs, faults, insurance

LEASES

- **Benefits**
  - Shifts equity out of major pieces of equipment and as a result reduces opportunity cost
  - Regularly update equipment to latest technology and new machine reliability
  - Uses buying power of a dealer or fleet company to be cost effective
  - May enable updating of machinery items sooner than they could otherwise be purchase, for example, to convert to CTF
  - Can stay within warranty period if turning over regularly, potentially reducing repair bills.
- **Disadvantages**
  - Difficult to establish
  - Requires individual approach with dealer
  - Limited hours per year (additional hours may be at agreed cost)
  - Locked into a fixed lease term

CHATTEL MORTGAGES

Chattel mortgages are one of the more favoured methods of financing equipment. One of the primary benefits being the ability to claim and reclaim all of the GST paid up-front. Payments can be reduced, assisting cash flow, with a 20-50 per cent "balloon" payment which is payable at the conclusion of the term. This balloon is usually serviced by the sale of the equipment which may alternatively be refinanced.

Chattel mortgages are sometimes also referred to as equipment loans or heavy equipment loans.

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DECISION SUPPORT: Outlining key variables and machinery metrics growers should consider when investing in machinery and technology

Applying the TPLM+C to Gross Farm Income ratio to your personal operation can provide insight around total machinery investment levels relative to other growers.

Prior to investigating any specific machinery purchase, calculating this ratio can help determine a benchmark investment in machinery relative to peers as a broad check.

As previously discussed, this is calculated as follows:

$$\text{TPLM + C Ratio} = \frac{(TP + L + M + C)}{\text{Gross farm income}}$$

Where:

Total Plant
Plant value x depreciation @ 10 or 12%
Exclude portion used for animal production

+ Labour
Labour costs plus family calculated as follows:
Management Role = 1, Operational Role = 0.75.
Apply total Units x $80,000 + 1% of Turnover

+ Maintenance

+ Contracting

On a national basis, this ratio is around 0.345:1, or TPLM+C is around 34.5 per cent of gross farm income.

Operators who are more efficient with their machinery investments will typically run at ratios less than 34.5 per cent. Regional variances can see this ratio vary between 32 per cent and 38 per cent.

NEW INVESTMENTS

When considering purchasing machinery and technology, growers should analyse the investment in the context of other opportunities to ensure an optimal return on investment is achieved.

The comparison of a number of options might call for an analysis of hourly operating costs or costs by area. Where an estimate of the future value of the machinery is required, this can be more difficult to determine, but should rely on average depreciation rates for comparable equipment.

Gathering data around the likely cost of ownership, is an important part of due diligence when investing in machinery. Depending on the machine in question, the metrics required may vary. Most would include combinations of the following key metrics broken up into three categories: operational, fixed costs and variable costs.

OPERATIONAL

- Area of operation (ha)
- Cropped area (ha)
- Interest rate (% p.a.)
- Machine use (hours/year)
- Contract use (hours/year)

FIXED COSTS

- Purchase market value of machine ($)
- Future market value of machine ($)
- Ownership term (years)
- Engine hours at resale (hours)
- Fuel burn rate (litres/hour)
- Storage, registration and insurance (Nominally 1 per cent)

VARIABLE MACHINE COSTS

- Field efficiency / work rate (ha/engine hour)
- Repairs and maintenance (A nominal fraction of the fuel use can be assumed)
- Fuel (Net cost after rebate)
- Oil (A nominal fraction of the fuel use can be assumed)
- Labour costs associated with maintenance and repairs (Nominally based on engine hours)
- Any timeliness or efficiency costs (loss of quality or yield)
- Allied equipment (For example, loaders, augers, trucks, bins)

Total annual costs can be calculated by adding annual ownership costs and annual variable costs. Both ownership and variable costs are usually calculated on an area basis for implements and allied equipment and on an hourly basis for tractors, harvesters, sprayers and self-propelled machinery.

The key metrics can be used to calculate ownership costs for both new and used equipment. See Farmanco used tractor cost example on page 15.

Figures calculated for a given machine can then be multiplied by a nominal profit margin (for example 10 per cent profit) if contracting. See Farmanco air seeder cost example on page 16.

TECHNOLOGY

In many cases the argument for technology investment is more clearly defined. For a given investment, quantify the increase in efficiency or productivity achievable.

An example of an investment in technology might be sectional control on a seeding rig. Despite running high accuracy 2cm RTK guidance, there is likely to be overlap depending on width of seeding bar and the complexity of headlands and number of in-paddock obstacles (for example, rock piles or trees).

An analysis of seeding operations can help to define overlap and determine if investment in sectional control can be warranted. Machine telemetry and product volumes applied can be directly compared to high resolution drone or satellite maps to establish actual area planted. It is not unusual to find around 5 per cent overlap, which can be reduced to less than 0.5 per cent with sectional control. (See Figure 13).

Investments in electronic hardware, software and service technologies are usually treated as having a zero resale value because in many cases technology is superseded rapidly, retaining little initial market value.

But an estimate of the usable life of the technology is important relative to the calculated payback period. It could also be argued that the inclusion of technology on an air seeder or tractor may assist resale of those machines when trading.

Applying the sectional control investment example to a 5000ha operation with 5 per cent seeding overlap, an initial investment in section control technology of, say $25,000 to reduce overlap to 0.5 per cent could be easily justified where seed and fertiliser costs were, for example $65/ha.

The payback period on the initial outlay of $25,000 is less than two seasons including consideration for opportunity cost.

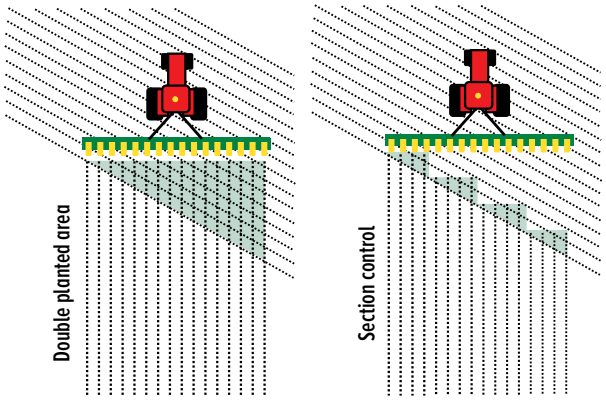

Figure 13: Section control in a seeding operation can be a worthy investment in technology with a rapid payback period
Source: IA State 2020

WORKED EXAMPLES:

The following examples utilise the operational, fixed and variable costs outlined above to calculate an estimate of the likely comparative costs of an investment in a piece of machinery.

Once these figures have been identified, they can be utilised in the calculation tool to ascertain machinery operation costs.

Building the cost base by utilising the breakdown of fixed and variable costs, allows for a range of possible ownership scenarios to be compared.

The following two worked examples demonstrate the data required and the calculations undertaken to derive values for total cost of ownership.

These calculation tools can be applied to any major machinery purchase if looking to compare the total cost of a planned machinery purchase.

EXAMPLE: Tractor costs

This example for purchasing a used tractor could also be used to evaluate the cost of a new tractor by making the market value (CMV) and new value (NV) the same.

Fixed costs include depreciation, opportunity cost, shedding and insurance which are calculated and annualised.

CONSTANT	TRACTOR TYPE	CONFIGURATION		OPPORTUNITY COST INTEREST RATE	CALCULATION
R	**4WD Tractor**			**4%**	
	Machine			**Current**	
A	Own Use (engine hrs/yr)			500	
B	Contract Use (Engine hrs/yr)				
	Total Hours Used/yr			500	A+B
	Fixed Costs	Dep'n from New in $/hr		**$66.67**	(NV-CMV)/E
NV	Market Value When New			**$400,000**	
CMV	**Market Value**			**$200,000**	
E	Machine hours			3,000	
OP	Ownership Period (yrs)			10	
	Engine Hours at Resale (hrs)			8,000	E+(OPx(A+B))
F	Litres of Fuel/hr			40	
TU	Total Use (Engine hrs/yr)			**500**	A+B
H	Shelter/Insurance/ Registration		1.00%	$1,200	Hx((CMV+I)/2)
I	**Resale Value**			**$40,000**	
AOC	Annual Ownership Cost	$/yr		$22,000	((CMV-I)/OP)+ ((CMV-I)/2xR)+ (IxR)+H)
		$/hr		**$44.00**	AOC/TU
	Variable Costs				
M	Repairs and Maintenance (% of Fuel)			40%	
	(av. for ownership period)			$9,200	Mx(FCxFxTU)
FC	Fuel (net cost after rebates)		**$1.15**	$23,000	FCxFxTU
O	Oil (% of Fuel)		10%	$2,300	Ox(FCxFxTU)
L	Labour Cost ($/engine hr)		**$35.00**	$17,500	LxTU
	Timeliness/Efficiency Costs (loss of quality, loss of grain)				
AVC	Annual Variable Costs	$/yr		$52,000	Mx(FCxFxTU)+ (FCxFxTU)+ Ox(FCxFxTU)+ (LxTU)
		$/hr		**$104.00**	AVC/TU
TAC	**Total Annual Costs**	**$/yr**		$74,000	AVC+AOC
		$/hr		**$148.00**	TAC/TU

Source: Farmanco 2021

EXAMPLE: SP sprayer costs

This worked example looks to compare a new self-propelled sprayer with a used machine. Variables including ownership period (OP), resale value (FV) and fuel consumption (F) are all arbitrary and can be adjusted to suit the machine under analysis.

As per this example, a careful analysis can sometimes yield unexpected results with the used sprayer in this instance having a higher total ownership cost in comparison to the new machine purchase.

Constant	Assumptions & Costs	Units	Boom	Machine		Calculation
	Sprayed Area & Use			**New SP sprayer (all options)**	**Used Basic SP Sprayer**	
OAS	Own Area Sprayed (ha)	Hectares		14,574	14,574	
CAS	Contract Area	Hectares				
TAS	Total Area Sprayed	Hectares		14,574	14,574	OAS+CAS
A	Boom Age at Start	Boom Hours			2394	
B	Ha per Boom hour	ha/Boom Hour		36.00	36.00	
TU	Total Use	Boom hrs/yr		405	405	TAS/B
	Fixed Costs					
CMV	Current Market Value	$		$605,000	$340,000	
FV	Resale Value	Todays $		$200,000	$180,000	
OP	Ownership Period	Years		10	4	
	Boom Hours at Resale	Hours		4048	4013	A+(TUxOP)
D	Depreciation	$/yr		40,500	40,000	(CMV-FV)/OP
H	Shelter/Insurance/Registration (% of Value)	$/yr	0.80%	$3,220	$2,080	Hx((CMV+FV)/2)
R	Interest Rate			2.50%	2.50%	
IOC	Interest or Opportunity Cost (%/Yr)	$/yr		10,063	6,500	(CMV-FV)/2xR)+(FVxR)
AFC	**Annual Fixed Cost**	**$/yr**		$53,783	$48,580	D+(Hx((CMV+FV)/2))+IOC
		$/Boom hr		$132.85	$120.00	AFC/TU
		$/ha		**$3.69**	**$3.33**	AFC/TAS
	Variable Costs					
F	Fuel	Litres/hr		20	25	
FC	Fuel ($/litre net cost after rebates)	$/yr	$1.15	$9,311	$11,639	TUxFxFC
O	Oil (% of Fuel)	$/yr		$700	$700	
M	Repairs and Maintenance	Average $/yr		$10,000	$14,000	
L	Labour Cost ($/Spray hr)	$/yr	$40.00	$16,193	$16,193	TUxL
AVC	**Annual Variable Cost**	**$/yr**		$36,205	$42,532	(TUxFxC)+O+M+(TUxL)
		$/Boom hr		$89.43	$105.06	AVC/TU
		$/ha		**$2.48**	**$2.92**	AVC/TAS
TOC	**Total Ownership Cost**	**$/yr**		$89,987	$91,112	AFC+AVC
		$/ha		**$6.17**	**$6.25**	TOC/TAS

Source: Farmanco 2021

A MACHINERY AND TECHNOLOGY INVESTMENT FRAMEWORK FOR GRAIN GROWERS

By Rob Sands and Mike Monaghan (FARMANCO)

KEY MESSAGES

- Making the right decisions on machinery and technology investments could double your profits.
- Discipline is needed to operate within sustainable cost ratios.
- Identify priorities for machinery replacement and technology for the next 10 years.
- Do your research to find the right machines or technologies that will do the best job for your business.
- Conduct an accurate and unbiased cost/benefit analysis.

Making machinery and technology investment decisions in isolation from a whole of business approach is dangerous. You can often justify each individual purchase as providing a benefit to the business, however you can also overload your cashflow with machinery payments. Without assessing all potential investments, you may miss the non-machinery based investments that would provide a better return to the whole business.

Purchasing machinery is not as simple as working out the fixed and variable costs and going for the option with the lowest costs. Calculating these costs is an important step however there are many other considerations.

Decisions around machinery and technology expenditure can be split into to four key areas which have different objectives.

CASHFLOW DEMANDS

- The total machinery payments on the business need to be considered. You can overload a business with machinery repayments. What level of expenditure can your business afford?
- A tight cashflow from high machinery investment can result in lower profitability of the business as a whole, through the reduced capacity to invest in other areas of the business, such as soil amelioration, soil and tissue testing, new varieties, leasing more land, critical infrastructure, employee training, and the list goes on.

ESSENTIAL OPERATIONAL REQUIREMENTS

- Where a machine is required for an “essential operation” such as a header to harvest your crops the objective is to minimise the total costs. You therefore need to calculate the total running costs, which also includes all the labour and management costs as well as the fixed and variable costs of the machine itself. These costs should be calculated on the relevant long-term production as $/ha or in the case of a harvester, $/tonne harvested.
- Service and backup for the machine, availability of parts, repairs and maintenance costs should be considered.
- What are you currently paying for contractors to complete the operation? Would it be cheaper to own your own machine? Would you do a better job than the contractor? Is timeliness of the operation being compromised?

TIMELINESS COSTS

- Delays in an operation, through lower capacities or breakdowns, between different machines needs to be well understood and an attempt to include the likely costs of these delays over the life of the machine.

PRODUCTIVITY INCREASES

- Assessment of returns, based on the potential yield increase, combined with a probability around the possible outcomes, needs to be performed.
- Reduced costs in $/t through lower costs or increased efficiency of inputs.
- Greater knowledge or data which leads to increases in production or a reduction in costs. The impact of greater knowledge for decision making is often difficult to measure but can have a significant impact on a business over the long term.

COMPARING WITH PEERS

Calculating your machinery investment and expenditure ratios and comparing them against the following benchmarked ratios will provide you with a guide to whether your costs are above or below industry averages. The top 25 per cent numbers will provide you with good targets to meet with your future decisions around machinery investment and operational efficiency.

IMPORTANT RATIOS AROUND MACHINERY INVESTMENT

	GRDC Project 2019					FARMANCO 5 year av.
	National	WA	LRZ	MRZ	HRZ	Top 25%
Number	445	312	64	182	66	82
Farmed Area (ha)	4,051	5,044	7,471	4,360	4,577	5,378
Machinery Value $/Farmed ha	$580	$489	$295	$515	$603	$453
Machinery Value $/Cropped ha	$810	$673	$440	$662	$929	$508
Machinery Value/Income	0.88	0.82	0.93	0.81	0.74	0.77
Machinery Capital Spend $/ha		$91	$62	$95	$107	$86
Machinery Capital Spend/Income		14%	18%	11%	17%	10%

TPML CALCULATIONS PER FARMED HECTARE

	GRDC Project 2019					FARMANCO 5 year av.
	National	WA	LRZ	MRZ	HRZ	Top 25%
Farm Income	$721	$661	$364	$680	$897	$700
Plant – (Depreciation $/ha)	$58	$49	$30	$52	$60	$50
Machinery						
– F&O	$33	$32	$21	$34	$36	$25
– R&M	$39	$38	$25	$40	$47	$33
Labour (Wages & Management)	$92	$69	$42	$69	$97	$68
Contract	$12	$11	$5	$11	$15	$10
TPML & C	$234	$198	$122	$205	$255	$197
% of Income	35%	33%	38%	32%	30%	28%

PHOTO: BEN WHITE

TECHNOLOGY CHOICES AND THE RETURN ON INVESTMENT

There are always lots of choice to invest in technology in your business, and any number of sales staff assuring you that their technology will make your business more profitable.

Once again discipline is required, as it may not be wise or affordable to invest in all the available technology right now.

The assessment needs to be based on conservative assumptions about the likely benefits to productivity or cost savings based on real data. It is a simple formula but getting an accurate estimate takes time, knowledge and good data.

Net Benefit = Total Benefits minus the Total Costs. This gives the magnitude of the boost to profit.

You should also look at the Return on Investment for the funds that need to be invested.

Return on Investment = Net Benefits divided by Cost of the Investment. This allows you to compare investments in different technologies and prioritise those investments.

LOW COST EXAMPLE: reducing harvester losses

TECHNOLOGY: Header loss trays, separator and scales.

BENEFIT: Extra income through reducing losses by fine tuning your header.

Research data into reducing harvest losses has shown that losses can be reduced by up to 100kg/ha for cereals and canola. Even if we assume that by measuring losses and adjusting the header setup we can save half these losses, it adds up to a significant saving over an average cropping program of 3,000 hectares.

Potential benefit of reduced losses = 2,000ha of cereal * 50kg/ha * $0.27/kg + 500ha of canola * 50kg/ha + $0.60 = $27,000 + $15,000 = $42,000. The potential cost of the technology and extra time may be around $7,000/year. So the net benefit per year is $35,000. The initial investment is only $5,000 which means the return on investment is $35,000/$5,000 which is a 700 per cent Return On Investment. This makes this investment the classic "no brainer".

Another way to look at this investment is to ask, what is the cost of a poorly set up header. Average cost of harvesting a 2.5t/ha wheat crop is around $35/ha. If your header is losing 50kg/ha more than it should be, your effective cost of harvest is increased by 50kg/ha * $0.27/kg = $13.50/ha, this is 39 per cent more than it should be.

PHOTO: BEN WHITE

HIGH COST EXAMPLE: Soil amelioration

TECHNOLOGY: Deep rippers, spaders, mouldboard ploughs, delvers, variable rate, controlled traffic, lime and gypsum applications.

BENEFIT: Extra income over and above the additional costs.

This analysis is far more complex and requires a significant investment. The cost/benefit needs to consider a range of issues including the individual farm's areas of a particular soil type, depth to clay, accurate surface and sub surface soil tests, existing machinery and whether changes are required, whether in smaller areas it would be cheaper to use a contractor, estimation of benefits over a range of seasons, assessing potential negative impacts on different crops, how long will the benefits last, and the list goes on.

While the amount of data required is extensive the same numbers are required for the analysis.

Net Benefit = Average Benefits over the Period of the Investment (compared to doing nothing) less the Extra Costs over the period of the investment.

The benefit needs to be compared to the outcome of not implementing the required soil amelioration as it is likely that doing nothing will see a decline in productivity over time.

Questions for growers

- **What is the highest investment priority in your business?**
- **Do you have a machinery replacement strategy?**
- **Do you know your total machinery cost per hectare? If so, are you in the top 25 per cent?**
- **How does your level of machinery investment compare to your peers?**
- **Was your last machinery purchase supported by a detailed analysis?**

Useful resources

grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2018/06/efficiency-versus-over-investment-in-plant-and-equipment-guidelines

grdc.com.au/resources-and-publications/groundcover/gc104/analysing-the-economics-of-machinery-purchases

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CASE STUDIES: NORTHERN REGION

PHOTO: BEN WHITE

ANDREW WINDSOR

Andrew Windsor runs a spray contracting business with four RoGators which service their farms as well as two local large clients. PHOTO: CUSSONSMEDIA

LOCATION: Coonamble and Werris Creek, Northern New South Wales

RAINFALL: 475mm

SOIL TYPE: Grey cracking vertosols

CROPPING AREA: 9,000ha

CROPS GROWN: Wheat, barley, chickpeas & canola

AVERAGE WHEAT YIELD: 2.5t/ha

PERMANENT LABOUR UNITS: 4

SEASONAL STAFF: 5

TOTAL MACHINERY INVESTMENT: $500/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $750,000

The Windsors can have their whole program sown in a week by operating 24 hours per day. PHOTO: CUSSONSMEDIA

What started out with an initial enquiry to a grower by Andrew Windsor about a land purchase, has resulted in the development of a spraying business which compliments his farms at Coonamble and Werris Creek. Andrew and his staff operate four RoGators both in their business and for two large clients, who are only 20 kilometres away. Good, long-term, skilled staff are the key to the spraying contracting business who Andrew says can manage the operation without him if need be.

Maintaining reliability so the Windsors can be timely with key operations is the over-arching machinery replacement strategy, so they tend to buy principal machinery new, financed by chattel mortgages.

Andrew's staff play a key role in identifying when a machine is becoming unreliable or isn't performing as it should. The tractors are generally replaced between 6,000 to 8,000 hours to maintain reliability and manage cashflow, while trucks are run for as long as they are continuing to serve their purpose.

A part of maintaining that reliability is ensuring after sales service is available, something that is costly for the Windsors because of the distance to local dealers. They try and do as much repairs and maintenance as possible on farm but with modern technology, Andrew notes sometimes they can't diagnose the problem with the machine, let alone fix it.

To manage cashflow, Andrew prefers to focus on maintaining a regular repayment schedule and keeping the potential for blowouts in repairs and maintenance costs low. For example, a wheel motor in a RoGator can cost about $30,000 to replace, which is nearly half of their annual payments. Therefore, a RoGator is replaced every year so they are in a four-year replacement cycle. Andrew doesn't pay additional funds into the repayments, so any cash surplus can be used for farm debt reduction.

While Andrew states he is fortunate to have great, long term staff, finding casual staff is becoming more difficult and so with future purchases they are buying larger equipment to cover the same hectares with less machinery and less people. In 2012, a second 12-metre planter was purchased before adding an 18-metre planter in 2019. While moving to running two 18-metre machines would work well at Coonamble, two 12-metre bars are used at Werris Creek which is 300 kilometres away, as they are more suited for road transport. One of the 12-metre bars is a disc machine, and the other has tynes, which gives Andrew great flexibility in matching the planter to the seeding conditions. If required, the Windsors can have their whole program sown in a week by operating 24 hours per day.

In 2020, after having reliability issues with their eight-year-old New Holland 8090, the Windsors upgraded to a John Deere 670 header which will compliment usually two or three contract harvesters. While Andrew doesn't believe headers are a great investment, he does value being able to have some control, such as being able to start harvest when he chooses. This is particularly relevant now, as the harvest contractor who had been servicing them for the last ten years has decided to farm in his own right.

Potential contractors come from Queensland and Victoria, however Andrew believes the time window for growers to go contracting before harvesting their own property is shrinking as crops are maturing at similar times in different locations.

A trucking company from Parkes with a large fleet has carted all of their grain for the past ten seasons, and while it is a significant cost, the Windsors couldn't find the labour to manage it themselves, so it is outsourced.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Planting tractor for Excel Stubble Warrior 18m	CASE Rowtrac STX 500 (new 2019)	1,200	800	$15,000	High machine hours (4000), increasing maintenance costs and warranty expiration.
Planting tractor for Excel Single Disc 12m, chaser bin & fert spreading	John Deere 8270 (new 2010)	8,000	300	$10,000	High machine hours (6000 – 8000) and increasing maintenance costs.
Planting tractor for Excel Stubble Warrior 12m	John Deere 9430 (new 2012)	8,000	300	$10,000	High machine hours (6000 – 8000) and increasing maintenance costs.
Front end loader tractors					
Sprayers	RoGator 1100 (new 2020)	400	200	$20,000	High machine hours, increasing maintenance costs warranty expiration and upgrade.
	RoGator 1100 (new 2017)	2,000	1,200	$20,000	
	RoGator 1100 (new 2015)	3,500	1,200	$20,000	
	RoGator 1300 (new 2014)	4,800	1,200	$20,000	
Harvesters	New Holland 8090 (new 2012) John Deere 670 (new 2020)	1,500 (separator)		$40,000	High machine hours, increasing maintenance costs, warranty expiration and upgrade.
Seeders	Excel Stubble Warrior 18m (new 2019) with John Deere 1910 430 bushel air cart (new 2010) Excel Stubble Warrior 12m with John Deere 1910 270 bushel air cart (new 2013) Excel Single Disc 12m with Simplicity 6000 air cart			$40,000 in total	High machine hours and increasing maintenance costs.
Trucks	Kenworth 609 with 1 grain trailer and 1 flat top (secondhand in 2014 with 400,000km)				High machine hours, increasing maintenance costs and maintaining road safety.

DANIEL AND MELISSA WEGENER

Daniel Wegener buys new machines a lot of the time but isn't afraid to modify existing equipment to gain the technological advancements without the cost of new equipment. PHOTO: CUSSONSMEDIA

LOCATION: 'Ferndale', Warra, Darling Downs, Queensland

RAINFALL: 550mm (Annual) 250mm (GSR)

SOIL TYPE: Self-mulching grey cracking clays

CROPPING AREA: 1600ha

CROPS GROWN: Sorghum, mung beans, barley, wheat and chickpeas

AVERAGE WHEAT YIELD: 3t/ha

PERMANENT LABOUR UNITS: 1.5

SEASONAL STAFF: 2

TOTAL MACHINERY INVESTMENT: $882/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: 3.5% of total machinery investment

Ten years ago, the focus for Darling Downs grower Daniel Wegener was to move to full control traffic, which eventuated in all new equipment purchased being on 4m centres. With the Wegener family achieving this goal, the machinery replacement strategy now focuses on replacing equipment if it is going to increase profitability. While they buy new a lot of the time, such as their John Deere 8410 and John Deere 8335RT tractors, they also aren't afraid to modify existing equipment to gain the technological advancements without the cost of purchasing new equipment. The downside to that approach, Daniel explains, is when you buy new, you can order your required specifications, something that is much harder when purchasing secondhand.

Originally the Wegeners bought WeedSeeker cameras in 2009 to install on their 24.4m (80 foot) John Deere 4710 SP boom, but when they purchased a new John Deere 4830 SP, they couldn't equip it with 36.6m of WeedSeekers because it was going to be too heavy for the boom. So, the cameras were taken off and stored for a rainy day.

At the time they didn't have too many resistant weed issues but in the last few years, feathertop Rhodes grass has become increasingly difficult to manage. So, after observing a neighbour's results with weed seeking cameras, Daniel sought to add a second boomspray to the business. In 2018 they purchased a secondhand 1998 model Flexi-Coil ground gliding boom that the existing cameras could be added to and purchased more cameras to complete the fit-out of the 36.6m boomspray. While Daniel acknowledged the old cameras definitely weren't going to be as good as brand-new ones, he felt they could successfully target 'coffee cup' sized and above feathertop, fleabane and milk thistle in fallow conditions. He estimates it cost about $90,000 to get their WeedSeeker going again, a fraction of the cost of buying a new machine.

The Wegeners run two seeding bars; an NDF planter which is the main winter crop planter and an older 2006 John Deere MaxEmerge, which is a primarily for summer crop planting. Like modifying the boomspray, to make it fit for purpose at a reduced cost, Daniel has added eSet meters to the older MaxEmerge - in effect modernising the bar without having the cost of upgrading to a new machine. The eSet meters allow for more accurate seed placement, therefore significantly reducing seeding rates and thus seed costs, which is particularly important for more expensive hybrid summer crop varieties such as sorghum.

The NDF planter was purchased new in 2017 after the Wegeners trialled a single disc unit on their original NDF for two seasons at no cost. Daniel says the ability to trial the new setup over a couple of seasons in varying seasonal conditions was of great benefit and gave them confidence in making that investment decision.

When the Wegeners looked to add a SP boom to their business, it was for a number of reasons. They wanted to increase the clearance for in-crop cotton and sorghum spraying and for sorghum spray outs and their linkage sprayer was becoming very costly to repair. They also needed something that was quick on the roads, as they have blocks between 25 and 50km away from the home farm.

Initially they bought a Wilmer, and with few SP booms in the district at the time, were able to do enough contracting work for neighbours to meet the repayment costs for the machine. While this worked well at the time, with increasing family commitments, this is not an avenue that is actively pursued for other machinery.

Daniel uses contractors for specialised activities such as spreading cow manure and carting grain off-farm. Depending on labour available, often those activities clash with other critical activities on the farm. He is also using contractors for laser levelling because there is not a lot of quality secondhand equipment available, within the price range, that is justifiable for the hectares they level.

	Make & model	Current hours or usage	Hours or usage/year	Replacement trigger
Tractor 1	John Deere 8335RT (new 2012)	4,500	550	High machine hours/technology upgrade.
Tractor 2	John Deere 8520T (secondhand 2009)	5,200	300	High machine hours/technology upgrade.
Tractor 3	John Deere 8410T (new 2000)	6,000	Minimal	Not looking to replace.
Sprayer 1	John Deere 4830 SP (2012 model)	3,800	540	Increasing repairs & maintenance costs/ upgrade to increase tank size.
Sprayer 2	Flexicoil ground glider trailing boom (secondhand 2020 – 2012 model) with added cameras (2009)	Lots		
Seeder 1	NDF disc planter (new 2017)		300	Technology upgrade.
Seeder 2	John Deere MaxEmerge (new 2006)		80 – 100	Cash surplus, can add extra upgrades as required.
Harvester	John Deere 9770 (secondhand – low hours)	2,500	250	High machine hours.
Trucks	1997 model T601 Kenworth (secondhand – lots km but well maintained 2012)	More than 1 million km	8,000	Cash surplus/increasing maintenance costs.

Daniel Wegener sowed Planet barley on 28th April 2020 with their NDF disc planter, which was purchased after trialling a single disc unit on their original NDF for a number of seasons. PHOTO: CUSSONSMEDIA

DARRYL BARTELEN, KRUI PLAINS PASTORAL COMPANY

An igloo to store machinery has been a game-changer for Darryl Bartelen because not only does it protect the machinery but his team is also doing a better job of repairing and maintaining the equipment because they have a more comfortable working environment. PHOTO: CUSSONSMEDIA

LOCATION: Moree, Northern New South Wales

RAINFALL: 577mm (Annual), 358mm (Summer) 219mm (Winter)

SOIL TYPE: Vertisol and grey cracking clays

CROPPING AREA: 4,500ha

CROPS GROWN: Wheat, barley, chickpea, sorghum, faba bean and mungbean

AVERAGE WHEAT YIELD: 2.52t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 1

TOTAL MACHINERY INVESTMENT: $130/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $300,000 (5 year average)

In Darryl Bartelen's first 20 years of farming, he bought very little new machinery but now when he replaces machinery that improves productivity or reduces potential down time, most of it is purchased new. For example, in 2018 a Boss 18m tyne planter was purchased to allow the Bartelens to cover their cropping program in a timely manner and allow deep sowing into moisture without being expensive to maintain. More horsepower was required for the Boss planter, so a CASE Quadtrac 500 was also purchased in 2018. Darryl purchased an additional two years warranty, so the tractor was covered for the first five years, giving peace of mind that the dealer was prepared to stand behind their machine.

Generally, the approach of buying new with warranty to allow some recourse if there are issues with a machine has served Darryl well. However, when he purchased a CASE Patriot 4340 self-propelled spray rig, also in 2018, it had a number of software and operating system issues and he found the technical support provided by the dealer to be disappointing. It was the Bartelen's own research that saw the issues resolved. Most servicing and maintenance is carried out on property once the warranty period has expired.

Darryl is a big advocate of thoroughly researching equipment prior to purchasing – when he thinks he has enough research, he does it again. This involves talking to neighbours, consultants and other machinery owners, questioning them on the service received from the local dealer, availability of parts and whether the machine performs as it should.

When the optical sprayer was purchased in 2015, a number of neighbours were interested in the technology and so Darryl contract sprayed approximately 15,000 hectares, which was great financially as it was a dry year. However, he now focuses on having the machinery available to use on his property when it is required, rather than chasing contracting work, which can be difficult to manage the client and his own needs.

Darryl believes owning headers is a huge investment and there is significant maintenance required for machines that are only used for three to four weeks a year, and so he employs contractors, who have been harvesting at 'Krui Plains' for nearly twenty years. The contractors supply the headers ready for the beginning of harvest and Darryl manages the associated grain handing and transport equipment. It is a shared responsibility that Darryl believed works really well and gives him good control over the harvest hours and the quality of the harvest.

The Bartelens have also relied on contractors to cart grain, predominantly back to Queensland, but as they are currently building a silo complex, Darryl sees they may be able to better utilise a truck in the future. However, that would require more labour which can be difficult to find.

Darryl is a strong advocate of holding onto his older quality machinery because he believes it still has potential value to his business and has a low depreciation cost. An example of this is their 855 Versatile, which is 40 years old, has over 20,000 hours and hasn't required an engine or gearbox rebuild. It starts every time and fills a gap when required, such as at seeding time in 2020 when it was used with the planter for 100 hours.

Storing the machinery in a drive through 45m long, 25m wide igloo has been a game changer at 'Krui Plains' because not only does it protect the machinery but Darryl has found his team is doing a better job of repairing and maintaining the equipment because they have a more comfortable working environment.

	Make model	Current hours or coverage	Hours or usage/ year	Annual average R&M costs	Replacement trigger
Planting & harvest tractor	Case Quadtrac 500 (new 2018)	2,000	700	$4,000	Initially purchased because of increase in horsepower required to pull larger 18m bar.
Spraying & harvest tractor	Versatile 305 (secondhand 2015)	6,000	1,500	$3,000	Increasing maintenance costs and looking for a dealer that will warranty 3m spacing.
Tractor 3	Versatile 855	20,000+	100	$500	
Sprayer 1	Case Patriot 4340 (new 2018)	1,000	300	$5,000	Was purchased to do more in-crop sprays with better clearance but two years of drought followed. Also has pulse width modulation which reduces overlap.
Sprayer 2	Optical TB (new 2015)	90,000ha	200	$4,000	Purchased for resistance management. Originally planned to replace in 2019 because of high hours but with drought opted to rebuild instead.
Seeder	Boss 18m tyne planter with Boss seed cart (new 2018)	1,500	500	$6,000	Upgraded from a disc planter because of pinning. Next upgrade could be to 24m bar.
Other significant equipment	Telehandler (secondhand)	4,000	200		

JAMES COGGAN, WONGLE FARMING CO

James Coggan has a number of owner driver header contractors who supply five headers every harvest. This is a long-term relationship, as the most senior contractor has been harvesting at 'Wongle' for 36 years.
PHOTO: CUSSONSMEDIA

LOCATION: Inglestone, Western Downs, Queensland

RAINFALL: 520mm

SOIL TYPE: Red loams to self-mulching clays

CROPPING AREA: 9,200ha

CROPS GROWN: Wheat, chickpeas, sorghum and occasionally mungbeans and cotton

AVERAGE WHEAT YIELD: 2t/ha

PERMANENT LABOUR UNITS: 4

SEASONAL STAFF:

TOTAL MACHINERY INVESTMENT: $295/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $270,000

When James Coggan is replacing tractors, he always tends to purchase a little more horsepower than he believes he needs, to provide the ability to sow chickpeas deep. Chickpeas are commonly planted 10cm deep using a John Deere 9560 RT and a John Deere 9570 RT in front of 27m Multiplanters but the extra horsepower means the chickpeas can be sown 23cm deep. They also choose to run large gear with multiple units, all on three metre centres, so both the seeding and spraying programs can be covered as quickly as possible. For example, if there has been good rain, planting can be staggered over three or four weeks however, if conditions are not as favourable, James can have seeding completed in about 10 days.

Tractors, sprayers and planters are always purchased new and most commonly leased for the first year before being rolled into a chattel mortgage. Repayments are structured depending on the machine type, with the aim of having most paid out over four or five years. With a lot of contoured country, the sprayers are changed over around 4,000 hours so James will keep a fairly reasonable balloon on them and if they are in good condition and are working well, he'll pay the balloon out or will roll it into another sprayer.

James also values the technology improvements that come with replacing the sprayers regularly. AgFiniti is used in the sprayers so both sprayers can 'talk' to each other and can copy jobs as they are working in real time. James has found this technology particularly useful if one of the sprayers stops for some reason, the operator doesn't need to talk to the other, they put it onto the screen and it'll come straight up on the other machine's screen where they're up to, allowing the operation to continue seamlessly.

The Coggan's run reasonably modern road train-rated trucks to cart grain to silos on farm as well as to local feedlots, where most of the grain has been sold to in the last five years. James believes trucks are a 'necessary evil' and prefers to run modern trucks which would be easy to sell if required. Minor machinery, such as grain conveyors are replaced only when they are worn out.

A team of predominantly owner operators are contracted to harvest, supplying five machines between them, which allows for the job to be completed promptly. Securing the contractors has been easy for James, with the most senior contractor coming to 'Wongle' for 36 years and the most junior for 10 years. The contractors generally start their harvest season at the Coggan's and if another contractor is required in a big harvest year, the core group of contractors is approached first before another contractor is added to the mix. James says this works well because in big years, all the contractors are keen to get to their Walgett and Coonamble clients.

The Coggan's built their first WEEDit based on an old Flexi-Coil 67 XL which was the base model from which Croplands developed their WEEDit machines. In a dry year, James says the WEEDit comes into its own, saving between 85 to 95 per cent in chemical costs as well as controlling resistant feather top Rhodes grass, liverseed grass, barnyard and Queensland bluegrass.

In terms of making decisions on machinery purchases, James works closely with his agronomist as a guide to what is and isn't working well locally. He also has a great relationship with the WEEDit and GPS representative based in Goondiwindi who often flags with James when something of interest may be coming available. They have also in some instances been able to trial machinery before purchasing, such as the Miller sprayers which James trialled on-farm for a week before purchasing.

With most dealers two hours away in Dalby, minor repairs and maintenance is done on farm and appointments are made in advance for the larger services. They are big believers in running clean oil drums and funnels, so as James says, "they love splashing petrol about". He has also had success in dealers including services and lubrications in the purchase price, although that isn't always forthcoming in a deal.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Planting Tractor 1	John Deere 9560 RT (new 2012)	5,000	700	$5,000 (annually) New Tracks at 4,500hrs costing $44,500	High machine hours 7,000 – 8,000 hours.
Planting Tractor 2	John Deere 9570 RT (new 2019)	950	800	$7,000 includes windscreen replacement	High machine hours 7,000 – 8,000 hours.
Harrowing and WEEDit Tractor	John Deere 8295 R (new 2017)	2,000	600	$2,000	High machine hours 7,000 – 8,000 hours.
Sprayer 1 & 2	Millers 7310 x 2 (new 2019)	1,000 each	900	$6,000 each, nozzles, filters etc	High machine hours 4,000 hours.
Sprayer 3	WEEDit	30, 000ha	7,000 – 8,000ha	$1,500	Technological improvement.
Seeder 1	Multiplanter (new 2010)	40, 000ha	4,000ha	$7,000	High hours (15 years).
Seeder 2	Multiplanter (new 2008)	48,000ha	4,000ha	$7,000	High hours (15 years).
Truck 1	Western Star 4800 FX Road Train (secondhand, 2007)	400,000km	3,000 – 5,000t grain carted	$7,000	
Truck 2	Western Star 4864 FXB (secondhand, 2013)	220,000km	3,000 – 5,000t grain carted	$8,000	

When replacing tractors, the Coggan's look for additional horsepower so if conditions require it, they can deep sow chickpeas with their two 27m Multiplanters. PHOTO: CUSSONSMEDIA

KEITH AND RAE LOGAN, LOGAN CATTLE COMPANY

Keith and Rae Logan tend to purchase new key machinery items that improve productivity. PHOTO: CUSSONSMEDIA

LOCATION: 'Currajong Park', Meandarra, Western Downs, Queensland

RAINFALL: 530mm

SOIL TYPE: Brigalow clays and belah clay loams

CROPPING AREA: 2,870ha

CROPS GROWN: Wheat, chickpeas, barley and sorghum

AVERAGE WHEAT YIELD: 2.6t/ha

PERMANENT LABOUR UNITS: 7

SEASONAL STAFF: 4 at harvest

TOTAL MACHINERY INVESTMENT: $3.6m

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $700,000

After sales service and the ability to source parts locally is a critical decision driver for Western Downs growers Keith and Rae Logan when purchasing machinery. They tend to purchase mostly new equipment for critical operations such as planting and spraying, but will consider purchasing secondhand equipment with low hours so reliability is maintained. They are also firm believers that if you can't afford it, don't buy it, so tend to pay cash for new purchases to limit their exposure to a run of poor seasons.

Machinery upgrades are driven by improvements in productivity. The Case Puma will be sold because it is not on three metre centres and with wide tyres, Keith estimates they were losing about six per cent in yield because of the extra compaction. When they change over the Patriot boom, they will increase the boom width from 30m to 36m after calculating that crop damage is costing between $30,000 – $40,000 a year on an average wheat yield of 2.5 t/ha.

The Logans are happy to modify existing equipment to suit their situation. For example, the first camera sprayer was built on a secondhand rig to test its suitability at a reduced cost before eventually a new WEEDit was purchased in 2017.

Despite only having the Gessner Landmaster for the past four seasons, the Logans are looking to upgrade to a machine that will improve crop establishment. As Keith says, "If you can increase yield by a couple of per cent, profit increases massively and it costs the same to sow."

The Logans use contractors with specialised equipment to assist developing land as well as for harvest. While Keith believes they will eventually run their own headers, with limited staff he believes his time is best spent managing the harvest and marketing the grain, so they use contractors to supply three headers. They have also just employed a truck driver, to keep Keith in a harvest management role. However, using harvest contractors isn't always easy and Keith is planning to secure contractors with a contract, to avoid surprises or disagreements.

Warranty work is conducted by dealerships but otherwise, with a mechanic on staff and a fairly extensive workshop, most repairs and maintenance are handled on-farm. Keith believes maintenance is everything and so invested in a cement floor in the workshop to make the maintenance task more appealing for their team.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding tractor	Case Quadtrac 450	3,500	800-1000	$10,000	High hours (6,500 – 7,000) and increasing maintenance costs. Also consider purchasing a machine on 3m centres rather than 2.5m, to match other machinery.
Spreading and developing tractor	Case Rowtrac 400 (secondhand 2018)	3,800	600-700	$8,000	High hours (6,500 – 7,000) and increasing maintenance costs.
Camera sprayer and chaser bin tractor	Case Puma 195	3,200	300	$4,000	Being traded because not on 3m centres and has big, wide tyres.
Tractor 4	John Deere 6610	5,500	200	$3,000	Only if significant mechanical problem.
Tractor 5	John Deere 6910	5,500	200	$3,000	Only if significant mechanical problem.
Tractor 6	New Holland 9482 Versatile	6,500	200 – 300	$3,500	Only if significant mechanical problem.
Sprayer 1					
	Case Patriot 3330 SP	3,000	400 – 500	$10,000	Upgrade from a 30m to 36m, newer boom with same 4000L tank.
Sprayer 2	Croplands WEED-IT TB (new 2017)	750	300	$5,000	Upgrade if better technology available.
Seeder	Gessner Landmaster with 1200L Simplicity Cart	1,000	250	$10,000	Looking for better germination.
Truck 1	Western Star 4900			$12,500	If production increases, considering putting a driver on into a newer, more efficient truck.
Truck 2	Freightliner FL 112			$12,500	No plans to upgrade.
Truck 3	ACCO 8 Wheeler (1996)	360,000km	10,000km	$2,000	No plans to upgrade.
Trailer 1	1 Grain Trailer (new 2016)		20,000km	$2,000	No plans to upgrade.
Trailers 2,3, & 4	3 Grain Trailers (secondhand 2015)	700,000km	20,000km	$6,000	No plans to upgrade.
Mother Bin 70T				$2,000	No plans to upgrade.
Finch Chaser Bin 22T				$2,000	Planning to upgrade to larger capacity (47T).

The Logans are keen to improve the germination of their cereal crops and are looking for a bar that will deliver.
PHOTO: CUSSONSMEDIA

NICK ENNIS, LAWSON GRAINS

Nick Ennis, 'Borambil' Manager for Lawsons Grains has found the improvements in technology between the John Deere S790 and S690 headers has resulted in productivity improvements. PHOTO: CUSSONSMEDIA

LOCATION: 'Borambil', Rand, Southern New South Wales

RAINFALL: 480mm

SOIL TYPE: Predominantly red sandy loam with a range of other soils

CROPPING AREA: 8,200ha

CROPS GROWN: Wheat, barley, canola and vetch for hay

AVERAGE WHEAT YIELD: 3.5t/ha

PERMANENT LABOUR UNITS: 4

SEASONAL STAFF: 4 (Seeding) and 8 (Harvest)

TOTAL MACHINERY INVESTMENT: $420/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: 0-15% of total invested (dependent on cash surplus)

Lawson Grains has found they can hold key machinery for longer, without seeing a corresponding increase in repairs and maintenance and reduction in timeliness of operations. As a result, they are aiming to reduce their annual machinery replacement investment. PHOTO: CUSSONSMEDIA

With shareholders to report to, reducing the cost of machinery ownership without losing reliability is a key focus for Lawson Grains. The company use diminishing value depreciation that closely matches market depreciation, but widening replacement costs (increasing cost of new machines) now sees them holding machines for longer. They are not seeing a corresponding increase in repairs and maintenance nor reduced reliability as a result of this decision. As a result, they are aiming to reduce their annual machinery replacement investment.

Across Australia, Lawson Grains have the broader strategy of running the same brand of machinery with the same technology platform for two key reasons. Firstly, when staff move between farms, they know exactly how a machine operates and what its capabilities are. Secondly, having the same technology platform means data is easily captured from the machines, monitored, and aggregated at a company level to benchmark individual machine performance. Additionally, farm performance is also monitored, benchmarking productivity either at an operator level, or in the way that a farm is structured around machinery.

Machinery purchasing decisions also involve looking for improvements in technology at Lawson Grains. As Borambil Manager, Nick Ennis explains, they have seen an improvement in productivity between John Deere S790 and S690 harvesters. The S790 automatically adjusts throughout the day to optimise the capacity of the machine, without the operator having to and so when fatigue or complacency sets in or inexperienced operators are using the machine, it makes the necessary adjustments to get optimum performance. Nick says while the S690s are still great machines, the operators have to be more skilful and change settings more frequently to get the most out of them.

Nick has found the performance data collected from machines has been hugely beneficial for both the seasoned operators and those who are less experienced. While the best operators get satisfaction from optimising performance, Lawson Grains are targeting those operators to identify how they can improve the efficiency of the less experienced operators and drive harvest performance across the business.

A key part of improving the skill set of their operating staff was to implement a number of harvest schools where all the permanent and casual harvest staff would come together to learn the safe operating procedures of the machines and maintenance skills before operating the machines. In addition to providing this level of training, less experienced staff are monitored before they are signed off as being competent to operate a machine individually.

Given the value of the data captured from the harvesters, Lawson Grains choose to own machines rather than use contractors for harvest. Also, with critical jobs like harvest, seeding, in-crop spraying and spreading, they value having complete control so optimal timing of operations is achieved.

About 30 per cent of Borambil's repairs and maintenance is performed by the local John Deere dealership, which does all the major services, the after-harvest service of the headers and the 1000 hours service on the tractors. After harvest, each of the headers is inspected by a qualified John Deere mechanic who outlines anything that needs to be repaired or replaced or potentially could give trouble the next season.

Currently 'Borambil' runs two 12m seeders with two tractors, rather than one larger unit, so the tractors can be used for a number of different operations like spreading fertiliser and towing chaser bins. If they increased the seeder to 24m, they'd need one larger tractor with more horsepower, which requires less staff to operate, but is not as easily transferred between other operations.

Contractors are used for grain and fertiliser cartage and hay making. However, due to increasing safety concerns, at 'Borambil' they are considering purchasing a truck mounted grouper to fill the seeders. With 'Borambil' making up nine different farms varying from 250 to 2,800 hectares, 75 kilometres apart, they are finding the chaser bins currently utilised for this purpose are spending a considerable amount of time on the road.

An advantage of selling and trading machinery of different ages around Australia, is that Lawson Grains have a good understanding of what a secondhand machine is worth. While their preferred strategy is to trade older machinery through the dealer, they will also sell the machine privately or via auction.

	Make & model	Current hours or usage	Hours or usage/year	Replacement trigger
Planting tractor 1	John Deere 8370RT (new 2017)	4,516	1,350	Cash surplus, machine hours (6,000 – was 5,000 but haven't seen a reduction in reliability) and increasing maintenance costs.
Planting tractor 2	John Deere 8370RT (new 2017)	4,367	1,350	Cash surplus, machine hours (6,000 – was 5,000 but haven't seen a reduction in reliability) and increasing maintenance costs.
Chaser bin, spreading and hay tractor	John Deere 8260R with front end loader (new 2013)	5,100	500	Cash surplus, machine hours (7,000 – 8,000) and increasing maintenance costs.
Sprayer 1	Miller Nitro 5333 (new 2016)	2,821	750 (including 130 – 150 hrs windrowing)	High machine hours (3,000), reliability, technology upgrade.
Sprayer 2	John Deere 4060 with exact apply nozzles (new 2019)	933	602	High machine hours (3,000), reliability, technology upgrade i.e. exact apply nozzles has reduced overlap from up to 9% to sub 1%.
Harvester 1	John Deere S790 (new 2018)	450	390	Cash surplus, machine hours (2,500) and upgrading technology.
Harvester 2	John Deere S790 (new 2018)	526	395	Cash surplus, machine hours (2,500) and upgrading technology.
Harvester 3	John Deere S690 (new 2017)	866	391	Cash surplus, machine hours (2,500) and upgrading technology.
Harvester 4	John Deere S690 (new 2017)	950	398	Cash surplus, machine hours (2,500) and upgrading technology.
Harvester 5	John Deere S690 (new 2015)	1,800	420	Cash surplus, machine hours (2,500) and upgrading technology.
Seeder 1	12m DBS (new 2014)	4,000	565	Upgrading technology i.e. disc vs tyne, seed singulation, section control and cash surplus.
Seeder 2	12m DBS (new 2014)	4,000	565	Upgrading technology i.e. disc vs tyne, seed singulation, section control and cash surplus.
Chaser bins 3 x 30T				Wear and tear/structural integrity.
Dunstan 110t Mother bin			400	Wear and tear/structural integrity.

LEE AND CASSIE COLEMAN, BLACKJACK FARMING

Lee Coleman is an early adopter of technology but is focused on realising those gains when purchasing new machinery. PHOTO: CUSSONSMEDIA

LOCATION: 'Yamboon', Croppa Creek, North West New South Wales

RAINFALL: 630mm (Annual), 191mm (May – Sept)

SOIL TYPE: Brigalow, loamy red and black soil

CROPPING AREA: 2,441ha

CROPS GROWN: Wheat, barley, durum, chickpeas and sorghum

AVERAGE WHEAT YIELD: 3.54t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 1

TOTAL MACHINERY INVESTMENT: $800/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: 10% of total invested

ANNUAL TOTAL MACHINERY REPAIRS AND MAINTENANCE: $105,000

Lee Coleman classes himself as an early adopter of technology, but he is very careful to not justify efficiency and productivity gains when spending thousands of dollars on a machine and then not realise those benefits. When Lee left his career as an engineer 10 years ago to come home to what was his grandparent's farm, he inherited principal plant that was on average about 15 years in age. With that older machinery, he had some difficulty trying to get efficiency and reliability across the cropping system. So, in the past 10 years, all of the tractors have been replaced, bringing the average age of the principal plant now down to about four and half years.

The Colemans operate a one-unit system consisting of a 12m header, 12m planter and a 36m sprayer for the 2,400 hectare program and while Lee notes that their machinery investment could be more efficient, it fits with their farm which is hilly, with contours and rocky areas. As a result, they have to operate machinery at slower speeds than growers on flatter country.

The Colemans purchase a mix of new and secondhand machinery, with the new equipment being predominantly leased with a balloon that's equivalent to the resale value. This is to reduce the amount of capital tied up in the machine, which Lee says can be better used to reduce land debt. He also believes that despite a tough few seasons with drought, once the lease period ends they will be in a financial position to maintain that age and reliability spectrum. As they make future machinery purchasing decisions, Lee will be weighing up whether to adopt the latest technology, albeit at a higher cost, or whether to purchase a reliable, low hours machine and be in a better financial position and still get 95 per cent of the available technology.

Lee is also considering whether he can add technology to existing equipment without purchasing it new. For example, he runs a 20 year-old Simplicity seed cart but has added hydraulic rate controllers and bin cameras and modified it from two to three metre centres for their controlled traffic system. This investment of $25,000 is a fraction of the cost of purchasing a new seed cart with that technology, and unless he plans to increase scale, Lee says he can't justify replacing it.

For ease of management, the Colemans run a John Deere fleet which has a number of benefits including having a single control system, consistency in training as staff understand both the capabilities of the machines, and how to service and maintain them. Predominantly all of the standard services are carried out on 'Yamboon' and then the dealers are used for more technical issues.

Lee focuses on understanding the major reliability issues in each model and watching for any signs of problems before they arise. For example, his brother purchased a new header at the same time and it had a catastrophic failure, so by keeping an ear to the ground for issues other users are facing, Lee avoided a similar situation. Also, Lee has purchased extended warranties on his sprayer and the current header, to ensure they run reliably without any additional repair and maintenance costs.

CASE STUDIES: NORTHERN REGION
LEE AND CASSIE COLEMAN, BLACKJACK FARMING

A key investment focus since returning to the farm has been an increase in grain storage from 500 tonnes of sealed storage to over 4,000 tonnes. This has meant many step changes in silo size and auger capacity, something which Lee wishes he had decided to invest in sooner. In terms of return on investment, the silo complex has been excellent, allowing them to fill them sometimes three times a year and then sell into the market at opportune times.

With a focus on productivity, efficiency and profitability at Blackjack Farming, Lee and Cassie employed a security software developer as a farmhand looking for a tree change. Matthew Higham worked as a farmhand for five years but soon grew tired of all the paperwork involved as an operator. This led the Coleman's to work in partnership with Matthew to develop FarmSimple, a complete farm management system. The Coleman's use the cloud-based system to reduce paperwork, co-ordinate their team, ensure compliance and analyse their business. With their machinery, all of the manuals are located in the app for easy servicing and spare parts ordering.

	Make & model	Current hours or usage	Hours or usage/year	Replacement trigger
Planting tractor also used for a road grader	John Deere 9460 R (secondhand 2013, 1,500 hrs when bought)	4,500	600	High machine hours (7,000+). Previous tractor was replaced at 9,000 hours.
Chaser bin tractor, back-up planter tractor, scraper bucket tractor for grading	John Deere 8530 (secondhand 2006, 4,000 hrs when bought)	9,500	513	Due for replacement pending seasonal conditions.
Rock raking and picking, loader tractor	John Deere 6140 R (secondhand 2013, 4,500 hrs when bought)	5,100	400	Expect will last till 10,000 hours so no current plans to replace.
Spraying	John Deere R4033 SP (new 2015)	2,750	342	Plan was to replace at 3,000 hours but will re-bush and hold to 4,000 hours.
Seeding	Excel Stubble Warrior – double disc with precision planting electric drive V-sets (new 2013)			Will maintain this planter with plans to buy a summer crop planter which will extend the life of the winter crop planter.
Harvester	John Deere S780 (new 2018)	400	200	Plan to replace to maximise reliability at 2,000 – 2,500 hours.
Truck	Western Star 4964 (secondhand 2006) Rhino 32 Classic tipper (new 2017)	1.5 million km	20,000km/yr	
Other significant equipment	J&M Chaser Bin GC24T (new 2012) Brandt 13-110 HPX Auger (new 2016)			Will replace auger if required and consider upgrading to match the capacity of the header when it is upgraded. Will also consider dry hiring a chaser bin rather than upgrading. Capacity is already matched, so no plans to upgrade.

The ability of machinery to handle undulation, rocks and contours on 'Yamboon' are key considerations.
PHOTO: CUSSONSMEDIA

LUKE AND PETER BRADLEY, WOOL-A-ROO AG

Luke Bradley uses high contractor pricing in budgets to determine whether purchasing a new key piece of plant is justifiable. PHOTO: CUSSONSMEDIA

LOCATION: 'Lindley Downs', Springsure, Central Queensland

RAINFALL: 450+mm

SOIL TYPE: Self-mulching grey cracking clays

CROPPING AREA: 4,100ha

CROPS GROWN: Sorghum, wheat, maize, chickpea and barley

AVERAGE WHEAT YIELD: 2 – 2.4t/ha

PERMANENT LABOUR UNITS: 4

SEASONAL STAFF: 0

TOTAL MACHINERY INVESTMENT: $130/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $550,000

Contracting experience has been the foundation of machinery replacement decisions for Luke and Peter Bradley. Originally the Bradleys began contract harvesting in northwest and southern NSW and central Queensland, before adding contract spraying, fertilising and planting to their services. In 2011 they began leasing 'Lindley Downs' with Westchester and continued contract harvesting for another five years before winding back. They were missing key operations at home which weren't covered by the income generated by harvesting. Now, they only contract harvest for one client which is both manageable operationally and economically, as it pays for the repairs and maintenance costs of their two John Deere S680 harvesters.

Running the numbers is very important for the Bradleys who use high contract pricing when running budgets to examine possible machinery purchases. When contracting was a core part of their business, this was how they budgeted for the banks and found it is a very quick way to evaluate if a new purchase can pay its way, because if the budget doesn't work using contract pricing, the purchase isn't justifiable. They also use a benchmarking service through their farm consultant to continually monitor their business performance across a range of targets, including dollars per hectare invested in equipment.

Machinery purchases are made to match agronomic needs and generally key pieces of equipment are purchased new. That being said, the Bradleys look to invest in technology and where possible, adapt or retrofit it to machinery. This has saved significant costs over the years, particularly with planters, which represent their key machinery purchases.

Three different planting bars are operated at Lindley Downs; a 24m Excel summer planter with row cleaners and 1.5m spacing, a John Deere DB60 and a 12m Excel winter planter. All are set up with liquid furrow injection to build efficiencies into planting windows. Typically, the Bradleys have four days to plant the summer cropping program to maximise crop establishment in heavy soils and high temperatures. Luke explains when they start planting it is generally too wet but by the end of day four, they're struggling to get a really nice finish and if they can't close the trench and they get a 40-degree week following planting, it can be disastrous.

The John Deere DB60 was originally bought to singulate wheat and barley but the Bradleys have learnt it is difficult to singulate wheat because the plates require a lot of cleaning, so now that bar is primarily used to sow chickpea and corn at 75cm spacing but can also be used to sow chickpeas at 37.5cm.

The Excel winter planter on 37.5cm spacings has been a workhorse for the Bradleys, with Luke estimating it has sown about 100,000 hectares. Every 12,000 hectares the units are stripped down and sent to Excel for rebuilding which Luke says is the most cost effective approach.

The Bradleys operate one newer tractor for planting to maximise reliability at time critical periods and minimise downtime. At the end of the warranty period they consider whether to add it to the fleet or sell it. Other key considerations when purchasing a new tractor are the hydraulic and electrics capacity. The repairs and maintenance of the older tractors are carried out on farm, as Luke is a qualified electrician and they also have a qualified fitter and turner on staff.

When upgrading to the Agrifac Condor Endurance sprayer, the Bradleys were chasing an increase in efficiency and so they increased the tank size from 4,500L to 8,000L which meant a reduction in downtime filling the boom. They could also slow down from 22 – 24km/hr to 13 – 18km/hr and cover the same spray area with a 48m boom over the previous 36m and have more hours spraying in the window. In addition, they had the capacity to increase spray volumes, with most of their water rates being 73 – 100L/ha.

When the sprayer was purchased, the Bradleys purchased a premium package from the dealer which meant they wouldn't have to do any of the maintenance or servicing. That decision was about containing some of the machine's maintenance and as it was a new machine, Luke was a little unsure about its longevity compared to the older machines. He thinks they will use more premium repairs and maintenance packages in the future when replacing key equipment such as the planting tractor. This is because they will get better value and cost $1,000 for a return trip from a dealer, if the dealer is coming out to replace an o-ring, they will make sure they have it in the vehicle.

After contract harvesting for so many years, the Bradleys now use a contract harvester with whom they have a long-term relationship with if they are faced with a significant winter crop and the onset of the rainy season.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Planting tractor 1	John Deere 9470R (new 2016)	1,500	300	$5,000	Increasing maintenance costs & warranty expiration. Also hydraulic and electric capacity.
Planting tractor 2	John Deere 8360R (new 2013)	4,600	300	$10,000	Increasing maintenance costs & cash surplus. Also hydraulic and electric capacity.
Tractor 3	John Deere 8530 (new 2010)	3,500	150	$10,000	Retained for back up and harvest requirements.
Tractor 4	John Deere 8530 (new 2009)	5,500	150	$10,000	Retained for back up and harvest requirements.
Sprayer	Agrifac Condor Endurance (new 2018)	500	350	$1,000	Upgraded tank size for better efficiency. High machine hours & increasing maintenance costs will be drivers for future replacement.
Seeding	Excel 24m Summer (new 2016)	15,000	250	$10,000	Upgrade (size, technology, features).
	John Deere DB60 (new 2019)	4,000	250	$50,000	
	Excel 12m Winter (new 2009)	100,000ha	250	$20,000	Next to be upgraded.
Harvesters	John Deere S680 (new 2014)	1600	250	$20,000	Increasing maintenance costs & warranty expiration.
	John Deere S680 (secondhand 2016)	400	250		
Trucks	Kenworth T409 (new 2012)	100,000km	10,000km	$5,000	Cash surplus.

The Bradleys run two John Deere S680s so they have one set of parts to manage and they will add a contract harvester if they have a significant winter crop to harvest before the rainy season. PHOTO: CUSSONSMEDIA

PAUL TOGNETTI, LAKE HAWDON PROPRIETORS

'Myee' Manager Paul Tognetti (L) and owner David Hurst (R) run John Deere equipment so the one brand of computer software can be easily analysed for making variable rate decisions. PHOTO: CUSSONSMEDIA

LOCATION: 'Myee', Grenfell, Central West New South Wales

RAINFALL: 625mm (Annual) 375mm (GSR)

SOIL TYPE: Clay loams

CROPPING AREA: 1,977ha

CROPS GROWN: Wheat, barley, canola, oats and vetch for hay

AVERAGE WHEAT YIELD: 3.25t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 0

TOTAL MACHINERY INVESTMENT: $48/cropped ha (harvester not included)

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $95,000 (leased)

With the main farm based at Robe in South Australia 1,000 kilometres away, the difference in location means there are some unique opportunities to share machinery between the SA and the Central NSW property. Paul Tognetti, manager of 'Myee' in Grenfell, describes the Robe property as further south and closer to the coast, so they harvest later than the NSW property. Canola is generally started at 'Myee' in November before finishing wheat in early December and then trucking the header to Robe where they harvest canola and barley, and then in most seasons, start the wheat after Christmas, with harvest finishing in late January. Two prime-movers and trailers are also shared between the two properties. Paul says it doesn't work to share other plant because it is generally required in both locations at the same time.

After shifting to controlled traffic about 12 years ago, Paul is now focused on fine tuning inputs, which includes variable rate phosphorus, nitrogen, lime and gypsum. Therefore, it is important for the properties to have the same brand of principal machinery so the technology platforms are the same, meaning data can be readily collected and assessed.

With the exception of the header, new machinery is generally leased, with the plan to buy and hold rather than look to trade. With interest rates so low, leasing allows surplus cash to be used to reduce farm debt and for the cost of the machine to be spread over time.

When purchasing machinery, business owner David Hurst and Paul consider whether a machine is fit for purpose or can be better utilised. For example, they were initially planning to purchase another tractor because the one tractor was being used for spraying and spreading, and as they have grown in size, they weren't being as efficient with the spraying and spreading operations. They decided it made more sense to purchase a self-propelled sprayer which would reduce the hours added to the tractor, allowing it to last longer and give more flexibility in their operations. Rather than purchasing a new SP which they felt was difficult to justify over their area, a low hour SP machine has been purchased.

Because Paul and David consider the header to be such a key piece of machinery, it is traded every five years. David liaises with the local dealer and the traded machine is often sold before it arrives back with the dealer. The header will be upgraded to a 12m front to increase efficiency, so the NSW harvest can be completed quicker and the machine can arrive earlier in SA.

After sales service is important to Paul and David, particularly as they choose to hold onto machinery rather than trade regularly. Basic repairs and maintenance are carried out at 'Myee' but dealers are used for bigger jobs and as machinery becomes more technologically advanced, Paul notes often the dealers are required anyway to identify issues with computer software that isn't available to owners.

With small areas of both canola and hay and plenty of contractors available, long term contractors are used at 'Myee' for hay making and windrowing canola.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Planting tractor	John Deere 9220 (secondhand 2011)	5,800	430	$4,666	High machine hours & increasing maintenance costs but are looking for a long life.
Spraying and spreading tractor	John Deere 7200R (new 2014)	6,400	900	$3,778	Just decided to upgrade to a secondhand SP, so less hours will be added to this tractor to prolong its life, rather than replace tractor now. In future will run until maintenance costs become too high.
Sprayers	27m Stoll S6 (new 2017) 36m John Deere 4940 SP (secondhand 2020)	1,551	521		Selling to upgrade to the SP. Just purchased, rather than purchasing another tractor. Upgraded to a wider boom. High machine hours, increasing maintenance costs and upgrade.
Harvester	John Deere S670 (new 2015)	2,125	275 (NSW) 150 (SA)	$9,000	Upgrading to 12m because of high machine hours and increasing maintenance costs.
Seeder	9m Flexicoil Bar 820 with Gason Cart 1890 RT		2,027ha		Increased maintenance costs and upgrade to 12m to increase efficiencies.
Trucks	MB 2233 Tipper Kenworth 401T Tipper	1.2 million km 1.3 million km	1,000km 1,000km		No plans to replace.
Other significant equipment	Dunstan 80 T mother bin Coolamon 30 T chaser bin Breadal K185 Spreader				Recently upgraded for size and technology. i.e. scales for variable rate sowing. No plans to upgrade. High machinery hours & increasing maintenance costs.

A harvester and two trucks are shared between the `Myee' property in NSW and the main farm in Robe, SA.
PHOTO: CUSSONSMEDIA

STUART McDONALD

Stuart McDonald upgraded to a new header which was easier to find staff to operate than the older header which still worked well operationally but was difficult to find skilled staff to operate. PHOTO: CUSSONSMEDIA

LOCATION: 'Belmont', Canowindra, Central New South Wales

RAINFALL: 600mm (Annual), 300mm (GSR)

SOIL TYPE: Red brown earth

CROPPING AREA: 1,100ha

CROPS GROWN: Wheat, canola, chickpea and barley

AVERAGE WHEAT YIELD: 2.8t/ha (5 yr) 3.4t/ha (10 yr)

PERMANENT LABOUR UNITS: 2

SEASONAL STAFF: 2

TOTAL MACHINERY INVESTMENT: $100/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: 8% of total invested

Machinery purchases for Stuart McDonald have to be strategic. In the last few years he has made the decision to replace some machinery, not because of reduced reliability, but because it was no longer the right fit for his business. For example, in 2015 he purchased a new John Deere S680 to replace a 15 year old header which was still highly functional and operationally suited the business, but required skilled staff to operate. Stuart says it was harder to find skilled staff than the funds to purchase a new header, so a new machine that is easier to drive and more attractive to potential staff was purchased. Also, as a high wear machine, where avoiding down time is critical, Stuart felt a new machine outweighed the benefits of a high hour secondhand machine.

Both new and secondhand machinery is purchased and if it is secondhand, it needs to be within five to ten years of current technologies to prevent a future big leap from a 20 year old machine to a new one. Depreciation costs are also a factor in decision making at 'Belmont'. For example, when the McDonalds decided to change their planting system from a tyne to a disc machine to incorporate more residue and save more moisture, the McDonalds bought a four year old, secondhand Morris Razor disc planter rather than a new one. Part of the reason was Stuart couldn't justify the high depreciation costs in a new planter that is only used for a few hundred hours each year, over a planting window of a few months, with forage crops included.

Stuart is a member of the business management group Ag EDGE, through which he meets quarterly with fellow peers and a professional facilitator to discuss the strategic direction of the members businesses. He finds this a great forum to evaluate potential machinery purchases among other business decisions.

When determining when to bring contractors onto the farm, Stuart is mindful of the key tasks that the permanent two labour units can complete without losing efficiency. For example, in 2020 they needed to sow in between rain events as well as spread lime and gypsum, so contractors were used for the spreading. With between 300 – 400 hectares of canola to windrow, Stuart doesn't believe he has the scale to justify the purchase of a windrower, so contractors are used. Stuart notes that because of the scale of the jobs they are offering the contractors, they have been completed in a timely manner.

Stuart has considered using contractors for sowing, but because they are targeting optimal sowing windows for their grain and forage crops, their sowing window can extend from early March until the end of May. Therefore, Stuart believes they get better efficiency and timeliness by doing seeding themselves. The McDonalds have one on-farm and one off-farm truck however local contractors are predominantly used to cart grain, fertiliser and livestock.

Oil changes and regular maintenance is carried out at 'Belmont' with the idea being by keeping machines clean, little problems can be identified before they become big ones. The harvester is serviced by the local dealer, to ensure this key piece of technical machinery is in optimum condition for harvest.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding tractor	Case 400 Rowtrac (secondhand 2015)	2,600	300		Upgraded to run new bar. Expect tracks to double annual costs at least $3,000.
Utility tractor 2	John Deere 7410 (new 1998)	6,400	400	$1,000	Utility tractor – no current plans to upgrade.
Utility tractor 3	John Deere 6210 (new 1999)	6,100	400	$1,000	Utility tractor – no current plans to upgrade.
Sprayer	John Deere 4730 SP (new 2015)	1,600 35,000ha	350	$1,000	Machine has enough capacity so no current plans to upgrade. Hold until need extra capacity and or reliability decreases.
Seeder	12m Morris Razor (secondhand 2019) with a Flexi-Coil 1330 air cart (new 2019)	33,000ha	1,200 – 1,500ha	$5,000	Bar replaced a 20 year old machine as changed planting system from tyne to disc. Purchased secondhand for quarter of price of new machine (4 years old when purchased). Planning to upgrade air cart.
Harvester	John Deere S680 (new 2015)	1,200	200 – 300	$10,000	Replaced a 15 year old machine which was still suited to the business but difficult to find skilled staff to operate. Planning to hold for another 5 years.
Truck	Freightliner FL 112 with 2 axle dog trailers (secondhand 1994)	More than 1 million km	10,000	$7,000	

While the truck is used at harvest, contractors are used for the bulk of the cartage requirements at 'Belmont'.
PHOTO: CUSSONSMEDIA

CASE STUDIES: SOUTHERN REGION

PHOTO: BEN WHITE

AG (ASKIN) MORRISON PISA ESTATE

AG Morrison replaces the sprayer every three years at 3,000 hours because it sells well and any significant repair costs are avoided. PHOTO: AG MORRISON

LOCATION: Cressy, Tasmania

RAINFALL: 550mm (Annual) 400mm (GSR)

SOIL TYPE: Mixed

CROPPING AREA: 1,800ha

CROPS GROWN: Wheat, barley, canola, green peas, poppies, potato, corn, grass seed, clover seed and chicory seed

AVERAGE WHEAT YIELD: 8t/ha

PERMANENT LABOUR UNITS: 8

SEASONAL STAFF: 2

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $400,000

When AG Morrison is considering to upgrade machinery, he first runs the numbers through a spreadsheet, comparing the cost of using a contractor to carry out the operation or whether it is better for the Morrison family, including AG's father Ian and brother Will, to own a new machine. While this is helpful from a numbers point of view, AG also considers how it would fit in the rest of their operation. For example, he believes they could easily justify buying balers, however in summer their team are already busy with other tasks such as harvesting and managing irrigation, so adding balers to the business would require extra staff and bring more complexity. In this instance, the Morrisons also have a nearby baling contractor who can come in with three machines and perform the job much faster than they could. AG believes a key part of maintaining a good relationship with contractors is to be loyal and to pay on time.

Traditionally the Morrisons focused on paying back debt but now cash surpluses are used to best improve equity and the business. As AG explains, with interest rates so low, it's better to make five or ten per cent return on an investment, while at the same time make the farm a more enjoyable place to work.

As part of that strategy, and to keep the monthly finance payments on machinery constant, tractors are traded every 4,000 - 5,000 hours when the finance expires, with the old machine being used as a deposit. Also, the sprayer is replaced every three years at 3,000 hours because it sells well and any significant repair costs are avoided because an extended warranty has been purchased to cover the machine for the first three years. As an added bonus, this change over period also normally coincides with a new set of tyres being required soon, so there is the potential to save about $15,000 by selling the machine before the tyres need to be replaced.

The strategy to replace seeders is different, where technology is instead a major focus. Five years ago the Morrison's weren't growing many seed crops, however they now make up more than half of the cropping program, so they eventually bought the Amazone drill after initially using contractors to sow the seed crops. The Seed Hawk is used to sow cereals and canola.

With such a diverse range of crops where two harvesters are often needed for harvesting at the same time, up until 2017 the Morrisons used contractors for harvest. When the opportunity came up to purchase a cheap, secondhand Claas Lexion that had only done 400 hours, they jumped at it. The Claas was used in conjunction with the contractor's John Deere 9650 and when he retired, the Morrisons purchased it from him.

In 2020, with low interest rates and tax incentives available, the Morrisons purchased a new John Deere T670 header. They were originally looking for a good, secondhand straw walker harvester for the seed crops, however with none available, a new one was purchased. AG considers the new header a long-term investment, and will most likely sell the John Deere and then run the two headers, upgrading to a new one every ten years.

While the machinery dealerships handle the machinery that is under warranty, with two qualified diesel mechanics on staff, repairs and maintenance of the remaining machinery is easily handled on farm.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding, spreading, ground preparation tractor	John Deere 8245R (new 2018)	2,600	1,300	$1,000	High machine hours (4,000 – 5,000 hours / 3.5 – 4 years), increasing maintenance costs and cash surplus.
Tillage and feeding tractor	John Deere 8270R (new 2017)	3,000	1,000	$1,000	High machine hours (4,000 – 5,000 hours), increasing maintenance costs and cash surplus.
Third tractor	John Deere 6155R FEL (new 2018)	2,300	1,000	$1,000	High machine hours (4,000 – 5,000 hours), increasing maintenance costs and cash surplus.
Sprayer	Amazone Pantera (new 2018)	1,000	2,000	$1,000	High machine hours (3,000 hours or 3 years), warranty expiration, increasing maintenance costs, upgrade technology, cash surplus.
Harvesters	Claas Lexion 670 (secondhand 2011) Purchased at 400 hours. John Deere 9650 CWS (secondhand 2004)	1,000 4,000	300 300	$15,000 $15,000	Increasing maintenance costs and upgrade. Increasing maintenance costs and upgrade.
Seeder	6m Amazone Cirrus (new 2015) 8m Seed Hawk (new 2015)	3,000ha 1,200ha	6,000ha 700ha	$500 $3,000	New technology and cash surplus. May purchase another Amazone machine and run two. Increasing costs and upgrade.
Trucks	Kenworth 401 (secondhand 2006) Hamelex tipper trailer (new 2015)	1.5 million km 40,000km	25,000km 10,000km	$5,000 $1,500	Increasing maintenance costs.
Other significant equipment	Case iH mower (new 2017) Dunstan mother bin & chaser bin Tillage equip; Delmade offset discs (new 2020) Amazone catros multi disc (new 2017) Amazone spreaders (new 2015 and new 2020)	500ha	1,000ha	$500	Replace every 5 years to avoid costly repair bills. Technology upgrade and cash surplus. Just purchased to increase storage capacity. Plan to upgrade every 5 years to avoid increased maintenance costs. Plan to trade in every 3 – 4 years for better resale value.

ANDREW, JENNY, TIM AND ELLEN POLKINGHORNE

Andrew Polkinghorne and his family balance the reliability of key machines and repair costs relative to market depreciated value. PHOTO: CUSSONSMEDIA

LOCATION: 'Kingara Farms', Lock, Central Eyre Peninsula, South Australia

RAINFALL: 330mm – 380mm

SOIL TYPE: Calcareous sandy loam

CROPPING AREA: 6,000ha

CROPS GROWN: Wheat, barley, canola, lentils and faba beans

AVERAGE WHEAT YIELD: 2.3t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 2

TOTAL MACHINERY INVESTMENT: $583/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $350,000

While tractors, boom sprays and seeding bars are generally purchased new, the Polkinghornes tend to run secondhand headers which are reliable and have the required capacity without large capital costs. PHOTO: CUSSONSMEDIA

Determining the optimum time to replace machinery is a balancing act for the Polkinghorne family, who evaluate the reliability of the machine and its repair costs relative to its market depreciated value. A machinery replacement schedule outlines the planned changeover for each key piece of equipment. For example, the main tractor is scheduled for changeover at 7,000 hours, the main harvester at 1,500 hours, the second harvester at 2,500 hours, chaser bins every 10 years and mother bins every 15 years.

In his early farming career, Andrew Polkinghorne predominantly purchased secondhand machinery and invested in land, however with expansion now in hand, they have a little more discretion on machinery investments. Key pieces of machinery are used at capacity, so it is very important the machinery is very reliable and serviceable. Therefore, tractors, seeders, sprayers and sometimes the main header is purchased new with chattel mortgages over 3 – 5 years.

Andrew has found as their scale increases, it has become more difficult to acquire suitable secondhand machinery that meets their technology requirements. Currently cropping 6,000 hectares with an 18m Seed Hawk bar that runs liquid fertilisers, the bar operates 24 hours a day for roughly five weeks. The Polkinghornes were considering replacing the bar because it was dropping in value quickly and the repair costs were also rapidly rising, however the reliability is okay and it still establishes a crop very well.

They were debating changing to a disc machine to achieve a higher ground speed and therefore more productivity, or alternatively upgrading to a wider bar travelling at the same speed to achieve an increase in productivity. In terms of technology requirements, a non-negotiable was that the bar either has coulters or is a disc machine.

After weighing up the quality of various machines, including specifications, reliability, total capital costs and long-term ownership costs, the Polkinghornes decided to add a second bar to the operation for 2021. A 12m Bourgault disc with high disturbance wing seeder boots was purchased to test the technology before possibly upgrading to a larger disc bar. Andrew comments it was the best increase in productivity they could get for the capital invested versus replacing the existing bar with either an 18 or 24m seeder.

Although the risk of weather damage at harvest is relatively small, the Polkinghornes run two headers to provide enough capacity and reliability to ensure they are finished harvest by Christmas. As the headers aren't operating at capacity, the Polkinghornes are more comfortable purchasing a secondhand harvester, particularly for the second machine, and sometimes for the first, where a previous owner has already carried much of the depreciation cost. Andrew adds if he compares the cost of ownership over that period, for tonnes of grain harvested, there isn't much difference between a new and secondhand machine. However, the Polkinghornes believe running a new larger header can put a lot of pressure on both cashflow and the balance sheet, so they prefer a lower risk strategy of reducing the overall capital investment by purchasing headers predominantly secondhand.

The Polkinghornes have syndicated the purchase of some flat rollers with another local farming family. Given timeliness isn't critical for this operation, and with a formal agreement in place, Andrew says it is a partnership that works very well.

While Tim Polkinghorne is a qualified diesel mechanic, with limited labour available and an increasing reliance on the dealers to manage the more technologically sophisticated machinery, much of the servicing of major items are handled by experts. While Andrew notes it is expensive to outsource, it is more efficient because of the knowledge and experience they bring to the job.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding and mother bin tractor	John Deere 9520RX (new 2016)	3,157	720	$5,000	7,000 hours to reduce depreciation costs, avoid high maintenance costs and reduced reliability. Will replace earlier if more horsepower is required.
Spraying tractor	John Deere 8320RT (new 2019)	1,449	1,000	$2,000	Upgraded to tracks for increased versatility. Replace at 7,000 hours to reduce depreciation costs, avoid high maintenance costs and reduced reliability.
Spreading tractor	John Deere 8285R (new 2013)	8,573	1,071	$7,000	Original plan was to replace at 6,000 hours but will now hold until 10,000 hours. Expect reliability and technology improvement then.
Sprayer	Beverley Hydraboom (TB) (new 2016)	4,000	4,000	$1,000	Policy is to change at 10 years. Could upgrade to a SP or add a secondhand SP and keep the Hydraboom.
Harvesters	John Deere 9870 (secondhand 2011 New Holland CR9.90 (new 2018)	2,300 540	300 200	$15,000 $13,000	Increasing repairs and maintenance costs and reduced reliability (2,500 hours). Consider good parts and service available so will run longer than the New Holland. Between 1,000 – 1,500 hours before repairs and maintenance costs increase. The New Holland replaced a John Deere header, increasing productivity by 20% for the same cost.
Seeders	18m Seed Hawk 1830 (new 2010) with Morris Cart (new 2020) 12m Bourgault disc (new 2021 season) with Morris aircart (secondhand 2016)	720 720	7,920 720	$8,000 $1,000	Purchased smaller bar to test technology first and it was the best increase in productivity for the capital invested vs replacing existing seeder with 18 or 24m bar. The two bars will run together. Purchased new Morris air cart to double capacity and added section control.
Trucks	Kenworth 404 (secondhand) Kenworth 108 (secondhand) 2 tipper trailers (new) 1 tri-dolly 1 skel trailer	1.26 million km 1.82 million km 200,000km each 60,000km 1 million km	220 hours combined	$8,500 $6,000 $2,000 each $1,000 $1,000	
Other significant equipment	Telehandler (secondhand purchased 2015)				

JARRED TILLEY, GREENWITH FARMS

Jarred Tilley and his family use an advisory board to ensure their machinery replacement decisions are objective.
PHOTO: CUSSONSMEDIA

LOCATION: Kapunda and Booborowie, North Barossa Valley, South Australia

RAINFALL: Kapunda 475mm (Annual), 370mm (GSR) Booborowie 435mm (Annual), 320mm (GSR)

SOIL TYPE: Red brown earths and self-mulching clays

CROPPING AREA: 2,400ha (including sheep feed)

CROPS GROWN: Wheat, barley, export hay, canola and beans

AVERAGE WHEAT YIELD: 3t/ha

PERMANENT LABOUR UNITS: 4

SEASONAL STAFF: 0

TOTAL MACHINERY INVESTMENT: $584/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: 10% of total turnover per annum

Farming with his father Robert and brother Leith, Jarred Tilley has found using an advisory board to identify strengths, weaknesses and opportunities has ensured machinery purchasing decisions are objective. Jarred explains they have a policy of keeping annual machinery repayments to 10 per cent of their turnover and forecast their needs for the coming five years. They also closely monitor the machinery income investment to income ratio with the aim of it being under 0.8.

Annually the Tilley's present plans for the year ahead to the board, which consists of themselves plus an independent chair and they also invite a business consultant and a representative of the bank to these meetings. Together, they work through the weaknesses of the business and identify how to solve any problems, being open minded to new, secondhand or other machinery alternatives.

A good example of this process is the decision not to replace their Flexi-Coil seeding bar as scheduled. The board decided rather than replace the 12-metre spring tyne machine with a 12-metre hydraulic tyne bar, the biggest gains could be made by doubling the size of the air cart and keeping the current bar rather than upgrading both. Jarred says for half the investment, they have achieved 70 per cent of the desired increase in efficiency.

The Tilleys run a set of machinery that compliments their scale, preferring to use their own machinery and run it efficiently without the need to take on contracting work. However, with two farms 100 kilometres apart, they do run two 36-metre boomsprays with 5,000 litre tanks, one purchased new and the other secondhand. At seeding time, they use one tractor to sow and one to spray and then after sowing, the duals are taken off the seeding tractor and it tows the second boomspray at Booborowie. At a total cost of $100,000 for the sprayers, Jarred says it's a cheap system now but acknowledges that will change when the machines need to be upgraded as their reliability declines.

The Tilleys buy a mix of secondhand and new equipment, depending on their requirements and budget. The last two headers have been bought secondhand at 1,000 rotor hours and although the last machine was traded at 2,500 hours, Jarred hopes they can hold the Case 8240 for longer. While they tend to purchase trucks secondhand, the Tilleys find good value in purchasing trailers new. With a two-week window for hay baling, they opted to buy a new Krone baler for optimal reliability.

Using grain storage bags and with a lot of their grain and hay sold domestically, the Tilleys don't have to rely on contractors to shift their produce at harvest, and instead can sell it opportunistically, moving it with their own truck. They are currently in the market for a general purpose secondhand truck for increased flexibility that can pull a road train in the future but are finding it difficult to source.

Machinery is typically purchased using chattel mortgages with a longer schedule and the Tilleys prefer monthly payments to even out cashflow. Jarred also notes buying without a trade-in opens flexibility to find a good value machine and in that situation, they aren't averse to looking interstate for the optimal deal.

In the past the Tilleys did more servicing and repairing of their machinery but after deciding they weren't doing it as well as they could, they have shifted strategy to concentrate on maintaining the machinery themselves and using a local diesel mechanic and the dealers for machinery repairs. Jarred plans to stock more key parts of their time critical machinery to ensure they aren't held up waiting for parts.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Primarily seeding tractor but has many roles	New Holland T8390 (secondhand – 1100 hrs 2016)	5,000	1,000	$4,000	High hours (5,000) – just traded for a Fendt, has improved transmission. No allegiance to brand.
Spraying and spreading tractor	Case Puma 180 (secondhand – 100 hrs, 2016)	3,200	800	$2,500	High hours (5,000) – will be demoted.
Rock picking and hay raking tractor	Case Puma 165 (new, 2009)	6,500	250	$4,000	A lot spent on R&M in last 12 months so plan to keep long term.
Sprayers	36m Hardi 5,000L (new, 2009) 36m Goldacres 5,000L (secondhand, 2009)			$1,000 each	Increasing maintenance costs and high hours.
Harvester	Case 8240 (secondhand – 1,000hrs 2018)	1,400 (rotor)	250	$15,000	High hours (2,500 hours) but looking to extend to 3,000 rotor hours). Have been buying at 1,000 hours. Straw chopper for using chaff cart.
Seeder	12m Flexicoil ST820 (new 2002) with Bourgault 6350 bin. (new 2018)	30,000ha	2,400ha	$2,000	Have planned to upgrade earlier but are maintaining it due to other priorities. Replacement would be to improve seed placement with hydraulic tynes.
Truck	Kenworth 401 (secondhand - 1.1M Km 1997) with steel tipper and drop deck	1.4 million km	20,000km	$8,000	Technology – B-double for hay.
Other significant equipment	JCB 541-70 Telehandlers (2) Techfarm CT30 Chaff cart (new, 2019) Krone Baler 1290HDPXC (new, 2018) Massey 1386 TB Mower conditioner (new, 2018)	2,300 130	430		No intention of trading in telehandlers. Technology – if can't bale hay timely.

Despite scheduling to replace their bar, Jarred Tilley and the farm's advisory board decided to double the capacity of the air cart instead which still resulted in 70 per cent of the gain in efficiency they would have got from replacing the bar and the air cart, for half the cost. PHOTO: CUSSONSMEDIA

JASON MARWOOD

For better efficiency, Jason Marwood and his uncle share ownership of some pieces of plant that aren't used for extended periods of time and aren't time critical.
PHOTO: JASON MARWOOD

LOCATION: Nowingi, Northern Mallee, Victoria

RAINFALL: 250mm (Annual) 110mm (GSR)

SOIL TYPE: Sand

CROPPING AREA: 5,500ha

CROPS GROWN: Wheat, barley, oats, vetch, chickpeas and lupins

AVERAGE WHEAT YIELD: 1.1t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 1

TOTAL MACHINERY INVESTMENT: $2,000,000

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $180,000

Jason Marwood's family is a big believer in segregating the farm while everyone's still young and has lots of energy to grow the business. After separating from his uncles, Jason's father operated his farming business for 17 years and then in 2018, the farming business was split between Jason's siblings, into two farms and a sheep station. Jason runs his farm and his father operates the other enterprises on behalf of his siblings. Prior to implementing the succession plan, the machinery in the farming business was all owned but to 'even things up' the debt associated with the station was paid by the farm. So, with succession costs to take care of and some dry seasons, Jason dropped the annual machinery investment from about $180,000 to $150,000 which matches up with his depreciation costs.

For better efficiency, Jason and his uncle share ownership of some pieces of plant that aren't used for extended periods of time and aren't time critical. For example, they share a roller for legumes. A mother bin is also shared between Jason and his uncle year-in, year-out, which means in the 'off years' Jason doesn't have much grain storage. He is currently considering adding another harvester, either a secondhand machine or using a contractor in the short term who could provide the added benefit of storage facilities. Jason is planning on purchasing a mother bin in time.

While Jason will purchase new machinery, he believes the high capital cost of a new header is hard to justify when two older machines can probably harvest 180 per cent of what one machine can. In addition, he notes buying new doesn't exclude the possibility of having mechanical issues and from the second year, it also requires repairs and maintenance.

New machinery is purchased using chattel mortgages and sometimes Jason will purchase extended warranties to give peace of mind on machines that have previously had reliability issues. He is planning to trade his John Deere R4045 SP boom in either a year before the extended warranty runs out if there is a good deal, or trade it in at the end of the extended warranty and take an extended warranty out again on the new machine.

Jason prefers to stick to one brand of machinery because, as he explains, it is like the iPhone/Android debate; once you know one platform, even if it annoys you a bit, you are reluctant to change the system you are familiar with. He also believes there is added efficiency gained by having one brand – for example, the same oil filter that will fit all the John Deere tractors.

However, before purchasing new machinery Jason will price up other options and if there is a significant price difference, he would consider changing brands. When planning to replace machinery Jason also takes into account if his neighbours are also looking for a trade. He found when he and his neighbour joined forces to purchase similar machines, because there were two sales, John Deere was able to match the opposition's prices.

Jason also considers the value of the Australian dollar when purchasing machinery, looking to purchase machines when the dollar is really high. He believes some machinery is very pricey at the moment which is probably partly why he has been reluctant to change some equipment over.

With more land to manage after purchasing a new farm in 2020, Jason is open to use contractors to ease the pressure in time critical periods. A contractor with a camera sprayer is used for summer spraying and as he is a neighbour to the new farm, it is relatively easy to secure his services.

When Jason first began operating on his own, and with limited mechanical knowledge, he used to pay mechanics to conduct machinery services and any repairs. Now he uses the mechanics to conduct pre-season checks on the header, seeder and baler and after considering the advice, will have a go at fixing the majority of issues, with the mechanics being used to pick up any of the gaps.

	Make & model	Current hours or usage	Hours or usage/ year	Annual average R&M costs	Replacement trigger
Seeding tractor	John Deere RX470 (new demo 2017)	1,600	800	$4,000	Warranty expiration at 5 years (4,000 hours) and technology upgrade. However, because they have a backup tractor, may keep rather than sell.
Chaser bin tractor	John Deere 9520T (secondhand 2006)	14,500	200	$15,000	High machine hours, increasing maintenance costs. Has had an engine rebuild so now can be backup seeding tractor if required.
Third tractor	John Deere 8260R (secondhand 2013)	5,500	500	$5,000	Planning to purchase another loader tractor/ fork lift to save hours on the 8260R. Most likely to add a newer 8260R rather than the tractors listed above.
Sprayer	John Deere R4045 (new 2017)	1,000	400	$5,000	Warranty expiration and technology upgrade to pulsating system. This is the current priority for change.
Harvester	John Deere S670 (new 2014) with S40D front	3,500	700	$40,000	Planning to keep and add another secondhand machine that is the same or use a contractor to run two machines. Then can hold existing machine for another 3 years.
Seeder	John Deere 1830 Air drill (new 2013) with John Deere 1910 aircart (new 2013)	5,000	800	$20,000	Looking to replace with a bar which has better seed placement, lighter weight, and increased size from 18m to 21m. Then would be comfortable to hold for 10 years.
Trucks	Frontliner (secondhand 2006) Lustry BD (new 2011)	14,000	400	$15,000	High machine hours and increasing maintenance costs. Considering adding a secondhand truck, so larger truck would just be used for highway work.
Other significant equipment	Kuhn LSB Baler (secondhand 2010)	5,000	150	$18,000	High machine hours and increasing maintenance costs. Consider changing to a round baler for ease of operation and R&M.

LES DUNN, DUNN PASTORAL COMPANY

The bottom line is the key criteria for Les Dunn when replacing his machinery. He uses a number of tools to remove the emotion from making key investment decisions.
PHOTO: LES DUNN

LOCATION: Rupanyup, Southern Wimmera, Victoria

RAINFALL: 410mm

SOIL TYPE: Loam, clay loam and self-mulching heavy black soils

CROPPING AREA: 2,300ha

CROPS GROWN: Cereals, canola, faba beans and lentils

AVERAGE WHEAT YIELD: 3t/ha

PERMANENT LABOUR UNITS: 2

SEASONAL STAFF: 4

TOTAL MACHINERY INVESTMENT: $2.2M

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $100,000

With a mining management background, it is no surprise that Les Dunn makes machinery purchases based on the economic bottom line. Les uses a number of tools to help him make informed decisions, including being an avid user of risk assessment models to analyse options methodically and take the emotion out of any machinery investment decision. For example, if he was looking at variable rate technology, some of the questions Les would ask are: Is it science supported? Is it commercially developed? Is it economically feasible? With the help of his consultants, these risks are ranked, which Les says helps to raise any potential issues before a purchase is made.

In addition, when purchasing new machinery, Les is mindful of trying to keep his machinery investment to income ratio at 0.7 as a key performance indicator to keep their machinery spending in check. With contractors generally available, he also calculates whether it is worth owning the machine themselves or whether contracting is a better option.

The Dunns have a target of cropping 4,000 hectares within the next five years and so the focus is on land acquisition rather than trading machinery at this particular point in time. For example, Les believes by choosing to operate higher class series 8 tractors and if he is vigilant on maintenance then there is really no reason to change them over in the short term. Basic repairs and maintenance are carried out on farm, while professionals are used for the rest, meaning good service support is a key criteria when making machinery purchases.

Agronomy is also an important factor in determining machinery requirements for the Dunns. An internal review of the business identified they needed to change their approach to early nitrogen application. The initial practice was to wait until they had confidence in the season and if there was rainfall forecast, then nitrogen would be applied. However, now even if it is going to be a dry year, Les believes it is still beneficial to apply nitrogen early. This resulted in purchasing a Bredal spreader in 2018 and adding another team member to manage the early nitrogen application.

As they continue to grow in size, Les uses contractors in what he calls the transition phase where they move from a one plant operation to running two machines. Early in 2020, Les considered upgrading from a tow-behind to a self-propelled (SP) boom, however with no suitable low hour machines available, and a new SP not justifiable, the decision was made to upgrade the tank size and technology to a Goldacres Praire Pro. Les will still use a spray contractor to compliment his boom when required and is considering offering the contractor a certain amount of fixed and contingency work to build that relationship.

In the past Les used a harvest contractor along with their own 10-year-old John Deere 9670, however with the potential for COVID to affect availability, he made the decision to purchase a new header earlier than planned. A key lesson Les has learnt through contractors is that he has the ability to run his machinery for longer than he previously thought. For example, his previous contractor had a header with 4,000 – 5,000 rotor hours that was the same age as the Dunn's, which had only 2,200 rotor hours. As a result, Les has no plans to sell his old header and plans to run two headers separately in the future.

When the economics stack up to replace a machine, Les tends to purchase new rather than a machine with low hours. This is because, as Les says, in a lot of cases there's a reason why they're being sold. Also, sometimes there's not much difference in price between a new versus very low hour machine, so Les prefers to buy new, using equipment finance with annual post-harvest payments over a five or six year loan term.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding and chaser bin tractor	8320R (new 2020)	500-600		$300	Has good capacity and can be used for a range of operations so no plans to upgrade.
Chaser bin and spreading tractor	8295R (new 2010)	7,500	500 – 600	$1,000	No plans to upgrade.
Spray tractor	8245R (new 2016)	1,800	600 – 700	$2,000	If move to an SP, this tractor would be used as a trade.
Sprayer	36m Goldacres 8,500L Prairie Pro TB (new 2020)	15,000ha	15,000ha 230		Upgraded to a larger tank size (8,500L from 6,000L) plus improved technology with sectional and boom height control. Considered an SP however couldn't find suitable secondhand option and new SP wasn't justified.
Harvester 1	John Deere S780 with John Deere 740D front (new 2020)				Purchased new rather than relying on contractors due to COVID impacting availability of machinery (not staff).
Harvester 2	John Deere 9670 (new 2011)	3,000 (engine) 2,200 (rotor)	250 rotor hours	$15,000	No plans to replace at this stage.
Seeder	12m Horwood Bagshaw scaribar with Simplicity 9000 air cart (new 2005)			$6,000	No current need to upgrade as technology works well and has capacity to cover more hectares.
Trucks	Volvo (secondhand 2008) Ford L9000 (secondhand 1993)	700,000km 1.7 million km (engine rebuild at 1.6 million km)	80,000km 10,000km	$5,000 $2,000	
Other significant equipment	30T Finch chaser bin (new 2019) 30T Finch chaser bin (secondhand 2005) Bredal Spreader (new 2018)			$1,000 $1,000	

MARTY AND ANNE COLLINS

While Marty Collins used to run a contractor's header with his own to harvest their lentils, wheat and barley, he has decided with lentils being a high value crop, he is better off running two of his own machines to enable a timely harvest and reduce the risk of weather damage.
PHOTO: CUSSONSMEDIA

LOCATION: Yorketown, Yorke Peninsula, South Australia

RAINFALL: 400mm (Annual) 310mm (GSR)

SOIL TYPE: Alkaline loams to red stony soils

CROPPING AREA: 3,665ha

CROPS GROWN: Wheat, barley and lentils

AVERAGE WHEAT YIELD: 4t/ha

PERMANENT LABOUR UNITS: 5

SEASONAL STAFF: 1

TOTAL MACHINERY INVESTMENT: $818/ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $400,000

After increasing in scale and relying more on staff, Marty Collins has shifted his approach from purchasing secondhand key machinery to predominantly purchasing new for increased reliability, service and ease of operation for staff. However, Marty has also learnt that just because an item has been purchased new, it doesn't mean it won't come with any problems.

When they purchased a new Flexi-Coil 5500 bar in 2016, Marty found it had been incorrectly set-up by the dealer, which resulted in a huge number of issues. Through experience, Marty learned the best way to resolve these issues was to document the problems and any correspondence relating to their resolution. They have changed dealers and while Marty doesn't describe the bar as being 100 per cent reliable, he is happy with its performance and has decided to rebuild the wear parts and hopefully gain another five seasons, rather than selling the bar.

Farm manager Nathan Phasey is mechanically minded and often diagnoses machinery issues early before they become big problems, however with newer machinery requiring computer diagnoses, there is a limit with what they can do on farm. The local dealer is 130 kilometres away and travels to do pre-season checks on the header and bar, with the Collins making the final decision as to who will make what repairs. While Marty doesn't like having to rely on dealers for diagnostics on new technology, he does value the broader experience they have in managing machinery and the increase in fuel efficiency and reliability that new technology offers. In terms of being able to get the help when they need it, Marty notes the importance of maintaining a good relationship with the mechanic and paying their bills promptly.

Marty does have a machinery replacement schedule, however if the right opportunity presents to get a good buy that is going to add efficiency and productivity to the business, then he will purchase ahead of schedule. He also considers when buying a key piece of machinery what it means for the rest of the equipment. For example, Marty knows he can't buy a hew header for efficiency without matching the increased capacity with a bigger chaser bin and more cartage capacity.

For many years after leasing their contractor's farm, the Collins' used the contractor to provide a header in addition to their own, to harvest their lentils, wheat and barley. After the contractor retired following the 2019 season, Marty evaluated the benefits of continuing to use a contractor or whether to run two of their own harvesters. He noted that while in a lean year, the cost of a contractor is much cheaper than a new header and is fully tax deductible. However, with lentils being such a high value crop that are very susceptible to poor weather conditions, the decision was made to purchase an additional header. Another benefit of owning both machines will be the ability to extract yield mapping data.

The biggest value Marty sees in running his own road train is the ability to control more of the grain delivery process. For example, when the truck driver is a member of Marty's staff, he can explain any potential classification issues when the grain is being delivered and instruct the driver to do a re-test whereas a carrier could be more inclined to accept the downgrade and move on to the next load. Additionally, as about 95 per cent of their lentils are held on farm before being delivered to container packers in Adelaide, having their own truck means the Collins can respond quickly to orders at short notice.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding tractor	New Holland T9 505 (new 2017 model but purchased in 2019)	970	500	$2,500	Priority for tractors is to replace seeding tractor at 10,000 hours and then others drop down the list.
Reefinator and chaser bin tractor	Case Steiger 450 (secondhand 2006)	3,324	530	$3,500	High machine hours (6,000) and increasing maintenance costs.
Utility tractor	Case MX 275 (new 2008)	6,300	210	$1,500	Due to small size is currently underutilised but is of more value on farm than being sold. Cash surplus.
Sprayer	48m Hardi Saritor 5500 (new 2018)	1,600	600	$17,000	Depreciation cost is extreme once over 3,000 hours. As is first SP, unsure whether to trade before 3,000 hours or hold.
Harvester 1	Claas 780 (new 2016)	1091 Engine 823 Rotor	363 Engine 274 Rotor	$15,000	High machine hours (2,000 rotor) and increasing maintenance costs.
Harvester 2	Claas 8700 (new 2020)				Purchased to run two headers rather than one owned and one contracted machine. Has more capacity and more user-friendly screens than Claas 780.
Seeder	18 m Flexi-Coil 5500 with 4350 cart (new 2015)	2000	450	$30,000	Increasing maintenance costs. Have decided to rebuild and get another five years rather than sell. Plan to sell the cart and bar as a unit.
Truck	International Eagle with Stoodley R-train trailers (secondhand 2007)	More than 1 million km	Seasonally dependent	Varies	Upgrade from manual to automatic.

Having their own road train allows the Collins to deliver their lentils to Adelaide for container packing at short notice.
PHOTO: CUSSONSMEDIA

MONTY HARDS

Using their contracting business for additional cashflow and to help justify larger machinery purchases has been really useful for Monty Hards and his family.
PHOTO: MONTY HARDS

LOCATION: Serviceton, West Wimmera, Victoria

RAINFALL: 430mm

SOIL TYPE: Sand loam and heavy clay

CROPPING AREA: 3,000ha

CROPS GROWN: Wheat, barley, canola, beans and lupins

AVERAGE WHEAT YIELD: 3t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 2 – 3

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $328/ha (average last three years)

Using their contracting business to add cashflow to expand their farming business has been integral, Monty Hards believes, in getting them to where they are today. Monty's father began contract clay spreading as he was building the business and now they spread on average about 800 hectares annually, a figure that has reduced over time as the family has focused on their own operations.

With a number of predominantly sheep properties owned by absentee owners around them, the Hards also provide contract cropping operations. This is predominantly seeding but on one property, they contract seed, spray and spread. This service is convenient for the customers as it saves them investing in both the capital and the staff to operate the machinery.

Contract seeding has worked particularly well for the Hards because it has predominantly been sowing fodder crops for sheep feed, so they can start contract seeding in early April and get a reasonable proportion of their client's seeding completed before they want to start their own.

However, it has still been a balance to ensure their own business doesn't suffer because of the contracting work. Monty notes he was spending too much time off the farm contracting, especially in summer where one of his staff would be doing all the Hards' summer spraying and fertiliser spreading, while Monty would be busy clay spreading contracting. As a result, the clay contracting business now tends to fluctuate depending on the availability of staff to operate it.

The Hards used to run an old 18m Horwood Bagshaw and a 21m Morris C2, using the older machine for their own work, and running the good machine for contracting, something which Monty said didn't make a lot of sense. In addition, the Hards were trying to run the contracting bar around the clock and the home machine operating during the day. This meant Monty was driving night duty on the contracting machine and then spending the day supporting the home machine, something which wasn't sustainable. As a result, the decision was made to sell both bars and in 2020 the Morris C2 was upgraded to a Morris Quantum with the plan to do a little contract seeding on the side if it fits. Monty was very pleased with the decision, finding running one machine was more efficient for the business than running two. Also, it did work to add in some contract seeding when they had gaps in their program. For example, the beans, vetch and canola were sown first and then some contract seeding was completed before starting to sow their own cereals. Monty notes though, without the contracting work to justify it, they would never have taken that big jump into a new seeding bar.

Similarly, the Hards ran two older secondhand headers for a couple of seasons because of the significant cost to move into a new machine. However, after calculating the pre-season service cost of both machines was going to be very similar in cost to a scheduled payment of a new machine, in 2013 they upgraded to run one larger header. Aside from the ease in logistics in running one header rather than two, the capacity was increased from a 9m to a 12m front and the horsepower also jumped from 300 to 500.

Now the Hards tend to purchase key machinery new to keep reliability, using hire-purchase agreements with five year terms for larger items such as a header and three year terms for smaller items. Redundant machinery is generally traded or sold privately rather than retained.

After using cartage contractors in conjunction with their own prime mover and single trailer, with a biggest harvest coming in 2016, the Hards purchased a second truck to ensure the grain could be carted promptly to local silos.

Adding another truck and a bigger chaser bin made the process of getting the grain out of the paddock much more efficient.

Cartage contractors are used to transport fertiliser from port, because the intention wasn't to have the trucks operating all year. While Monty says it's an additional cost, by the time the truck is fuelled, maintained and a drivers wages paid, it's not super expensive, however he would rather have his staff focused on more on-farm activities.

	Make & model	Current hours or usage	Hours or usage/year	Replacement trigger
Seeder and clay delving tractor	CAT MT 865C (new 2015)	57,44	700	Decreasing reliability (8,000 – 10,000 hours). Replaced previous CAT at 14,000 hours before it had reliability issues.
Claying tractor	CAT MT 865C (new 2015)	6,868	400	Decreasing reliability (8,000 – 10,000 hours).
Chaser bin and spreading tractor	New Holland T8.410 (new 2018)	1,644	800	Decreasing reliability.
Clay spreading tractor	New Holland T9.670 (new 2020)			High hours / decreasing reliability.
Sprayer	36m Hardi Saritor (new 2018)	1,850	630	Upgraded from a TB for increased reliability, so unsure when will replace.
Harvester	New Holland CR 9.90 (new 2017)	1,010 (rotor)	336	Change over cost and reliability.
Seeder	21m Morris Quantum (new 2020) with Morris 9450 Cart (new 2016)	700	700	Sold two bars and replaced with one bar for better logistics. Kept the Morris cart from the previous Morris bar.
Trucks	Iveco truck (secondhand 2009) with a Freightmaster trailer Kenworth truck (secondhand 2016) with a Stoodley trailer.	Both more than 500,000km	Varies seasonally	No plans to replace.
Other significant equipment	Cooolamon Chaser Bin 36T			Long term implement not changed often.
	3 x JNR 4200E Laser Buckets			Long term implement not changed often.
	AgriSpread 2150T			Long term implement not changed often.
	Mower conditioner (2018)		9,000ha	Purchased when had frosted wheat.

SIMON BALLINGER, BALLINGER BROTHERS

Simon Ballinger closely monitors his machinery investment to income ratio, aiming for an average 5-year ratio of under one. PHOTO: CUSSONSMEDIA

LOCATION: **Wolesley, Upper Southeast South Australia**

RAINFALL: **420mm (Annual) 320mm (GSR)**

SOIL TYPE: **Self mulching clay and clay loam**

CROPPING AREA: **2,400ha**

CROPS GROWN: **Wheat, beans, canola, durum and vetch hay**

AVERAGE WHEAT YIELD: **4t/ha**

PERMANENT LABOUR UNITS: **2.7**

SEASONAL STAFF: **Family**

TOTAL MACHINERY INVESTMENT: **$890/cropped ha**

Using benchmarking to understand business performance is very valuable for Simon Ballinger. One of the metrics he monitors is machinery investment to income ratio, with the goal of having it below one (on a 5 year average). However, Simon acknowledges that with a poor season where income is adversely affected, the value can blow out pretty quickly. For example, his four-year machinery investment average is 0.6 which he rates as excellent, however the five-year average is 1.2 because of a bad season five years ago. Simon notes the last four years have been quite profitable with good seasons and good prices, so if he made key decisions based on those years alone, he could potentially make some poor decisions.

The Ballingers tend to use chattel mortgages to buy new equipment, especially the harvester, seeding and spraying tractors, while smaller items are more likely to be purchased secondhand. The general principle is to replace machinery before it has major mechanical issues, meaning they have reliable gear and focus on the machinery repayment cost, rather than additional maintenance costs. Simon notes low interest rates and good seasons have helped markedly in keeping them in the game of being able to change over to new.

The farm's advisory board has developed a machinery replacement plan and any decisions to upgrade or replace equipment is agreed upon at that level. However, that strategy can change if there is limited availability of stock or if good buying opportunities arise. Generally, the Ballingers replace key spraying and seeding tractors at between 5,000 to 6,000 hours to reduce the likelihood of breakdowns affecting the timeliness of their operations. Headers are planned for replacement at between 1,200 to 1,500 hours with Simon monitoring the changeover cost per rotor hour. However, the last three headers have been changed over every two seasons because a good opportunity presented itself.

Simon finds it really difficult to know when the right time is to change over his header. He knows of a consultant who has clients in the top 20 per cent that buy their headers at 2,500 hours and run them until they die, others who buy them at 1,200 to 1,500 hours and run them to 2,500 – 3,000 hours, and others like him who buy new and trade them in at 1,200 – 1,500 hours. Therefore, Simon surmises it is up to the individual to devise a plan that best suits their operation. In this business he views annual repayments as a fixed cost and with harvest taking between 400 to 500 hours over six to seven weeks, he figures that it makes sense to switch to a new, reliable machine which minimises the potential for downtime if it has similar repayments to the original header. However, if interest rates were at 10 per cent, Simon notes a very different approach would be used.

The Ballingers run a trail-behind Hardi boom rather than a self-propelled sprayer and after running the numbers numerous times on changing to a SP, Simon finds the depreciation costs of running a SP hard to swallow. In addition, if they bought an SP, it would mean moving to 3m centres which would then mean upgrading the other tractors to also run on the same spacing.

With Simon's grandfather starting the original New Holland dealership in Bordertown, 15km away, the Ballingers have a very good relationship with the dealer.

While minor repairs and maintenance are conducted by Simon and his team, with their key focus on timeliness of operations, they do not have a strong mechanical or engineering skillset, and so are happy to outsource larger mechanical jobs to the experts.

Contractors are used for hay which Simon says can be frustrating because they are at the end of a customer run, but with limited hay it doesn't currently make sense to purchase their own equipment. A SP contractor is used to desiccate canola and to help with the canola harvest timeliness.

	Make & model	Current hours or usage	Hours or usage/year	Replacement trigger
Seeding, spreading & chaser tractor	New Holland T8435 FWA (new 2018)	1,100	600 – 700	Replaced an articulated tractor without a PTO and which could only be used for seeding. High hours > 5,000.
Spraying tractor	New Holland T7290 (new 2018)	2,300	700 – 800	High hours > 5,000.
Mower conditioner tractor	New Holland T7235 FEL (new 2020)	250	400	High hours > 5,000 & cash surplus.
Sprayer	36 m Hardi 8,500 L (new 2017)		600 – 700	Expecting to be able to keep for another 5 years before upgrading. Not sure if it will be a TB or a SP, because of high depreciation costs with SP.
Seeding	12m Morris Quantum (new 2018) with Simplicity 9,000 L bin	4,800ha (two seasons)	2400ha	Expecting to last 10 years.
Harvester	New Holland CR990 (new 2018)	1,100	400 – 500	Changed in 2020 based on a policy of changing between 1,200-1,500 hours because of low interest rates, opportunity and maintaining repayments. New header is a class 9 (upgraded from class 8) with a Harrington Seed Destructor.
Trucks	Freightliner (secondhand 2007)	1.1 million km	10,000 – 20,000km	

According to their machinery replacement schedule, headers are replaced every 1,200 – 1,500 hours but the last three headers have been replaced after two seasons because of opportunity, low interest rates and good seasons. PHOTO: CUSSONSMEDIA

TASMAN FITZGERALD, GJ AND CA FITZGERALD

Tasman Fitzgerald and his family use an advisory board with an independent chair to guide strategic business direction, including machinery purchase decisions.
PHOTO: TASMAN FITZGERALD

LOCATION: Kyancutta, Upper Eyre Peninsula, South Australia

RAINFALL: 300mm (Annual)

SOIL TYPES: Sandy loam/grey calcareous

CROPPING AREA: 5,000ha

CROPS GROWN: Wheat, barley, peas and vetch

AVERAGE WHEAT YIELD: 1.4t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 2

TOTAL MACHINERY INVESTMENT: $440/ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: 10% of revenue

Tasman Fitzgerald came home to the farm at Kyancutta four years ago and now with plans for his brother to join the business with their parents, they are using an advisory board to assist in making key decisions, including machinery purchases. Their consultant is the independent chair and the family draws on their accountant, agronomist, financial planner, lawyer, and banker as required. One of the key tasks of this board is to develop a more detailed machinery replacement strategy, which clearly outlines the current drivers for the key machinery for their operation; the main tractor, seeder bar, harvester and boom spray.

Currently, the Fitzgeralds invest 10 per cent of revenue per year in machinery replacement and look to keep up-to-date with technology on the main pieces of equipment. Finance is used for key, larger items and then cash reserves are used for the other purchases. Beyond that, reliability is a key consideration to make sure operations can be completed in a timely manner. For example, for technology reasons the bar was upgraded to a Seed Hawk to improve seed depth placement, while a Hardi Saritor SP was purchased so that two boom sprays could complete spraying in a timelier manner.

Most key machinery is purchased new for better depreciation values and for the included warranty. As Tasman says, breakdowns are such a cost to production and efficiency, so they aim to hold good, reliable machinery. Part of that strategy involves using their local dealers to go over the seeding tractor and header to identify what repairs and maintenance is required. The Fitzgeralds ultimately decide what will be fixed and generally will try to do as much of it as possible before reverting to the dealer for bigger and more complicated jobs. Sometimes they will choose to run the machine a bit longer but will carry the necessary parts on farm, so the issue can be quickly rectified once it arises. Tasman estimates repairs and maintenance costs to be 5 per cent on revenue across their machinery.

The Fitzgeralds like to run John Deere tractors and New Holland headers for ease of management, but when buying a new item, due to its significant cost, they give each of their local dealers the opportunity to quote for the business. The pros and cons of each option will then be debated at the board meetings.

While Tasman says they tend to run one larger unit rather than two smaller units, which are more difficult to staff, in 2019 the Fitzgeralds bought a secondhand Gleaner header to use with their New Holland. This allowed them to harvest field peas and barley in different areas of the farm at the same time, and having the Gleaner header to harvest the field peas meant the risk of breakdown of their main header was reduced.

Contractors are used by the Fitzgeralds for hay baling, however in 2019 they purchased a hay cutter out of cash flow, so they can control part of the hay making process. While Tasman acknowledges they probably don't have enough area to justify the cutter, being able to use it to contract cut neighbours frosted crops has helped to offset the purchase cost. If the Fitzgeralds decide to do more hay, then Tasman doesn't rule out purchasing a hay baler, however he is very cautious not to over capitalise.

	Make & model	Current hours or usage	Hours or usage/year	Replacement trigger
Seeding tractor	John Deere 9510R (new 2014)	3,734	500 – 600	Look to trade at 5,000 – 6,000 hours to keep machinery value on farm in check. Likely to coincide with needing a larger air seeder.
Boomspray & chaser bin tractor	John Deere 8320R (new 2012)	7,500	350	Hold rather than replace and instead trade seeding tractor.
Stone rolling tractor	John Deere	10,000	200	Hold rather than replace and instead trade seeding tractor.
Sprayer	Hardi Saritor SP (new 2019) Hardi Commander 7000 TB (2010)	550 6,000hrs	400 300 – 400	No current plans to replace within 5 years. No plans to replace – will keep as a backup to the SP. Because of the SP, has reduced average hours from 700 – 800 hours annually to 300 – 400 hours.
Harvesters	New Holland 9090 (new 2014) Gleaner (secondhand)	2,100 (engine) 1,900 (rotor hours) 2,825 (engine) 2,180 (rotor hours)	250 (rotor) 250 – 300 (rotor)	Deal at the time and reduction in reliability. Used to be every 5 years, now possibly holding longer. Considering replacing with reduced machinery repayments (more cash flow) and likely increased maintenance costs. Bought to increase efficiency and save bigger machine from harvesting peas. Won't replace.
Seeder	24m Seed Hawk	500 – 600		Seeder was upgraded for more accurate seed placement. Next replacement will be bigger bar.
Trucks	Kenworth (secondhand 2006) Western Star (secondhand 2019)	More than 1 million km 750,000km		No plans to replace within next 10 years.
Any other significant machinery	Manitou Telehandler (new 2017)	700		

The Fitzgeralds purchased a new Hardi Saritor SP to use in conjunction with their Hardi Commander trail behind to make spray applications more timely. PHOTO: TASMAN FITZGERALD

TIM HAUSLER, BATCHICA WEST FARMS

For key pieces of machinery, Tim Hausler aims to pay cash for at least half of the changeover price in a principal payment and then uses chattel mortgages to keep low, equal payments of around $25,000 over four years.
PHOTO: TIM HAUSLER

LOCATION: Warracknabeal, Northern Wimmera, Victoria

RAINFALL: 392mm (Annual), 264mm (GSR)

SOIL TYPE: Mixed

CROPPING AREA: 2,800ha

CROPS GROWN: Wheat, barley, canola, lentils, vetch hay

AVERAGE WHEAT YIELD: 3.54t/ha

PERMANENT LABOUR UNITS: 2.5

SEASONAL STAFF: 1

TOTAL MACHINERY INVESTMENT: $3 million

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $270,000

Despite nearly doubling his farm size in the last ten years, Tim Hausler's farm is still a single-plant farm. However, each piece of machinery he operates has to be bigger for the system to work. While Tim is happy to carry land debt, he prefers to keep machinery debt low.

For the key pieces of machinery, Tim aims to pay cash for at least half the changeover price in a principal payment and then uses chattel mortgages to keep low, equal payments of around $25,000 over four years. This coincides with the end of the machine's time on the farm before it is changed over. This strategy minimises the risk of breakdowns at critical times and means Tim receives a good changeover price.

To ensure cash is available to facilitate Tim's approach, he uses Farm Management Deposits (FMD) in good seasons to put money aside. Tim acknowledges this strategy has preferable taxation benefits, however those funds could be used to reduce land debt. However, with interest rates so low, having the money put aside gives Tim security knowing that both his current and future machinery finance commitments can be met, and other potential acquisitions could be made, even in tough seasonal conditions.

While Tim prefers to purchase key tractors, tow behind boomsprays, headers and seeders as new equipment, if he decides to change over to a self-propelled sprayer (SP), he is tempted to purchase a secondhand machine with low hours as part of the transition into a new machine. At this stage, large capacity 8,500L trailing boomsprays work for them with their large paddocks. If they do shift to an SP, Tim notes the individual nozzle technology would be a good thing, however he is just not sure if the overall gain is worth the expense.

A fair proportion of the cropping program is lentils, so to reduce the risk of weather damage and costly downgrades, Tim uses a contractor to harvest about 40 per cent of the lentil program. The contractor is a farmer from the south west Wimmera, whose crops aren't mature enough to be harvested when Tim's are, so it works well for him to assist Tim to break the back of the lentil harvest over a week.

After experiencing the logistical difficulties of direct-heading a heavy canola crop in 2016, Tim now uses a contractor to windrow canola in big biomass years. Both of these contractors are contacts Tim met through overseas farm tours, a significant bonus of those experiences, according to Tim.

Tim's repair and maintenance strategy revolves around 'not breaking the machines in the first place', and so uses a dealer to service key pieces of equipment. In addition, because he only keeps his critical machinery for four years, Tim believes the chances of something going wrong are very low.

	Make & model	Current hours	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding, roller and mother bin tractor	John Deere 9420R (new 2017)	1,393	350	$1,000	Plan to hold for about 8 years and then change for better fuel efficiency and improvements in technology.
Spraying and chaser bin tractor	John Deere 8R 250 (new 2020)		600 – 700		Replaced a JD 7230R because of improved horsepower. Expect to replace in 4 – 5 years.
Spreading tractor	John Deere 7930 (new 2009)	5,026		$1,000	Replace in a couple of years because it will be in the interim period with the other tractors. Will consider low hours secondhand.
Sprayer	Hardi Commander 8500 (new 2017)	1,800	600	$1,000	Plan to replace in 2 years to avoid breakdowns.
Harvester	John Deere S780 (new 2018)	640	350	$7,000	Expect to replace in 4 years.
Seeder	John Deere 15m 1830 with 1910 bin (new 2013)		300	$1,500	Upgraded to a new, wider 18m JD 1830 bar for 2021 for greater ha/hr. Also want a mounted shifter for improved filling.
Trucks	Mack Vision (secondhand 2005) Stoodley B-Double trailers B trailer (new 2013)		30,000km	$10,000 total	May keep as a 2nd truck and buy a newer, higher horsepower truck in about 2 – 3 years.
	A trailer (new 2019)				
Other significant equipment	JCB Agri (new 2019)		150		Possibly keep for 5 – 6 years.

CASE STUDIES: WESTERN REGION

PHOTO: BEN WHITE

EVAN HALL, KUNMALLUP PASTORAL CO

With strong mechanical skills and a preference to keep funds in the business rather than tied up in machinery capital, the team at 'Kunmallup' prefers to purchase secondhand machinery. However, with limited stock available, Evan Hall and broader family purchased a new John Deere 9520R in 2020. PHOTO: CUSSONSMEDIA

LOCATION: Woodanilling, Great Southern, Western Australia

ANNUAL RAINFALL: 425mm

SOIL TYPE: Sand through to heavy loam

CROPPING AREA: 4,000ha

CROPS GROWN: Canola, wheat, barley, oats, hay and lupins

AVERAGE WHEAT YIELD: 2.5t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 3

TOTAL MACHINERY INVESTMENT: $300/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $150,000

The modern-day Thomson family farm 'Kunmallup' is a unique farming operation, comprised of three families; Russel and Margaret Thomson, son-in-law Evan Hall who runs the cropping, and daughter Bindi Murray, who runs the sheep operation.

Traditionally they have operated the farm with an older plant list, preferring to keep the funds in the business rather than tied up in rapidly depreciating assets. However, the purchase of more land and expansion of the cropping operation over the last five years has driven the need to upgrade some plant. Matching the plant and equipment to the size of the program means the cropping program is completed in a timely manner. With multiple blocks and a mix of permanent and seasonal staff, keeping the operation simple as they expand is important.

At 'Kunmallup', each family sits on the farm management group board and when purchasing big ticket items, a business proposal is taken to the board for approval. This ensures all parties are happy and in agreeance with the purchase. In addition, the farm's accountant is occasionally consulted when purchasing machinery, mostly for tax planning purposes.

The increasing scale and complexity of the cropping program has driven a need for reliability, particularly at seeding. Relying on a one-unit plant at seeding, which includes a 14m Ausplow DBS bar, a 9,000L Ausplow cart and a 36m John Deere self-propelled (SP) sprayer, means breakdowns can be costly. A good example of this occurred in 2018 when a tractor had to be hired to finish seeding due to a major breakdown. Evan Hall believes while a two-unit plant at seeding could be beneficial, he feels it is better to employ additional staff to run one unit for longer rather than purchasing another machine which then requires additional support and logistics. Instead, Evan would consider upgrading the seeding bar to increase capacity and improve technology by adding section control and on-the-go calibration. In contrast, at harvest, two John Deere headers are used, and while three headers were used one year, they found two were more efficient.

Generally, machinery is purchased secondhand, however with limited availability of secondhand tractors, a new John Deere 9520R tractor was purchased in 2020. The decision to purchase new was driven by the need for a reliable tractor, knowing if it had to be replaced mid-season, a secondhand one may have not been available. Despite this, Evan believes there's good buying to be had when purchasing machinery secondhand, particularly with headers and sprayers. When purchasing secondhand, Evan looks for moderate hours, although he is not opposed to higher hours, often sourcing secondhand machinery online. The family has always purchased John Deere tractors and headers, which is complemented by having a John Deere dealership close by in Wagin.

While some farmers avoid running predominantly secondhand machinery, both Russel Thomson and Evan have strong mechanical skills and they also have a mechanic on staff, so most repairs and maintenance are conducted on farm, keeping costs low.

To avoid falling behind, Evan will occasionally use local contractors if required to assist with spraying, hay baling, swathing and grain cartage. They did some contract seeding this year for a neighbour, which although opportunistic, did provide some good supplementary income, however it's not something he will seek to do every year.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding tractor	John Deere 9520R (new 2020)	670	670	$500	Increasing maintenance costs and reduced reliability of previous tractor.
Spreading, chaser bin tractor	John Deere 8400 (secondhand, 1998)	15,000	400	$2,000	Will look to upgrade one of the 8400's to newer model with more horsepower and keep existing tractor because they are of more value on farm than selling.
Spreading, chaser bin, nurse tank for boomspray	John Deere 8400 (secondhand 1998)	15,000	400	$2,000	
Sprayer	36m John Deere 4930 (secondhand 3,500 hours)	6,700	800	$3,000	High machine hours (8,000).
Harvesters	John Deere 9760 STS with 936D front (secondhand 2006)	4,350	Combined 847	$3,000 each	Considering a Seed Destructor, otherwise wouldn't change.
	John Deere 9760 STS with 936D front (secondhand 2004)	5,166	611 rotor		
Seeder	Ausplow 14m DBS 260 – 54 (secondhand 2005) with Ausplow 9,000 L TBH multistream bin (secondhand, 2000)	15 years old	5,000ha annually	$1,000	Upgrade technology i.e. section and size in time.
Trucks	FH16 Volvo (secondhand, 2010) NH12 Volvo (secondhand, 2000) 2x grain pocket road train tippers (secondhand, 2005 and 1990's) 1x B Double hay trailer (secondhand, 1989)	1 million km 1.6 million km	Together do 90,000km	$10,000	Increasing maintenance costs.
Other significant equipment	Self-propelled hay mower/swather (secondhand, 2007) Bale stacker (secondhand)	4,000	400	$1,000	Upgrade the front only for increased capacity.

GARY LANG

Gary Lang believes your investment in machinery should equal the size of your operation, and whilst the size of his operation might call for a two-unit set-up, he manages to run it with one. This is achieved by spreading his seeding program over seven to eight weeks, primarily to reduce the risk of frost damage, which is common in his area.
PHOTO: CUSSONSMEDIA

LOCATION: Wickepin, Upper Great Southern, Western Australia

RAINFALL: 380mm

SOIL TYPE: Mixed

CROPPING AREA: 5,000ha

CROPS GROWN: Wheat, barley, canola, lupins and oats

AVERAGE WHEAT YIELD: 2.4t/ha

PERMANENT LABOUR UNITS: 3

SEASONAL STAFF: 1

TOTAL MACHINERY INVESTMENT: $2,458,986

ANNUAL MACHINERY REPLACEMENT INVESTMENT: 10 – 15%

Gary Lang has always invested in land and purchased equipment appropriate to run it, which over the years has allowed him to pay off his machinery and farm debt. Traditionally, Gary has replaced his main machinery including tractor, sprayer and header at 5,000 hours (every 4 – 5 years), typically purchasing new. However, with the prospect of his children returning to the farm unlikely, Gary made the decision seven years ago that 2023 would be the end of his farming career. Consequently, he has been strategic with recent purchases to ensure he will have maximised the use of his current machinery by 2023. This led to the earlier than planned purchase of a header in 2019, knowing by 2023 it would be at an ideal age to sell without losing too much value. Whilst his main plant is upgraded regularly, for the last 12 seasons Gary has used the same air seeder bin as it's simple to use and upgrading hasn't offered any improvement in technology. He did consider upgrading to a bigger bin three years ago to improve productivity, but instead decided to invest in a better system to fill the seeder, so inexperienced seasonal workers could load up without assistance.

Gary operates his farm with the philosophy that your investment in machinery should equal the size of your operation, and whilst the size of his operation might call for a two-unit set-up, he manages to run it with one. This is achieved by spreading his seeding program over seven to eight weeks, primarily to reduce the risk of frost damage, which is common in his area. This has aided Gary in terms of how much plant he has to buy to run his business, combined with running mostly near new machinery which offers reliability and enables him to get more productivity out of one unit rather than running two. However, if Gary didn't have such a big frost risk, he notes it would be more profitable to run two seeders. Operating a one-unit controlled traffic system means all of Gary's machinery matches, therefore he runs a 12m DBS bar, a 36m Nitro 6333 self-propelled (SP) sprayer and a 12m front New Holland header.

When looking to purchase machinery Gary primarily seeks advice from his farm consultant and although he often has a preference, is open to changing brands and will shop around for the best deal. He rarely keeps in contact with dealerships, preferring to make contact only when he needs to replace his machinery.

Being a progressive farmer, Gary is open to learning new skills, particularly to improve profitability. He acknowledges a business management course he did 25 years ago armed him with valuable negotiating skills, which he still uses when purchasing and trading machinery.

With majority of Gary's time spent running the business, he has three permanent staff. One is a boiler maker by trade and has strong mechanical skills, and so most of the repairs and maintenance are done in-house. However, if a technical or major repair is required, he has a preferred dealership mechanic he calls on.

Gary doesn't see the value in purchasing a new big truck, therefore he relies on a contractor to cart his lime, fertiliser and some grain. Lacking a second tractor, Gary also uses a reliable, long-term local contractor to spread his fertiliser.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding and chaser bin tractor	New Holland 8435 (new 2020)	800	1,100 – 1,300	$5,359*	High machine hours (< 5,000 hrs), replaced every 5 years.
Sprayer	Nitro 6333 boom width 36m (new 2019)	1,600	1,000	$9,305	High machine hours (< 5,000 hrs), replaced every 5 years.
Harvester	New Holland 8.90 comb width 12m (new 2019)	700	700	$6,296	High machine hours (< 2,500 hrs), replaced every 4 years.
Seeder	Simplicity air seeder 13,000L (new 2012)	12 years	5000ha/yr	$11,000 80% of this is consumables (points)	Increased capacity and improved technology.
	12m DBS bar (new 2018)	3 years		$9,000 Mostly upgrades	Upgraded previous machine because of increasing repairs and maintenance costs.
Trucks	Intereagle prime mover (secondhand 2017)	1.4 million km	15,000km/yr	$14,000	Used for on-farm cartage and taking grain into silos, therefore could never justify a new truck.

* Average R&M cost over the last 5 years of the previous machine

JESSIE DAVIS, EL DIXON AND SON

Murray Dixon and Jessie Davis are now focusing on maintaining reliability and preventing major machinery breakdowns. As part of that strategy, they are planning to change over a major piece of equipment every five years, which commenced with the purchase of a secondhand 2011 John Deere 9770 harvester in 2019.
PHOTO: CUSSONSMEDIA

LOCATION: Narembeen, Western Australia

RAINFALL: 300mm (Annual) 200mm (GSR)

SOIL TYPE: Mixed

CROPPING AREA: 4,000ha

CROPS GROWN: Wheat, barley, oats and lupins

AVERAGE WHEAT YIELD: 1.5t/ha

PERMANENT LABOUR UNITS: 2

SEASONAL STAFF: 1

TOTAL MACHINERY INVESTMENT: $212/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: 1% depreciation as a percentage of turnover

Without a succession plan in place during the early 2000's, selling the family farm seemed to be the best option. However, Jessie Davis is thankful the farm didn't sell while she and her sister were at boarding school. Jessie went on to study agricultural business, returning to the farm in 2014 with her parents, Murray and Vicky Dixon and in 2021 her husband Trent joined the business.

In 2013 the family decided not to renew a cropping lease and so their cropping area halved from 8,900 hectares to 4,000 hectares. Jessie acknowledges this has left them with high maintenance costs and an overcapitalisation of machinery. Through a change in strategy and management, Jessie and her family are now focusing on maintaining reliability and preventing major machinery breakdowns. As part of that strategy, they are planning to change over a major piece of equipment every five years, which commenced with the purchase of a secondhand 2011 John Deere 9770 harvester in 2019. The sprayer is planned for replacement in the next five years and the seeder following that.

Jessie and her family have budgets set, so if a good deal presents itself, they are ready to purchase. They look to buy secondhand machinery with low hours that is easily maintainable and keep in regular contact with their local dealership to identify potential purchases. They only run John Deere tractors and harvesters, and aim to replace them with similar models that use the same parts and consumables to prevent wastage. Running a controlled traffic system with a 15m (50 foot) DBS bar, 15m spreader and 45m Sonic boomspray, Jessie notes this limits their ability to purchase a self-propelled (SP) sprayer because there are limited 15m models available.

Also, they rely heavily on the second tractor to pull the boom, spreader and chaser bin and currently see more value in having a second multiple use tractor than an SP. However, this philosophy may change when the sprayer is upgraded in the next five years.

With Murray having strong mechanical skills, the family is open to modifying existing plant, particularly if new equipment doesn't offer advances in technology. A good example of this is the plan to completely rebuild the DBS bar, offering a cost saving of $400,000 compared to buying new, which will free up money to invest in other machinery or pay down farm debt.

Murray conducts most of the repairs and maintenance himself on farm however if a major breakdown occurs, particularly an electrical one, he will use the dealership mechanic with technical expertise. As Jess and Trent have minimal experience with repairs and maintenance, they expect to upskill and may rely on mechanics more in the future.

Despite originally planning to buy a new truck, Jess and her family purchased a secondhand custom made Hitachi Canon clay spreader and trailer in 2019. This was because they believed they will get greater benefit by focusing on soil improvement, and if they need additional help carting grain, they can hire a contractor relatively easily. The plan is to supplement farm income by contract spreading over summer.

With the exception of fertiliser cartage, Jess and her family don't use contractors, however in good seasons, for timeliness reasons, they will use a contractor in addition to their own truck to cart grain at harvest.

	Make & model	Current hours or usage	Hours or usage/ year	Annual average R&M costs	Replacement trigger
Seeding and deep ripping tractor	John Deere 9420 (new 2005)	10,000	1,000	$3,500	Major breakdown, upgrade to something larger with two tracks rather than one.
Sprayer and chaser bin tractor	John Deere 8530 (new 2008)	6,500	550	$1,700	Major breakdown, high hours and a reduction in timeliness.
Sprayer	45m Sonic Boom 7,000L (new 2005)	7,000	460	$5,000	Increasing cost for repairs and maintenance. Most likely to be the next key item replaced with the second tractor.
Harvester	15m John Deere 9770 (secondhand 2011)	4,500 (4,000 hrs when purchased in 2019)	400	$10,000	Replaced old header because of increasing repairs and maintenance and to reduce grain loss from the back of header.
Seeder	15m DBS Case cart with a liquid cart (2005)	6,000	300	$4,000	Repairs and maintenance, improvements in technology.
Deep ripper	Gessner (1995)	1,500	50	$1,000	New technology, this system is simple and efficient.
Trucks	Louisville with 35T trailer (1987 secondhand)	1.05 million km	5,000km	$3,000	Scheduled to be replaced to take the place of older farm trucks which no longer work.
Other significant equipment	Clay spreader with custom bowl (purchased secondhand 2019) Excavator Trailer to cart spreading equipment (purchased secondhand 2019) John Deere mower (1996)	17,000	1,000	$1,000	Once the farm is complete or contract business is ready to sell.

PETER, CAROLYN AND ALEX REID

Peter Reid and his family makes machinery investments that increase his efficiency and productivity without over capitalising and jeopardising expansion plans.
PHOTO: ANDREW SMITH

LOCATION: Boyup Brook, South West Western Australia

RAINFALL: 615mm

SOIL TYPE: Forest gravel

CROPPING AREA: 1,100ha

CROPS GROWN: Barley, canola and oats

AVERAGE BARLEY YIELD: 4.3t/ha

PERMANENT LABOUR UNITS: 2

SEASONAL STAFF: 0

TOTAL MACHINERY INVESTMENT: $800,000

ANNUAL MACHINERY REPLACEMENT INVESTMENT: Between $100,000 – $200,000

Traditionally, the Reid family's farming enterprise has been livestock dominant, however over the last 15 years they have increased their cropping program and focused on upgrading machinery technology. For example, in 2017 Peter Reid says they purchased a new, larger Hardy 6,000L trail behind boom spray with section and auto height control. They also purchased a new T7250 New Holland tractor to pull the boom and spread fertiliser.

The Reids are forward planners and have a machinery replacement schedule, which focuses on purchasing machinery to meet future rather than present needs. With more family members planning on returning to the farm, the Reids are continuing their expansion plans and so machinery purchases need to match their increasing scale. A good example of this is when Peter purchased a 7T super spreader 20 years ago instead of a 4.5T spreader. At the time it was far too big for his needs, however with the expansion of the cropping program, the larger spreader was more efficient. It increased productivity and saved time without the need for replacing the machine as expansion occurred.

However, Peter is committed to not over capitalising on his machinery and will buy secondhand machinery that meets operational requirements while not limiting so his ability to expand because of investing too heavily in machinery investments. The Reids are also mindful of utilising tax advantages when making purchasing decisions.

The Reids are not opposed to upgrading equipment earlier, particularly if a sought-after piece of machinery becomes available sooner and it makes sense financially. They are not bound to buying new or used, or a particular brand of machinery and instead purchases are guided by the technology on offer. For example, Peter upgraded to a new Morris 9300 air cart because it had variable rate control and a liquid system, giving more flexibility in applying fertilisers, fungicides and wetters. In comparison, they didn't believe there was any additional technology offered by buying a new seeding tractor, so they opted to purchase a used 2005 Case STX Steiger with 2000 hours. Due to the amount of work carried out by the sprayer and spraying tractor (also used to spread fertiliser), the Reids will probably purchase these new.

The Reids operate a one-unit seeding system, consisting of an 11m bar and a 24m trail behind sprayer and was considering whether to purchase one large harvester or run two machines to harvest 300 tonnes per day. Peter concluded that purchasing a big header wasn't justified financially for his operation, so he opted to buy a second medium sized header for $90,000 rather than spending $750,000 on a new one. This decision gave flexibility as well as capacity as different crops could be harvested simultaneously on different farm blocks.

Whilst most operations are carried out using his own machinery, when the need arises Peter calls upon the help of contractors. For late season spraying he will use a SP spray contractor as it knocks down less crop than his trail-behind sprayer, which Peter estimates knocks down about five per cent of his crop. However, finding SP contractors can be difficult so Peter is considering purchasing a secondhand SP under 3,000 hours, possibly in a group with two other farmers for in-crop spraying.

While many SP owners initially intend to mainly use the trail-behind instead of the SP, wheatbelt friends tell Peter it is the tow-behind that gets left in the shed. However, as conditions can get very wet in Boyup Brook, Peter believes the trail-behind boom with its better flotation, will still be an important piece of equipment.

Basic repairs and maintenance to the sprayer, bar and air cart are carried out on farm by Peter and his staff, however he chooses to get newer tractors and harvesters, which are more technical to fix, serviced by qualified specialist mechanics.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Seeding tractor	Case Steiger STX (secondhand 2005)	2,400	220 – 225	$3,000	Replaced older tractor so it has hydraulic flow to run variable rate and the liquid system. Also, older tractor needed new tyres which would cost more than the tractor.
Spreader and spraying tractor	New Holland T-7250 FWA (new 2016)	3,000	750 – 1,000	$6,000	Higher hours (5,000 – 6,000 hours).
Utility tractor	John Deere 6430 (new 2012)	4,200	600	$4,000	Higher hours or not fit for purpose i.e. can't pull larger spreader
Sprayer	Hardi 6,000L Trail behind (new 2016)	2,500	600	$1,000	Contract spraying costs and availability, considering purchasing a secondhand SP sprayer for in-crop spraying, which could also be used to contract spray. Will buy a wider boom.
Seeder	11m Morris Concept bar (2014) with 9300 Series Morris Air Cart (new 2019)	1,800 500	225	$4,000 $1,000	Planning to upgrade the technology of the bar so it has hydraulic tynes and is 12m. Will consider secondhand and replacing the bushes. Upgraded for variable rate and to run liquids.
Harvesters	Case IH 2366 (secondhand 2004) Case IH 2377 (secondhand 2010)	4,100 2,500	400 – 450 between both machines	$15,000 – 20,000 between both	Run Case because they are a basic machine to operate. Replacement triggers are size, age, replacement costs, advice from neighbours, advice from accountant, needs to be secondhand.
Trucks	Mitsubishi Fuso (secondhand 2019)	288,000km	20,000km	$4,000	High kilometres, not fit for purpose. i.e. not enough payload.
Other significant equipment	7T super spreader	5,000	300	$2,000	Upgrade to increase capacity.

REECE CURWEN, TOORAWEENAH PASTORAL COMPANY

Reece Curwen and his family run a fleet of secondhand machinery that has higher hours but is maintainable. The biggest trigger when buying tractors is the buying opportunity in the secondhand market. Reece says that if they buy well, they can fund part of the opportunity by selling one of the older tractors, decreasing the average age of the fleet. As electrics are the biggest risk in all modern machines, they may become a trigger for replacement.
PHOTO: BEN WHITE

LOCATION: South Stirling, Lower Great Southern, Western Australia

RAINFALL: 400mm

SOIL TYPE: Sandy duplex, sand over clay

CROPPING AREA: 8,000ha plus 4,000ha pasture crops

CROPS GROWN: Canola, wheat, barley, pasture mix and silage

AVERAGE WHEAT YIELD: 3.2t/ha

PERMANENT LABOUR UNITS: 10

SEASONAL STAFF: 10

TOTAL MACHINERY INVESTMENT: $800/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $500,000

Reece Curwen prefers to invest in assets that will appreciate over time, such as land or land improvements, rather than those which are exposed to a maximum 10 per cent depreciation expense in the first few years of life. Therefore, the key focus of Tooraweenah Pastoral Company is to position the business so it is ready to take advantage of the next opportunity and so returns are reinvested back into the business to improve the system and the soil. For Reece and his family, machinery is just one part of making improvements to the whole operation.

As a result, the Curwens run a fleet of secondhand machinery that has higher hours but is maintainable. This strategy allows funds that would otherwise be tied up in machinery capital to be used elsewhere in the business. Reece purchases secondhand machinery from a range of sources, including eastern Australia, and believes there is a big opportunity to extract value from the secondhand machinery market for those that have done the research and remained patient.

On the south coast of WA there is always the chance of a big rain event during harvest, which can dramatically reduce the grain weight and quality of a mature crop, so the Curwens run nine German harvesters, harvesting on average 250 – 300 hours each. Reece notes the five Cat 480R machines, which are worth only $40,000 each, do require some extra maintenance however they have fully depreciated. Also, a bonus of running five of the same machines is that if one machine breaks down, they are able to sacrifice a machine and keep the rest of the fleet going while parts arrive. This strategy makes more sense to Reece than running three or four new machines at significant cost without a guarantee that breakdowns won't occur.

There are some exceptions to the Curwen's rule of running older secondhand machinery. The two RoGators were bought new because they were technologically superior to the older machines, and the Curwens are confident the current model RoGators will be able to run to 5,000 hours. Fertiliser spreaders have also been purchased new because there were no suitable secondhand machines available at the time.

Every operation is preferred to be conducted in-house at Tooraweenah Pastoral Company, with mowing the only cropping operation outsourced in 2020. The Curwens also look for opportunities for contract spraying, forage harvesting and trash cutting, which helps to further justify owning their own equipment.

To run a fleet of older machines requires a highly skilled and invested team. Reece says they have fantastic mechanics within the business, who are responsible for the repairs and maintenance. To minimise breakdowns at harvest, the machines are well maintained. For example, the bearings are changed at 1,000 – 1,500 hours, or when they have an abnormal temperature at testing. While Reece acknowledges they do have additional breakdowns during harvest and extra maintenance costs, these costs combined are still less than the depreciation on new equipment.

A critical part of this strategy is to attract and retain mechanically minded staff. Reece is a 2015 Nuffield Scholar and as part of his scholarship studied the dynamics between family farming and labour management systems. The key things he learnt from the program was how critical it is for his business to have a good culture, a shared mission and a set of core values. Changing the company's culture was the most critical element to improving the

productivity of the business. Reece believes culture is created by design or default, and so he ensured the whole team at Tooraweenah Pastoral Company was involved in developing a shared mission and core set of values. Reece says this has been invaluable because it is very difficult for team members to argue against something they helped create.

Regular meetings with the team to action the mission have been critical, as has conducting quarterly reviews for staff input and systems improvement. Reece says his staff are empowered by the responsibility they have for business operations and some business decisions. The company also gives staff the opportunity to upskill through short courses.

	Make & model	Current hours or usage	Hours or usage/ year	Annual average R&M costs	Replacement trigger
All-rounder tractors	Claas Axion 950 (secondhand 2014) Claas Axion 950 (secondhand 2012) Claas Axion 950 (secondhand 2018) Claas Axion 850 (secondhand 2016)	3,500 avg/ machine	1,000 avg/ machine	$3,000 avg/ machine	The biggest trigger is the buying opportunity in the secondhand market. If we buy well we can fund part of the opportunity by selling one of the older tractors, decreasing the average age of the fleet. Electrics are the biggest risk in all modern machines, so may become a trigger.
Seeding tractor	Cat Challenger MT865C (secondhand 2008)	8,000		$30,000 on new tracks in 2019	The aim is to run to 15,000 hours (theoretically 10 years away).
Sprayers	RoGator 1300C (new 2018) RoGator 1300C (new 2017)	1,500 avg/ machine		$3,000 avg/ machine	Aim to run this model for the next 6 years. Electrics will be the main limitation.
Harvesters	Cat 480R Lexion (secondhand 2000) Cat 480R Lexion (secondhand 2001) Cat 480R Lexion (secondhand 2003) Cat 480R Lexion (secondhand 2004) Cat 480R Lexion (secondhand 2000)	4,500 avg/ machine	250 – 300 hours avg/ machine	$5,000 avg/ machine	The resale on the 480Rs given hours and age are practically the cost of the tyres hence they will be more value either in the paddock or as parts.
Harvesters	Claas Lexion 600 (2008) Claas Lexion 600 (2009) Claas Lexion 770 (2012) Claas Lexion 770 (2013)	3,500 avg/ machine	300 avg/ machine	$6,000 avg/ machine	Compared to the 480Rs these will have a better resale, however given the low hours conducted per year, there isn't a huge incentive to upgrade. Electrics are the weakest points in all modern machines so this may provide a trigger.
Seeders	Bourgault 5810 with 2004 simplicity 12000 air cart Bourgault 5710 with Bourgault 6550 air cart Direct Seeding Gent Disc Openers with with Simplicity 9000 air cart	10,000 hectares		$4,000/ machine	Bars – no end date. Box – no end date assuming fertiliser damage can be reduced.

GAVIN AND HAYLEY HILL

Gavin and Hayley Hill have relatively low machinery repairs and maintenance costs. This is mostly driven by an on-farm maintenance regime. Knowing the depreciation cost of equipment and buying well is part of their machinery investment strategy. In parallel to this approach, surplus cash is invested in the internal expansion of equipment to service their hay enterprise. PHOTO HAYLEY HILL

LOCATION: Holt Rock, Western Australia

RAINFALL: 320mm (210mm GSR)

SOIL TYPE: 65 per cent heavy – loam, 35 per cent light – yellow gravel sand

CROPPING AREA: 6330ha

CROPS GROWN: Wheat, barley, canola, lupins, field peas, oaten hay.

AVERAGE WHEAT YIELD: 1.8t/ha (5yr average)

PERMANENT LABOUR UNITS: 1 – 2

SEASONAL STAFF: 2 for seeding, 5 for harvest and hay work

TOTAL MACHINERY INVESTMENT: $340/cropped Ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: Around $300,000

Holt Rock, WA growers, Gavin and Hayley Hill say the key to making machinery investment work well for them is to carefully consider all options and avoid having to make rush decisions. For the Hills, this includes working the numbers carefully to understand the return on investment. Buying well is important in keeping the depreciation cost down, particularly for higher value gear like harvesters.

Being relatively remote means a callout to the farm is $600 before a spanner is even lifted, so most repairs and maintenance are done on-farm by themselves. While Gavin and his team don't have formal mechanical qualifications, boiler maker experience and sound practical knowledge go a long way to being able to address any breakdowns.

Major annual maintenance requirements are also done by Gavin and his team on-farm. As an example, harvesters undergo a post-harvest evaluation and recommendations for remedial repairs with a parts list provided by their local John Deere dealers, Ag Implements.

The ability to repair and maintain gear also influences changeover timing with Gavin able to keep older gear going until an opportunity arises. He says the weekly rural papers and auction results are an important pricing touchstone and studies them regularly.

Both new and low-hour secondhand equipment is purchased with calculations done on the depreciation cost of used equipment. The weekly rural papers are again used to identify equipment options when it comes time to purchase. Gavin says both family and staff are involved in selecting the gear with a practical maintenance perspective coming from staff helping to identify the best machine for the job.

From a financing perspective, manufacturer provided (Agco and John Deere) chattel mortgage finance for both new and used equipment has proven to offer very competitive rates.

With export hay comprising a significant part of their cropping programme, Gavin says surplus cash in the business is currently funnelled into internal expansion of that component of their operation.

Hay-specific machinery purchases including Krone high-density balers, has seen a shift from contractors to their own hay gear. With contract baling costing $32/tonne and the baler capable of punching out eighty, 700kg bales per hour, the cost of the baler is quickly recouped.

Gavin and Hayley run their operation on a 9m CTF regime employing two 18m Flexi-Coil 820 bars which are paired with a 15,000L Simplicity cart.

Gavin explains that one bar is set up with 229mm (9") spacing for hay while all other crops are planted with the other machine on 305mm (12") spacing.

The seeding rigs are pulled by the latest purchase in their fleet, a John Deere 9470R which was purchased new in 2018.

Spraying equipment has been most recently upgraded with a 10,000L, 36m Sonic boom spray with Airtec twin fluid system that does the bulk of the spray work. It is supplemented with a 4365 Miller Nitro self-propelled sprayer for busy requirement times; in-crop and summer spraying work.

CASE STUDIES: WESTERN REGION
GAVIN AND HAYLEY HILL

Gavin explains that utility tractors are plentiful on farm with the requirement for hay work taking up to five machines in one paddock for baling and stacking. These tractors usually clock up high hours (8-10,000 hours is not uncommon) with newer low-hour utility tractors purchased shuffling others down the inventory list.

Gavin says he doesn't like old gear lying around the farm so at some stage they get moved on if an opportunity arises, but with hay and field bin duties calling, there is nearly always an application for the older iron at the Hill operation.

	Make & model	Current hours	Hours or usage/year	Annual average R&M costs	Replacement trigger
Utility tractors	John Deere: 8295R 8320 x 2 8770 (4WD) 6920 (hay raking)	 3,400 8 – 9,000 9 – 10,000 5,000	 500 (spraying and hay) Variable Variable 300	 Minimal to date Minimal – servicing done by self on farm for all utility tractors.	Generally higher hours.
Seeding tractor	John Deere 9470R	1,200	500	Minimal – new machine. Servicing done by self on farm.	Hours and maintenance costs followed by any tech upgrades that can demonstrate a return.
Sprayers	Sonic 10,000L 36m boom 4365 Nitro	Purchased new in 2019 Purchased at 3500hrs, now 4750hrs	20,000ha 2 – 300	Minimal – new machine Recently did a wheel motor circa $20k. Outside that, servicing done by self on farm.	Expected to provide at least a decade of service. High machine hours (5500+) will trigger replacement.
Harvesters	John Deere S660 John Deere S760	800 (in 2yr) 1,200 (in 5yr)	350 350	Around $10,000 per annum for each harvester excluding labour costs.	Look to turn over at around 2000h depending on depreciation cost per hour.
Seeders	2x 18m FlexiCoil with 15,000L Simplicity air cart.	Seeding bars are around 10 years old, cart was purchased in 2006.	500	Minimal	Section control may trigger upgrade of air cart.
Trucks	T908 Kenworth Iveco Powerstar 2x 45ft drop decks (hay) 2x tippers		Variable	All servicing done on farm – Cummins engines.	Changeover of trucks and trailers is generally driven by opportunity.
Hay gear	Krone HD baler Mower conditioners Rakes	300 300		All servicing and maintenance done on farm	Looking to build inventory. Changeover will be opportunity driven.

ASH REICHSTEIN AND MEGAN McDOWALL

Ash Reichstein and Megan McDowall are always looking for machinery opportunities that will suit their business. But suggest that careful planning and research are needed to ensure the right piece of equipment is purchased to meet the needs of the operation. PHOTO: BEN WHITE

LOCATION: Esperance, Western Australia

RAINFALL: 430mm (270mm GSR)

SOIL TYPE: Circle valley loam, sandy gravel over clay, sandplain.

CROPPING AREA: 5500ha

CROPS GROWN: Wheat, barley canola, lupins, faba beans

AVERAGE WHEAT YIELD: 3.6t/ha (5yr average)

PERMANENT LABOUR UNITS: 2

SEASONAL STAFF: 3 for seeding, 4 for harvest

TOTAL MACHINERY INVESTMENT: $658/cropped Ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: Around $300,000

Ash Reichstein and Megan McDowall say the key to their machinery investment strategy is buying the right machine for the job the first time and not having to turn gear over frequently. This means that brand loyalty gives way to functionality and suitability for the task.

In most cases, machinery replacement is prompted by opportunity for Ash and Megan with the driver for change, in most cases being the need for capacity.

But the approach has shifted for over the last ten years, where previously they would purchase only new gear, keeping it for three or four years with repairs and maintenance expenses kept to a minimum. More recently, Ash and Megan keep key pieces of equipment for five to nine years.

Ash points out that technology demonstrating a return can influence changeover timing. For example, Ash and Megan crop some lake country, which, even using 12m seeding bars, has been able to demonstrate a return with around a 10 per cent reduction in seeding inputs realised.

Seeding equipment technology developments have seen Ash and Megan turnover their air carts most recently to take advantage of sectional control and variable rate technology. The two DBS seeding bars are four and 15 years old (the 15 year-old was purchased secondhand 3 years ago) and both are expected to continue to deliver for the foreseeable future. They are one of the few pieces of farm machinery that have appreciated in value since purchase.

The time of largest production risk in the Esperance area is at harvest. Proportionally, the corresponding investment in harvesting capacity is where Ash and Megan have a majority of their machinery inventory invested. This is supplemented with a contractor whose input has steadily been increasing as the requirement for capacity has increased. Aside from cartage of grain and hay at harvest, this is the only contracting input Ash and Megan use.

Ash says their Claas harvesters each do around 300 rotor hours per year with the trigger for replacement normally being hours. But like their air cart upgrade, technology in the form of harvest weed seed control (HWSC) mills may influence the timing of changeover for new harvesters.

The timing of the harvester changeover could also see a shift to an alternating strategy to temper cash outlays in the longer term.

Megan says the reinvestment of cash surplus is primarily to pay down debt as a priority, with this then paving the way for expansion and the required machinery to operate on an expanding programme. Chattel mortgages are the preferred method of financing gear but a healthy component of the purchase is usually cash.

Repairs are usually self-diagnosed, with maintenance generally carried out by local dealers because they are more efficient and usually have specific tooling. Skill sets amongst staff include auto-mechanical proficiency so smaller repairs can be handled on-farm, but larger and more complex repairs including electrical faults are left to the dealer or contract mechanic.

Ash and Megan suggest that dealer service and backup reputation is an important consideration for machinery used during time critical operations. Seeding and harvest gear are prime examples where a breakdown can mean missing a critical agronomic window which can carry a significant yield penalty. Backup during these periods is therefore critical and prioritised.

Planned machinery investment decisions are made at an annual farm business review with consultant. Selection of specific equipment is done in collaboration with staff likely to operate the machine, ensuring there is buy-in and agreement on the best tool for the job. A list of points for and against any specific model machine is usually drawn up to help analyse and refine the selection process.

Ash says that approaching trade in time, there is infrequent dealership discussions with further enquiry and revisiting options as the time to trade draws nearer.

But occasionally opportunities arise that might address an immediate need. One such example is a Nyrex mother-bin that was purchased during the 2019 harvest. It was an older model, but still new and Ash was able to negotiate a good deal on the price. With a wry smile, Ash adds that Megan sometimes finds his bargaining and negotiating skills a little "forward" when it comes to the sharp end of cutting the deal. But then counters the comment with the point that "dealers can always say no if the proposal doesn't suit them."

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Utility tractors	Fendt 930	5800	500	Total R&M across all equipment is $80/ha of cropped area as a 5–year average	Machine hours with increasing repair and maintenance costs are the primary triggers for replacement.
	Case Rowtrac 380	3,000	1,000		Rowtrac may be retained as a utility machine and replaced with a Quadtrac
Seeding tractor	Challenger MT855C	8,300	400	Total R&M across all equipment is $80/ha of cropped area as a 5year average	
Sprayers	Case IH Patriot 4430 Goldacres 6536 trailing boom		600	Total R&M across all equipment is $80/ha of cropped area as a 5year average	May transition 4430 to be the second sprayer and look for a low hour pigeon pair to replace the trailing boom.
Harvesters	Lexion 770 Lexion 770	3,600 (in 9yr) 2,100 (in 5yr)	300 300	Total R&M across all equipment is $80/ha of cropped area as a 5year average	May look to replace with low-hours Claas with integrated HWSC.
Seeders	2x 12m Ausplow DBS seeder bars, both with Morris air carts.	DBS bars: 4 and 15 years Carts: 4 years	400	Total R&M across all equipment is $80/ha of cropped area as a 5 year average	Bars may not be replaced unless better technology (eg. Bridge frame) becomes available.

ANDREW AND JACINTA TODD, LAHARNA FARMS

Timing is everything when farming in Western Australia. Andrew and Jacinta Todd look for opportunities to improve profitability through machinery purchases which stack up economically. PHOTO ANDREW TODD

LOCATION: Dowerin, Western Australia

RAINFALL: 320mm (215mm GSR)

SOIL TYPE: Highly variable sand/gravel/loam

CROPPING AREA: 4200ha + fallow

CROPS GROWN: Wheat, barley, canola, lupins, oaten hay.

AVERAGE WHEAT YIELD: 2.2t/ha (10yr average)

PERMANENT LABOUR UNITS: 1

SEASONAL STAFF: 2 for seeding, 2 for harvest

TOTAL MACHINERY INVESTMENT: $343/cropped Ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: Variable pending opportunity

Time in preparation saves time in operation according to Andrew Todd who farms at Dowerin, WA. While the adage paraphrases his predecessors, Andrew reckons that if there is one thing he has learnt about farming in WA, it is that timing is critical to extracting maximum profitability.

Andrew says the two FWA tractors are used for multiple applications with the older 8320 purchased with 4600 hours on the clock doing all spreader and chaser-bin work with some spraying work when things get busy. The 8295R purchased new in early 2015 however, does the majority of the spraying work and is predominantly dedicated to that purpose, clocking up around 600 hours per year.

Andrew adds that the 8295R is connected to the boom at all times, even during harvest where spraying can often be required and adding that timeliness is essential.

From a spraying perspective, two Beverley Hydrabooms are used with identical specifications to simplify repair and parts inventories.

The argument for the front-wheel-assist and trailing boom over a self-propelled boom come back to a lower depreciation cost for the spraying outfit with the option for flexibility and integrated redundancy if required. Andrew supported the spraying outfit with a recently purchased chemical batching plant.

The seeding tractor is hooked up to the deep ripper where conditions are suitable, but 95 per cent of the hours on the STX500HD can be attributed to seeding and since purchased new in April 2015. As is the case with other DBS owners, the seeding bar is now worth more than Andrew paid for it.

Andrew says that benchmarking data suggests that while the machinery inventory has been updated in the past few years and fleet age has resultingly decreased, repairs and maintenance overall has increased from around $20/ha to $30/ha. This is a common theme according to some consultants who have seen similar trends as more complex equipment demands higher maintenance inputs.

Andrew says equipment acquisitions often come via contacts and conversations both verbally and online. Andrew says that he does not necessarily have a prioritised list of equipment to be purchased but is always looking for opportunity to optimise operations.

Andrew generally conducts an economic evaluation of these equipment opportunities, utilising research or on-farm-trial data as the basis for calculations. He says that the notional 10 per cent depreciation figures used for benchmarking purposes are probably not high enough in many cases but concedes that a nominal figure needs to be applied to recognise the use of the equipment in the operation.

If major machinery items (for example the harvester or seeding rig) are not supported by suitable ancillary equipment, Andrew points out that this can be costly because the peak capacity of the major plant item cannot be realised. But this is qualified by the importance of keeping the total investment in depreciating assets as low as possible.

Ultimately, there needs to be a happy medium where scale is matched by machinery investment levels and reliability, ensuring maintenance and management of those machinery assets does not impact timing of operations. Sometimes this means making do with older technology that can still be used, albeit with a couple of workarounds.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Utility tractors	John Deere: 8320 High hours/opportunity 8295R	 7,844 3,418	 600 600	Minimal – servicing done by self on farm For all plant, $30/ha	
Seeding tractor	Case IH Steiger STX 500HD	2,955	600		High hours/ opportunity.
Sprayers	2 x Beverley 8,000L 36m booms	n/a			Opportunity/ technology.
Harvester	New Holland 8.90 with Seed Terminator	887	450 – 500		High hours/ opportunity.
Seeder	1 x 15.2m DBS with 12,000L Simplicity air cart build 2000 model	E-series seeding bar is a 2002 build model purchased in 2010	570		Opportunity/ technology.
Trucks	Western Star with two tippers		Variable		

The Todds aim to minimise repair and maintenance costs by taking on repairs they can confidently do themselves in addition to most servicing on-farm. PHOTO: BEN WHITE

AMERY AND SCOTT DRAGE, DRAGE FARMS

Amery Drage and his family have changed their machinery replacement strategy significantly over the last five years, with the business now having a strong focus on technology, increasing the efficiency of inputs and maximising the capacity of their machines. PHOTO: CUSSONSMEDIA

LOCATION: Northampton, Northern Wheatbelt, Western Australia

RAINFALL: 400mm (Annual) 350mm (GSR)

SOIL TYPE: Red loam and sand over gravel

CROPPING AREA: 4,000ha

CROPS GROWN: Wheat, lupins, canola and albus lupins

AVERAGE WHEAT YIELD: 3t/ha

PERMANENT LABOUR UNITS: 2

SEASONAL STAFF: 2

TOTAL MACHINERY INVESTMENT: $900/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $50/ha excluding headers and tractors

The last five years has seen a major change in machinery replacement strategy for Scott and Amery Drage, from running low-hour machines to upgrading the entire fleet with new machinery. Since 2017, their cropping area has increased significantly from the family taking on a number of leases, with the business now farming six blocks around Ogilvie and Northampton. Much of the machinery they had prior to expansion was on the small side and their Northampton blocks have smaller, undulating paddocks, with creeklines and rock piles. To handle this country, the opportunity was taken to upgrade to new machinery to take advantage of improved efficiencies and technology.

Adding machinery that has section control into the business has been a game changer for the Drages given their undulating country. For example, seeding efficiency has been increased by upgrading the bar from a 12m working width to an 18m John Deere 1870 Air Hoe Drill and purchasing a John Deere 1910 Air Cart with section control, which Amery believes has reduced overlap of inputs by up to 10 per cent. The boom has also been upgraded to cover more area, moving from a 30m boom to a 36m John Deere R4045, which also has a larger 4800L tank. Upgrading to a high precision Kuhn Axent spreader, which also has section control, has produced an even spread pattern when applying potash at 48m and urea at 36m, matching CTF widths.

When deciding to move from a class 8 to a class 9 header, technology was a big factor in the decision to upgrade. The Drages were fortunate to be able to compare two competing brands with over two years with on-farm demos, before settling on the Claas Lexion. Key features of this machine was the Cemos Automatic system which self learns and adjusts the machine continuously and automatically in line with current harvesting conditions, which is especially handy when the sea breeze comes in. With undulating hilly paddocks, 3D sieves and auto slope were also appealing advancements in technology which reduce grain loss on the hills.

Deciding on the optimum tractor setup hasn't been as easy, with Amery commenting they have tried a number of strategies. With their front wheel assist (FWA) tractor and the four-wheel drive (4WD) tractor not often being used at the same time, in 2019, the Drages tried consolidating to just one 4WD on 1100 low sidewall tyres to get track/dual-like traction but without the oversize transport width of duals. Given the Drages shift blocks a lot, having a tractor that doesn't require an escort is very appealing. However, Amery and his family discovered the e18 power-shift transmission of the John Deere 9520R isn't suitable for spreading and not being able to easily remove ballast weights, the machine is too heavy on the crop leaving bog ruts in the wetter months, so a John Deere 8R280 FWA will now be used for spreading, rock raking and other lighter work while the 9520R will be used for seeding, deep ripping and to operate the 36T chaser bin.

Spreadsheets are an important tool to help Scott and Amery understand the business finances. Hire purchase (HP) is used to finance the larger items while cash is used to finance smaller equipment such as the spreader and ripper. The HP costs are currently about 10 per cent of income, however the Drages forecast the HP costs will drop to 3-4 per cent in 2022, freeing up more cash to grow the business. When they decided to purchase the FWA tractor, the spreadsheet was analysed to see how it would reduce the hours the 4WD tractor logged, how much it would initially increase the HP costs by and then how the costs would reduce over time across the fleet.

With a fleet of new machines, dealers are predominantly used for general pre-season inspections, however it is the preference of Scott to use local mechanics to save on travel costs, or otherwise fix machines, such as the bar, themselves.

In the past the Drages went contract spraying off-farm with their self-propelled sprayer to add cashflow to the business. Conversely, as the business has rapidly expanded the cropping program external contractors are employed on-farm as required for summer spraying with a WEEDit.

	Make & model	Current hours or usage	Hours or usage/ year	Annual average R&M costs	Replacement trigger
Deep ripping, seeding and chaser bin tractor	John Deere 9520R (new mid-2019)	1,597	1,000	$5,000	4WD tractor on 1100 LSW tyres was purchased for dual/ track-like traction without oversize transport width of duals. Plans to upgrade before 4,000hrs.
Spreading, rock raking, grading tractor	John Deere 8R280 (new 2021)	0	400		Purchased because power shift of 9520R isn't suitable for spreading and it is a lighter machine.
Sprayer	John Deere R4045 (new late-2017)	1,273	450	$10,000	Plan to change at 2,500 – 3,000 hours and would like to use green on green weed spraying technology.
Harvester	Claas Lexion 7700TT (new 2020)	530	520	Estimated around $20k	CEMOS Automation has maximised performance, Next changeover will primarily be because of increasing maintenance costs (2,500 hours) or if larger fronts for undulating country becomes available.
Seeder	18m John Deere 1870 Air Hoe Drill (new 2018) John Deere 1910 Air Cart (new 2017)	10,000ha	4,000ha	$20,000	Seeder was upgraded from 12m for extra efficiency. Added wider press wheels because of the deep ripping on sands. High maintenance due to very rocky country. Upgraded aircart with section control which reduced coverage area by 10%. It is quite high maintenance with section doors jamming with dust.
Truck	Mercedes Actros 2633 (demo 2018 model, purchased 2020)	400,000km	20,000km	$5,000	No plans to upgrade.
Other significant equipment	Kuhn Axent Spreader (demo 2018) Claas Scorpion Telehandler (new 2018)	7,600ha 1,000	5,500ha 300	$3,000 $5,000	The high precision spreader with section control was purchased to accurately spread potash 48m and urea 36m, matching CTF widths. Machine adjusts settings autonomously reducing setup times.

GEOFF AND FIONA, ANDREW AND GARY COSGROVE, COSGROVE FARMING CO

Geoff Cosgrove and his family have traditionally operated two John Deere S780 headers to harvest their 10,000 hectare cropping program, which are purchased new and paid out over four years. The machines are purchased new to ensure reliability and are replaced on a four-year cycle, irrespective of seasonal conditions.
PHOTO: CUSSONSMEDIA

LOCATION: Mingenew and Arrino, Mid-West, Western Australia

ANNUAL RAINFALL: 350mm (Annual) 300mm (GSR)

SOIL TYPE: Light sand to heavy clay

CROPPING AREA: 10,000ha

CROPS GROWN: Wheat, lupins, canola and barley

AVERAGE WHEAT YIELD: 2.7t/ha

PERMANENT LABOUR UNITS: 7

SEASONAL STAFF: 3

TOTAL MACHINERY INVESTMENT: $300/cropped ha

ANNUAL MACHINERY REPLACEMENT INVESTMENT: $52/ha

While many growers never consider purchasing new machinery without warranty, after an experience in 2020, it will be the new norm for Geoff Cosgrove and his family who farm a number of blocks in Arrino and Mingenew in WA's mid-west. They had an issue with a track on a tractor that delaminated after only 2,000 hours, causing damage to the machine. Given the Cosgroves had a similar tractor that had done a lot more hours and had not shown the same type of wear, they believed the track was not fit for purpose and wanted it replaced.

Eventually the Cosgroves discovered warranty is a contract between the manufacturer and the dealer, not the customer and the dealer. Geoff learnt that as the consumer he is protected by Australian Consumer Law, not the warranty, and so was advised to never sign a warranty paper.

Running machinery at capacity is a key focus for the Cosgroves who have traditionally operated two John Deere S780 headers to harvest their 10,000 hectare cropping program, which are purchased new and paid out over four years. The machines are purchased new to ensure reliability and are replaced on a four-year cycle, irrespective of seasonal conditions. Geoff notes while machinery is expensive, their machinery repayments are $52/ha which represents just over 10 per cent of the input costs of the cropping business.

With Geoff's brother Andrew being a qualified diesel mechanic, the business invests heavily in repairs and maintenance to make sure the machines are reliable. This means during seeding, when the bars operate 24 hours a day, 7 days a week, the cropping program can be completed within 24 to 25 days. Some tasks will be completed on farm but if they don't have time, local mechanics are contracted.

The Cosgroves aren't afraid to have equipment manufactured for their business if needed. For example, while Stiletto systems are used on the two 18m John Deere 1830 bars, 5.5-inch (14cm) car tyres were manufactured aftermarket as press wheels to better suit their variable soil types.

Surplus cash is used for debt reduction, be it on land or machinery, so the business can be in a financial position to capitalise on opportunities when they present. For example, during the 2020 harvest, Geoff and his family estimated ryegrass competition was costing them between $300 – 400/ha. The decision was therefore made to retrofit Seed Terminators for the 2021 harvest, with the extra yield gains expected to pay for the technology within the first year.

While Geoff doesn't like operating trucks, he admits they are a very important part of Cosgrove Farming Co, carting lime, fertiliser, grain at harvest and lupins throughout the year. Estimating the total freight task for the business to be about 40,000-tonnes and with a freight cost of around $6 – $8/t, Geoff believes it makes more sense for the business to own and operate two road trains and a six-wheel tipper with a five-axle dog, and use the $240,000 – $320,000 in saved contracting costs for truck repayments.

With a reasonably big harvest in 2020, the additional secondhand road train was purchased as the Cosgroves were concerned about receival sites filling up. With the two road trains, the Cosgroves delivered six to seven 150 tonne loads into CBH daily, totalling around 1,000 tonnes of grain.

Geoff also notes if they were to rely on contractors for cartage, they would need to upgrade the field bins for improved ease of use. Instead they are happy to use their existing field bins, with a system where they are also able to use their trucks as pseudo field bins.

Once the trucks have delivered the backlog of grain, in the middle part of the day they are often filled straight from the chaser bin to keep them rolling. Contractors are only used to make hay.

	Make & model	Current hours or usage	Hours or usage/year	Annual average R&M costs	Replacement trigger
Deep ripping and seeding tractor	John Deere 9570RX (new 2015)	3,811	800	$10,000	Higher horsepower tractors will be treated more like mining equipment, being refurbished rather than replaced.
Seeding, Plozza plough & Reefinator tractor	John Deere 9530 (new 2008)	8,137	800	$20,000	Rebuilt final drives will give another 10 years life.
Seeding, chaser bin and spreading tractor	John Deere 9420RX (new 2018)	3,430	1,100	$20,000	If replaced due to high R&M, it could be with two tractors due to the work it does.
Sprayers	John Deere 4045 (new 2016) John Deere 4940 (new 2012) WEEDit (new 2013) 36m Primary Sales Boom, 3,800L	1,961 3,998 80,000ha	600 600 10,000ha	$30,000 $30,000	Also on a 4 year repayment plan; at end of that period if R&M costs are high, it will be replaced. Would like to add the spot spraying technology onto a SP so that summer spraying can occur at the same time as harvest (currently a tractor short).
Harvesters	John Deere S780 (new 2019) John Deere S780 (new 2019) John Deere S670 (secondhand 2012)	600 600 300	948 rotor 951 rotor 2,666 rotor	$40,000 $40,000 $20,000	Harvesters are replaced every four years to ensure reliability with only two machines covering 10,000ha. Seed Terminators will be retrofitted for 2021 harvest for improved ryegrass management. Third header was added in 2020 as a good opportunity presented. It will be used to harvest canola and lupins.
Seeders	18m John Deere 1830 Air Hoe Drill x 2 (new 2014) John Deere 1910 Air Cart x 2 (new 2014)	40,000ha each	5,000ha	$40,000 per unit	Ran 1820 bars before upgrading to 1830s, so have basically run the same bar for 20 years. Added 5.5-inch car tyres (manufactured aftermarket) as press wheels for better performance across variable soil types. Will continue to rebuild rather than replace. The air-carts are plastic, variable rate equipped and double shoot so meet all of the technology requirements. Will look to replace the meter rather than the cart.
Trucks	Coronado with 2 x BRE Tippers (new 2015) CAT with 2 x tippers (secondhand 2014) Freightliner FL112 with 1 x dog trailer (new 1997) 1x B Double hay trailer (secondhand 1989)	240,000km 400,000km 540,000km		$45,000 $30,000 $15,000	Second road train was added in 2020 to increase capacity and get grain delivered faster. Due to scale, owning trucks is a necessity.
Other significant equipment	Deep Ripper (new 2012) John Shearer 5GP converted Plozza Ploughs x 2, operated in tandem (secondhand 2017) Reefinator (On order)	30,000ha			

NOTES

P Level 4, 4 National Circuit, Barton ACT 2600 | PO Box 5367, Kingston ACT 2604
T 02 6166 4500 **F** 02 6166 4599 **E** grdc@grdc.com.au