MY DATA MANAGEMENT

CASE STUDY REPORT

Investigating the difficulties generating, managing, storing and sharing on farm data

Report to Irrigation Research & Extension Committee

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Executive Summary

This is the first report in this research project exposing the issues surrounding the management of agronomic data in the Australian irrigation farm environment. This report contains findings of 8 case studies into current on farm practice and the difficulties facing growers now and in the future of digital farming.

The purpose of the case studies is to develop a best management practice document to be use as a guide for growers in their move to a precision agriculture approach to irrigation farming.

The 8 growers participating in these case studies are:

- Gavin

  A second-generation irrigation farmer located in Benerembah NSW. Predominantly producing cotton, corn, wheat and in the past rice.
  Gavin provides cotton picking, spraying, product application and land forming contracting services across the state generating and collecting large amounts of agronomic data daily.

  Gavin believes that data management has a role to play in his current farming and contracting businesses and has engaged a consultant to help with this. He has a high knowledge ??? and uses a wide range of hardware and software in his current operation.

  Gavin uses John Deere machinery, hardware and software exclusively to maximise efficiency.

  Agronomist: Ellie Storrier

- Robert

  A second-generation farmer located in Leeton NSW who made the switch from mixed farming to row cropping in the early 90's and now produces cotton, rice and wheat.
  Rob believes strongly that technology combined with data is key to his operations moving forward. He is dedicated to improving his operations in an endeavour to maximise his returns by minimising inputs and increasing on farm efficiencies. Rob utilises a mix of machinery brands but has standardised his hardware and software using Trimble as the platform.

  Agronomist: Emma Ayliffe

- Paul

  A second-generation farmer located at Wumbulgal NSW producing cotton, rice and wheat, a move from mixed farming in the 90's to row cropping motivated by a need to increase profitability.
  Paul utilises a range of machinery brands and operating hardware and software. Paul is dedicated to maximising the use of technology in his current operation and is willing to invest in hardware and software that gives him the ability to create a digital image of his farm.
  In the past Paul has had difficulty receiving technical support from machinery dealers and software providers which has led to stagnation of his Precision Ag pursuit.

  Agronomist: Brendan Wells

- Chris

  A third-generation farmer located in Wumbulgal NSW producing cotton, rice and wheat. Chris uses a range of machinery brands but has standardised his AMS ?? with all machines operating John Deere hardware and software.
  Chris places a high value on data but in the past has had problems locating and storing data. Management of all data generated on farm has been transferred to his agronomist.

  Agronomist: James Mann

- Joe

  A second-generation farmer located at Coleambally NSW producing cotton, corn and wheat. Joe also operates contracting services locally.
  Joe is part of the younger generation of growers in the region and believes that data generation, storage and sharing will help him become more profitable in the future. Joe utilises a range of machinery, hardware and software in his current operation but also believes he is not getting the full benefit from his investment. Has struggled to find reliable tech support.

  Agronomist: Lachy Vogan

- Steven

  A second-generation farmer located in Coleambally NSW producing cotton, rice, corm and wheat. Steven share farms with his siblings and utilises a wide range of machinery, hardware and software which is shared across several locations. Steve has found it difficult to maintain consistency of data generation and is highly motivated to find a solution. Steve utilises John Deere and Trimble operating systems and understands the role data management must play in his future operations to insure increased profitability.

  Agronomist: Brett Hay

- Matt

  A third-generation farmer located at Darlington Point NSW producing, cotton, rice, wheat, corn, nuts and prunes. Because of the diverse nature of farming operations Matt utilizes a wide range of machinery.
  AMS hardware and software combines Trimble and John Deere components. Matt is willing to invest in new machinery and tech to increase operation efficiency and to monitor crops. Matt is generating and collecting large amounts of data daily but struggles to manage the volume. He has had difficulty in the past receiving a level of tech support from local dealers. Matt has a strong belief that data generation, collection and sharing has a key role to play in his future farming operations.

  Agronomist: Alan Jones

- John and Will

  A father son operation located in Leeton NSW producing cotton, rice, corn and wheat. Generally, John and Will are at the very start of their precision Ag journey but are highly motivated to increase profitability by utilising technology.
  A good example of generational change motivating the move to digital farming.

  Agronomist: Sam McGrath, John Hill, Matt Watson.

These growers represent a variety of ages, farming operations and techniques, attitudes and levels of precision agriculture adoption.

Growers were chosen for the case study because they displayed a genuine desire to utilize technology and data to move to a precision agriculture, data driven operation to increase profitability.

All growers currently or recently utilise,

1. GPS, RTK guidance systems
2. In cab monitors with the ability to generate/record field operation and machine optimisation data.
3. Variable rate application software.
4. Back end data analysis software example: My John Deere, Apex, Trimble Farm Manager etc.
5. Land forming GPS software.
6. Farm field surveys
7. Soil moisture monitoring hardware and software
8. Aerial Crop imaging.
9. Soil mapping and sampling (EM survey)
10. Irrigation tracking and management software.

Each of the growers included in this report display these key qualities. In addition, provide exemplary examples of different facets of farming operational techniques. Some of these include,

- A noteworthy example of the difficulties surrounding Ag data optimisation
- A genuine desire to improve their business profitability
- High resilience to negative media
- A good understanding of machinery dealer motivations
- A family history of farming in the region
- A strong relationship with their Agronomic advisors

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Note

This is the first report in this research project exposing issues surrounding the management of agronomic data in the Australian Irrigation farm environment. The report contains findings of 8 case studies into current on farm practice and the difficulties facing growers now and in the future of digital farming.

The purpose of the case studies is to develop a best management practice document to be use as a guide for growers in their move to a precision agriculture approach to Irrigation farming.

Acknowledgements

Identification of good practice

Identification of suitable growers to participate in the case studies was undertaken before the case studies began in August 2018. This involved consultation with growers, machine audits, hardware and software audits along with current process examination and recording? to determine suitability for the project. All selected participants displayed good farming practice, strong relationships with their agronomic partners and a true desire to improve current process in order to adopt precision agriculture techniques.

Consideration was made to ensure that the case study groups covered a range of on farm capabilities, hardware and software, cropping techniques, locations and crops.

Methodology for case studies

The case studies were conducted by I-AG PTY LTD on farm at each of the participants locations. Interviews were conducted and recorded (footage is available on the IREC website). A machine audit was conducted for each participant to determine the level of capability, along with a hardware and software audit which included an audit of hardware and software in the participant's office space.

A standard set of questions were designed to highlight current attitudes to data management, collection, storage and sharing. Questions were designed to determine the level of precision agriculture applications participants currently utilised, including examples of their interactions with their agronomy partners. The questions helped determine the role machinery dealers and resellers played in their operations and highlighted current and future difficulties growers are facing when it comes to good data management.

Case study baseline questions
1. Tell us a bit about your on-farm data management process?
2. What are your thoughts about precision AG and the role it plays in your operation?
3. Where do you think data generation, collection and management fits in your daily process?
4. Do you have any PA goals?
5. Do you think they are achievable?
6. What issues have you encountered whilst trying to generate and collect data?
7. Does data generation and technology influence decisions when looking at purchasing new machinery?
8. What role does your machinery dealer and reseller play when considering new technology?
9. Who is your agronomist?
10. How active is your agronomist in your business?
11. Do you think that if your agronomist had access to more accurate and a higher quantity of data, would it make decision making easier?
12. What type of decisions would you like to make easier?
13. What is your internet like?
14. Have you used a contractor to provide drone or satellite imaging?
15. Where is this imaging stored?
16. Are you actively generating and collecting seeding, application or yield data?
17. Where is your data stored and do you have access to it instantly?
18. Have you used EM data in the past?
19. If so where is it stored?
20. Do you make use of tech like moisture probes and weather sensors?
21. Which tasks do you use contractors for?
22. What jobs do contractors do for you?
23. Do they or can they provide data for those jobs?
24. Looking to the future do you think technology and data management will be an important part of farming process?
25. Who operates your machinery?
26. Do you think machine operators need some ongoing training to help them consistently generate quality data?
27. Who do you think should provide tech training for operators?

28. Is training accessible for your operators?
29. Do you use brand related software to view your data?

Group interviews were also conducted with the participants Agronomy partners to ascertain the level data management each performs for their growers, which data sets were important when making agronomic observations and decisions during the cropping season and attitudes towards precision agriculture methods.

Agronomy partners baseline questions
1. How many contacts per week do you have with your grower?
2. Which data sets/layers are important during the growing cycle?
3. How are agronomic observations and recommendations communicated to your growers?
4. Are there checks in place to determine that recommendations are carried out within the specified time limit?
5. Which map generation software do you use?
6. How do you collect a grower's data?
7. Where do you store grower data?
8. What is your company's data policy?
9. What steps do you take to ensure growers data is not lost?
10. How do you share data with your grower?

In addition to site interviews, participating growers and agronomy partners were contacted by the researchers via email and telephone calls in which additional information about individual farming practice was gathered.

The interviews and additional information have been synthesised in this report to provide 8 concise overviews, one for each of the growers involved in the research. These overviews are designed to provide an idea of each grower's current practices, training regimes and business growth trajectories in the current environment.

The Case Studies

As noted above the growers chosen for this case study in to On Farm Data Management are:

Gavin Dalbroi

Robert Houghton

Paul Moon

Chris Moreshead

Joe Briggs

Steven Hardy

Matt Toscan

John and Will Houghton

Grower Baseline question analysis

Q1. On farm data management

From the answers given by participants it is evident that there has been no consideration to adopting a data management process in the office or in the on-farm process, 100% of case study participants answered no to this question.

Q2.What are your thoughts about Precision Ag and the role it plays in your operation?

100% of the study participants stated that Precision Agriculture application is extremely important in their farming future.

60% are using a PA application in some way,

40% were unsure exactly what PA is.

Q3. Where do you think Data generation, collection and management fits in your daily process?

100% of participants believed that generating, collecting and sharing data was important but all failed to understand where it fits into their daily process.

Q4. **Do you have any PA goals**?

All participants displayed a genuine desire to improve their operations by moving to Precision Agriculture however none had set goals or any sort of plan or pathway to achieve this.

Q5. Do you think they are achievable?

100% of participants believed that good PA practice is achievable now.

Q6. What issues have you encountered whilst trying to generate and collect data?

Participants expressed a wide range of difficulties encountered within this process or lack of. The main issues were,

1. Education:
    *   Participants felt that they lacked knowledge in key areas surrounding the function of data generation, hardware and software, maintaining an office system that was conducive to maintaining a high level of data standardisation.
    *   100% of growers believe that resellers do not have the knowledge about their own products to successfully advise growers.
    *   100% of participants believe that they do not utilise current hardware and software to its full potential.

2. Support: 100% of growers had difficulty accessing support for purchased hardware and software. 100% of participants stated that they were happy to pay for support.

3. Data storage and data ownership:

    *   60% of participants expressed concern that data stored in brand related software could be used for purposes other than the betterment of their operation.

- 40% did not care or did not have enough knowledge of data ownership laws to make consideration to what their data would be used for.
- 0% of participants have personal data storage system locally or cloud based, and all rely on agronomists / consultants to keep and manage files.
- 0% of growers have considered any sort of data management policy.
- 80% of growers have had data generated by contractors but have no idea where that data is located or have no access to that data.

Q7. Does data generation and technology influence decisions when looking at purchasing new machinery?

There is no doubt that GPS and autosteer components have the greatest influence when it comes to decisions around brand machinery purchases, the ability to easily integrate with existing GPS systems is of high importance to all participants.

The lack of knowledge around the capabilities of machine hardware and software contributes to the lack of process all participants displayed regarding machine hardware and software capabilities. 100% of participants agreed that they did not use current hardware and software to its full potential and that these factors were not considered during the purchase of new machinery.

Q8. What Role does your machinery dealer and reseller play when considering new technology?

100% of growers have had conversations with machinery sales people regarding new data technology. All participants believe that there is a general lack of knowledge within dealerships when it comes to identifying what works best for them. All participants expressed a lack of confidence and discontent with their machinery dealer's performance in this space. 100% of participants are more influenced by social media and online sources.

Q9. Who is your Agronomist?

Agronomy partners are listed in the participant profiles pages 2,3 and 4.

Q10. How active is your agronomist in your business?

100% of participants use agronomy services to maintain crop and field quality before, during and after the crop growing season. 7 out of 8 participants use the same agronomic adviser for all crop types however, the dynamics surrounding the delivery of agronomics varies from independent paid services to unpaid services that are combined with chemical purchases facilitated by resellers. Participants making use of the later displayed a diminished sense of value for agronomic services delivered in this way.

Participants had contact ranging from once or twice a week up to several times a week during the growing season. Participants using unpaid services had less contacts per week than participants using paid services.

Q11. Do you think that if agronomists had access to more accurate and a higher quantity of data would it make decision making easier?

100% of participants answered yes to this question.

A noteworthy observation is that participants believe that data can help provide a more collaborative relationship between grower and agronomist and view this as a positive outcome.

Q12. What type of decisions would you like to make easier?

All participants listed in crop time sensitive decisions as high priority.

Irrigation scheduling using soil moisture data.

Field management decisions like ground preparation and field design.

100% of participants had difficulty identifying the decision-making process.

Q13. What is your internet like?

100% of participants experienced difficulties with internet services and quality connection. However this has slightly improved recently.

There seems to be no problem inside the house or office however there are some major issues in field. Participant location has the largest effect on internet availability.

All participants believed that current internet services are inadequate, and providers will struggle to provide adequate services due to the growing demand into the future.

Q14. Have you used a contractor to provide drone or satellite imaging?

100% of growers answered yes to this question. All stating that their agronomy partners requested this type of data set.

Q15. Where is this imaging stored?

100% of participants did not know where their data was store or how to access it.

Q16. Are you actively generating and collecting seeding, application or yield data?

100% of participants answered yes to this question.

Q17. Where is your data stored, and do you have access to it instantly?

7 out of 8 growers did not know where any of their data was stored and did not have access to it instantly.

7 out of 8 participants relied on their agronomist to store their data.

0% of growers had considered the repercussions of data loss and responsibility for data loss.

Q18. Have you used EM data in the past?

100% of participants answered yes to this question.

Q19. If so where is it stored?

100% of participants did not know where this data was stored and did not know how to access it.

Q20. Do you make use of tech like moisture probes and weather sensors?

100% of participants are currently using or have used soil moisture and weather sensing technology.

Q21. Tasks you use contractors for?

Participants use contractor's for various tasks during the growing season including:

Land forming

Product application

Imaging

Soil Sampling

Harvest

Planting

Q22. What jobs do contractors do for you?

6 out of 8 participants use contractors to perform in field crop tasks like field preparation, planting and harvest operations.

100% of participants use contractors to perform crop scouting, soil monitoring and crop imaging tasks.

Q23. Do they or can they provide data for those jobs?

100% of participants did not know if their machine-based contractors had the capability to generate and share collected data.

100% of participants have never considered asking for machine generated data.

100% of growers using contractors for crop imaging, soils moisture and land forming data have received some sort of data set, generally a PDF printout.

Raw or unaggregated data has never been provided.

Q24. Looking to the future do you think technology and data management will be an important part of your farming process?

100% of participants believe that technology and data management will play a leading role in the development of precision agriculture now and in the future of farming practice.

Q25. Who operates your machinery?

Participants displayed varied attitudes around staff and machine operator capabilities. 100% of participants operated their own machinery to some extent, however this is influenced by the size of the organisation.

The general pattern here is that participants do as much of the machine operation as they can, relying on one or two permanent operators to spread the workload throughout the year and then employing casual operators during the growing season and harvest.

Q26. Do you think machine operators need some ongoing training to help them consistently generate quality data?

100% of participants answered yes to this question and were willing to pay for quality training.

Q27. Who do you think should provide tech training for operators?

100% of participants believe that there could be a mix of training facilitators.

These included:

Machinery dealers

Software and sensor providers and resellers

Government institutions

Grower Committees

Supply chain stakeholders

Data experts

PA consultants.

Q28. Is training accessible for your operators?

100% of participants answered no to this question.

Participants believe that there is a large gap in this space and are desperately looking for someone to fill it. There is a belief that operator error contributes greatly to the poor quality of data generation and that this can easily be remedied with education.

Participants suggested that training facilitated on farm, in the operator's machinery would be far more beneficial than the classroom option.

Q28. Do you use brand related software to view your data?

50% of participants use or have used brand related software to view data.

50% do not believe they have the capability to collect quality data to be viewed.

100% of participants expressed reluctance to utilise brand related software due to the following reasons:

File compatibility

Machine Monitor navigation

Support

Cost

Training

Time

Agronomy partners baseline questions analysis

Q1. **How many contacts per week do you have with your grower?**

Grower contact varied from between 2 and 6 points of contact during the growing season. The type of contact varied from on farm visits, phone calls and email contact.

Q2. Which data sets/layers are important during the growing cycle?

All agronomy partners agreed that the following data layers were critical during the growing season for all crop types.

Cut and Fill mapping

Planting data

Application data

Agronomic observation data

Yield data

Weather data

Other important layers to be considered are

Soil moisture data

Imaging data, NDVI, Biomass

Historical data

Soil mapping data

Q3. How are agronomic observations and recommendations communicated to your growers?

Generally communicated verbally via face to face or phone.

Email is used by all but not consistently.

Q4. Are there checks in place to determine that recommendations are carried out within the specified time limit?

No formal checking system is used.

Q5. Which map generation software do you use?

Agronomy partners us a range of software including:

My John Deere

SST Summit

Ag World

Trimble Advisor Prime

AFS Case

Field Cab viewer

Q6. How do you collect a grower's data?

USB devices are widely used as a preferred form of data collection tool. A small percentage of storage sharing and wireless data transfer occurs.

Q7. Where do you store grower data?

All group participants store grower data on the hard drive of their computers or laptops.

Q8. What is your company's data policy?

None of the group participants had ever viewed their company data policy. 100% were not sure what a data policy was or if the company that they worked for had a policy.

Q9. What steps do you take to ensure growers data is not lost?

No one in the group had taken steps towards ensuring their growers data was safe from loss or theft.

Q10. How do you share data with your grower?

A USB device is used by all in the group.

Report Conclusions

This report has examined 8 farming organisations which follow good practice in irrigation farming operations.

Identification of growers for the case studies was undertaken before the case studies began in August 2018. This involved consultation with growers, machine audits, hardware and software audits along with current process examination and recording to determine suitability for the project. All selected participants displayed good farming practice, strong relationships with their agronomic partners and a true desire to improve current process in order to adopt precision agriculture techniques.

As well as key criteria, consideration was made to ensure that the case study groups covered a range of ages, on farm capabilities, hardware and software, cropping techniques, locations and crops.

The observations from these case studies are governed by the individual capabilities and attitudes of each participant and are a true reflection of current process and attitudes.

Themes that have constantly emerged throughout the case studies are:

- The apparent knowledge gap within the machinery dealership network relating to the capabilities and integration of product.
- The lack of easily accessible support.
- The data knowledge gap, file compatibility etc.
- The lack of suitable back-end map generation and prescription generation software.

- Conflicting information from social and mainstream media, advisors and agronomists.
- The lack of contractor capabilities/responsibilities to provide good data.
- Data standardisation issues.
- Ability to identify the capabilities of their current machinery hardware and software.
- Data storage (how and where?).
- Data privacy (is this important?).
- Data ownership (who owns the data?).
- Data sharing options.
- Getting started in precision issues.
- Digital readiness.
- Different types of data and what it is used for.
- Poor past experiences associated with hardware investment.

Data value proposition

What we see here is a true understanding within the case study group that data has value. In the past all participants have invested in technology that enables the user to generate and collect multiple layers of data.
The suggestion that farmers fail to recognise the value of data does not apply here.
Observations within the case study group suggest that there is understanding that there are short term and long-term benefits derived from good data management practice.
It seems that the common themes listed have had a negative effect on precision ag and ag tech adoption.

Agronomic Partners

Agronomic partners provide are a strong driving force behind grower commitment to precision agriculture.

All participants displayed strong relationships with their agronomic partners.

The motivation to provide more tools to help agronomists maintain a high level of efficiency across the board is strong. However, the participants level of confidence in their ability to fulfil the expectation is low.

After data generation and collection, data sharing is of high importance. Here, the ability to share data with agronomic partners quickly and efficiency is key to managing crop daily. All the participants have had trouble managing this process in the past and have relied heavily on their agronomy partners to step in and take control.

Retrieval of aggregated data is also of high importance. Participants expressed difficulty receiving and utilising digital data aggregated by their agronomist for timely application operations.

Agronomists have a high involvement in the generation, collection, sharing and storage of participants data often being the main driver behind tech adoption and in many cases have taken up the role of tech support and advisors.

Digital Readiness

Participants displayed a lack of understanding of their organisation's digital readiness.

Understanding simple computer navigation, programming and cloud-based applications has proven difficult for all participants.

Office hardware and software, housekeeping and data management process have not been considered.

Options surrounding office hardware, operating systems and office process has not been a consideration in all eight cases.

The data management process

- **Office software**
- **Storage devices – options**
- **Data generation-data standardisation**
- **Data collection – process**
- **Data storage – process and options**
- **Data sharing-process and options**
- **Data privacy- organisation policy**

Across the board all participants had trouble understanding what a data management process is, how it fits with current job process and how the two processes are linked.

All case study participants regard data management highly within their operations, but all have had trouble defining and implementing a process that is sustainable. Noise from data stakeholders and the fact that there are so many options available to the participants is making it difficult to navigate this space.

Participants sighted the knowledge gap within dealership and reseller environment as an issue.

All participants sighted a lack of knowledge and confidence in their own computing skills as a major contributor.

The Knowledge Gap

Case study participants identified knowledge gaps in these key areas:

Data management.

Data standardisation.

Office process and computing.

Data privacy and ownership law.

Data relationships

File types

Map generation software capabilities

Current machine hardware and software capability.

Precision Ag application.

Machine software compatibility.

Agronomy partner requirements – data type.

Data Layering.

Data density.

All case study participants agreed the lack of knowledge and process has been the major block in their previous attempts to move to Precision Agriculture.

Previous attempts to gain knowledge from various sources has proven to be a difficult task. There are many conflicting opinions about who is responsible for knowledge delivery and the way it should be delivered. All participants expressed being extremely frustrated and confused by this process.

My Data Management Part II

The delivery of knowledge and process

One of the major blockers in PA adoption is a lack of knowledge, we will be delivering a case study specific knowledge/training in these key areas.

1. Digital readiness – planning and process
2. Data privacy and ownership.
3. Computing skills 101. (best practice)
4. Existing data layers.
5. Identifying and documenting current machine, hardware and software capabilities.
6. Best fit process. (avoiding the pitfalls)
7. Working with my agronomist. (important data layers)
8. Working with contractors. (what to ask?)
9. Map generation software. (best fit, subscriptions, navigation)
10. Data management process – generation, collection, storage and sharing.
11. Integration of data management process into existing machine management processes.
12. Process sustainability.
13. Planning for the future.
14. Support group. (getting the right support, setting up your group)