Modernising rice data collection

By David Troldahl
October 2017
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AgriFutures Australia is the new trading name for Rural Industries Research & Development Corporation (RIRDC), a statutory authority of the Federal Government established by the Primary Industries Research and Development Act 1989.
Foreword

This publication reports on the Modernising Rice Data Collection Project. The objective of this project is to modernise the way data is collected from growers to avoid duplication and to encourage the uptake of the use of MapRice.

NSW DPI and SunRice want to work together to get the most out of data collected from growers and avoid duplication of data collected from growers. The resultant outcome from the two organisations working together is a web based solution addressing the data collection and duplication issues.

This project benefits all rice industry stakeholders from SunRice and Australian Grain Storage (AGS) to growers, advisors, researchers and other organisations involved directly or indirectly with the industry. This project was funded from industry revenue to AgriFutures Australia, which is matched by funds provided by the Australian Government.

This report, for the Rice R&D Program, is an addition to AgriFutures Australia’s diverse range of over 2000 research publications and it forms part of our Growing Profitability arena, which aims to enhance the profitability and sustainability of our levied rural industries.

Most of AgriFutures Australia’s publications are available for viewing, free downloading or purchasing online at www.agrifutures.com.au. Purchases can also be made by phoning 1300 634 313.

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Managing Director
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Abbreviations

RIRDC Rural Industries Research and Development Corporation
GIS Geographic Information System
MapRice Sunrice GIS
AGS Australian Grains Storage
MIL Murrumbidgee Irrigation Limited
CI Coleambally irrigation
MI Murray Irrigation
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Executive Summary

What the report is about

This report looks at the roll out, implementation and grower uptake of the Sunrice Geographical Information System (GIS) known as MapRice. This research project was an opportunity for Sunrice and NSW DPI to work together and simplify the collection of crop related data using a web based program.

Who is the report targeted at?

The report is targeted at rice farmers and commercial agronomists record keeping for rice growers.

Where are the relevant industries located in Australia?

The rice industry is based in the Irrigated South-West Region of NSW. There are approximately 1000 farming enterprises that produce rice with the major production areas around the towns of Leeton, Griffith and Coleambally in the North of the Riverina and Finley, Deniliquin and Moulamein in the South.

The rice farming system is the major irrigated farming system in the Murrumbidgee and Murray Valleys, all of these farms would directly benefit from this project. The rice industry has the capacity to produce more than 1 million tonnes of rice each year, from around 100,000 to 130,000 ha. The farm gate value of the industry is $300 million with the total value including export earnings exceeding $1 billion. Australia exports a large percentage of its rice crop to about 70 major international destinations including the Middle East, Japan and Hong Kong.

Background

The Ricecheck database has been underutilised now for a number of years due to a range of factors including the drought and the program format. Moving forward it is still believed that there is a lot of useful information to come out of the Ricecheck survey each year, the more crops included the stronger the confidence in validity of the results.

We are also very aware that growers give their time in providing this data and quick feedback is needed for the Ricecheck system to work. Growers need to be able to use this information to help them learn from the season just gone and make adjustments accordingly for the coming season.

Data entry can be time consuming for both the farmer and those analysing it in its current form. Prior to this project a lot of information was collected from rice growers each year and growers were often answering the same question for a number of surveys so it was proposed to minimise this duplication by having NSW DPI and SunRice work together on a single data collection system. A centralised single data collection system should reduce the time it takes to get information back to growers, increase the ease for analysing the data and thereby maximising the data’s usefulness, which may in turn increase grower interest in providing the information that goes into the surveys, which again will strengthen the validity of the results.

Aims/objectives

The objective of this project is to modernise the way data is collected from growers to avoid duplication and to encourage the uptake of the use of MapRice.
Methods used

SunRice now has a web based system, MapRice that can be utilised to fulfil the needs of this project. The system has been developed by Agtrix and is now in use, through a joint initiative between NSW DPI and SunRice this system can be used to build a more reliable data collection system for rice which will help to build on current best management practices.

Results/key findings

- The uptake of MapRice by growers has grown from 62.2% in 2013/14 to 100% in the 2015/16 season.
- Growers fill in crop data only once instead of the multiple surveys used in the past.
- Logistics at harvest for Australian Grain Storage is made simpler as crop areas are already identified.
- Logistics for Sunrice to calculate crop forecasts and hence marketing opportunities have been vastly improved and sped up.
- Identifying research areas through mapping areas of higher or lower yields will be integral for future research projects.

Implications for relevant stakeholders

This project has implications for all those involved in the rice industry from Sunrice and AGS to growers, advisors, researchers and other organisations involved directly or indirectly with the industry. All these stakeholders will benefit from the outcomes of this project.

The successful uptake by growers of MapRice will simplify data collection from growers and give them a computer based record of their cropping systems on farm making future decisions easier with all the information in one place.

The industry will benefit from clearer logistical decisions from generated maps of crop areas which will also improve market forecasts.

Information gathered in MapRice will allow for more targeted research identified by it being easier to analyse the data collected through the program.

Recommendations

The results of this project should be communicated to the AgriFutures Australia Rice Research & Development committee and the rice industry.
Introduction

This research project was an opportunity for Sunrice and NSW DPI to work together and simplify and avoid duplication of the collection of crop related data using a web based program. The roll out, implementation and grower uptake of the Sunrice Geographical Information System (GIS) known as MapRice which has been developed by Agtrix and has been tailored for the Rice industry in Australia (Appendix 1) was the main focus for this project. The project team for the project was from NSW DPI, Sunrice Grower Services and Agtrix P/L Australia. This project has been an iterative process of consultation with rice growers, AGS and other stakeholders by Sunrice Grower services, NSW DPI and Agtrix to encourage the uptake of MapRice by growers.

Current Data Collection by SunRice includes:

- Seed orders: area, variety on each farm;
- Grower survey: confirms area and where sown (end Jan);
- After harvest: tonnes delivered x farm x grower x variety (end June).

Not a lot of data collected by SunRice is on management practices. At present all data collection is paper based and SunRice is moving to a web based data collection system that is also planned to be a portal for provision of research results and other technical information to rice growers.

Current Data Collection from NSW DPI includes:

- Sowing method survey: variety, sowing method & rate, establishment (Nov);
- Rice herbicide survey: herbicides and programs used, variety (Jan);
- NIR Tissue Test data: area, PI date, fresh weights (Dec/Jan);
- Water depth survey: PI date, microspore water depth & timing (Feb/Mar);
- Ricecheck data: preparation, chemicals, sowing data, PI data, water management, harvest information (after harvest).

Data collected by NSW DPI is more about management practices. At present all data collection is paper based and in a database not in a user friendly format. NSW DPI wants to move to a web based system.

There is an opportunity for NSW DPI to access SunRice information (subject to authorisation by the rice grower) such as the NIR database, establishment information and grain yield information to minimise what we need to try and collect off growers.

The resultant outcome from the two organisations working together would be a web based solution addressing the data collection and duplication issue. This would also allow the opportunity to investigate development of an App for smartphones and pads to enhance the entry of data in the future.

The outcomes of the project are:

- To access rice crop information already provided by growers to SunRice and NSW DPI and input it into a more user friendly data collection system resulting in reduced duplication of acquired data;
- To increase the usefulness of benchmarked data through a more user friendly data collection system, allowing more timely feedback to growers and industry stakeholders;
• Increase the uptake of growers using the database to 500 within the first year;
• Provide a quick turnaround of analysis for growers, researchers, advisors and the industry so as best management practices can be fine-tuned and issues can be further investigated before the following season;
• Increase research exposure through modern media e.g. video, phone applications; and
• Deliver research results and other technical information through a web based portal to be part of the MapRice system.

Objectives

1. Make MapRice system functional.
2. Develop data reporting system.
3. Develop functionality for the NIR Tissue test.
4. Develop applications for modern media.

Methodology

The methodology for achieving the outcomes related to the project was through training and engagement with the growers, industry representatives and GIS development personnel.

Throughout the project from the day MapRice was released there were opportunities for growers to gain help from Sunrice Grower services, AGS, Rice Extension and NSW DPI staff to enter paddock boundaries and sowing information into the MapRice program.
Season 1

The Sunrice GIS was launched in October 2013, for this first year pure seed growers had to use the GIS to qualify for pure seed growing bonuses. This was a way of testing the system with a guarantee that some growers would use the GIS and to get feedback from these growers as to how the system worked, what was good and what needed improvement. These growers formed the basis for the grower panel. There was some basic training and help provided to all growers at various venues throughout the year.

The appointment of a rice grower advisory panel was an important first step. Five growers mainly pure seed growers were approached to be involved in the project as an advisory panel giving feedback as to how well the system worked and how it could be improved.

![Figure 1. Screen shots of the MapRice program showing paddock mapping and crop detail form.](image)

In this first phase of the GIS farm and paddock boundaries had to be entered and then authenticated. Agtrix personnel worked with Sunrice grower services in lieu of employing a technical person to digitize paddock boundaries they also ironed out any technical problems that arose with the GIS as Sunrice grower services, NSW DPI personnel and rice growers used the system and identified problem areas. This ensured as much as possible that when the majority of growers used the GIS that it was as problem free as possible.

An approach was made to Murrumbidgee Irrigation Limited, Coleambally Irrigation and Murray Irrigation to ask for access to their farm and paddock boundary records for rice growing areas. These companies have to map these areas on a yearly basis to calculate water usage and it seemed that if the GIS could supply this information once up and running it would be a large time and cost saving for the irrigation companies and once again stop duplication of information being accessed from growers.

Sunrice Grower Services then signed Memorandum of Understandings with Murray Irrigation in relation to sharing this information using the information gathered through the GIS and as
a result MI and CICL have supplied shape files of the paddocks that have previously had rice recorded digitally and these have been added to the GIS program. There were some issues that occurred when these files were loaded, as some of these paddock boundaries and the farm boundaries overlapped causing errors that needed to be adjusted. Some of these paddocks have also been redesigned and are not relevant to what is now there. Unfortunately we have experienced difficulty obtaining similar information from Murrumbidgee Irrigation Limited. A user guide was developed and sent out to all growers to help with data entry.

A GIS review meeting was held in March 2014 to explore ways to make it easier for growers to enter their own paddock boundaries into the system and to rework the data forms for sowing details, fertilisers and chemicals for easier data entry. The crop details form was found to be overcomplicated and has been changed and refined subsequently. The major issue for growers was that although they could enter their paddock boundary data, these had to be authenticated before they could enter their sowing data. Nevertheless by the end of the first year of use the GIS had 62.2% of growers sowing details entered into the system. The remaining crop data was recorded by phone survey with no mapping of the paddocks.
Season 2

Once again it was compulsory for pure seed growers to fill in their paddock and sowing details. Report cards were generated from MapRice for these pure seed growers paddocks from information gathered from field inspections that had been carried out throughout the season.

The Crop Survey circular was sent to growers in late November requesting crop details no later than Friday 12 December 2014. A user guide was again sent out to growers with instructions on how to use as well as contact details of how to get help. When this information was sent to growers they were given the option of entering the data directly onto the web or drawing their crop areas on a map that was provided and fill in a paper based system with a form that included paddock history, varieties sown, planting date, area sown and area, and variety re-sown if any, this information was then entered manually by Grower Services.

Figure 2. Map showing sowing dates and location of all Reiziq crops.

There was a meeting between Sunrice, NSW DPI, Agtrix and the grower panel where uptake issues and how to encourage growers to use Maprice were discussed. The outcomes are documented below:

On-line entry of data was lower than expected and the issues raised include:

- Internet access and speed
- Time taken to get on system (going through SunRice rather than directly onto Agdat)
- Value to growers (have been keeping information in their head for so long now why change)
• Name of system scaring people off (change to MapRice along lines of Cotton Map?)

• Number of growers who are not able to use computers and have no interest in learning

• Farm boundaries not correct and then not being allowed to draw paddocks outside farm boundaries

Options put forward to increase grower uptake were:

• Increase efforts to develop off-line program that updates automatically when in range (will work on mobile device such as phone or tablet)

• Incentivise input of information via the web by:
  – Reducing seed cost,
  – Including GIS as part of the quality specifications, for inputting sowing, chemical and fertiliser details (has been used in other industries when introducing QA programs)

• Incentivise input of information via the web by third parties such as aerial operators or agronomic advisers

• Develop relationships with aerial operators to share information so that Grower Services can enter information

• Ask for survey data earlier in season such as mid-November (program does allow growers to put information in at any-time), this should allow for more time to follow up non users and enter via Grower Services

• Increase training using Rice Extension Team.

• Visit growers on an individual bases and enter all paddocks and names so that information can be entered later over the phone or with a quick visit.

• Dedicated resource fully focused on GIS with casual team employed from pre-plant to end of December

• Have Normalised Difference Vegetation Index NDVI images available to growers prior to Panicle Initiation PI (work under way to have this completed for multiple providers)

• Increase reports available to growers

• Improve multi crop functions

After the second year of MapRice 58.3% of growers sowing details were entered on-line. The lower results are partially related to fewer growers entering their own data as well as SunRice grower services not being able to follow-up with growers to enter data this season as they did in both the previous and subsequent seasons.
Season 3

In the 2015/16 season growers were not given the option of a paper based survey and were asked to enter their planting details into MapRice with an incentive of a 10% rebate on their seed used, to try and increase the uptake from growers and capture the information prior to 30 November. User guides were updated again and sent out to help growers with data entry (Appendix 3).

The Sunrice GIS was rebadged as MapRice which was similar to Cotton Map and was thought that it might be less confronting to the growers. There were 48% of the paddocks information entered prior to the 30 November, this was an increase of 11% from the two previous attempts to get the information using this method. Jeb Hutchison from AGS was a great help in contacting growers and getting paddock information into MapRice.

The MapRice program currently has 100% of the known rice crops planting details entered. This includes information on paddock location, variety sown, planting date, rate and sowing method.
Rice meetings, field days and training days

Each season presentations were given at the six rice pre-season rice meetings held at Whitton, Griffith, Coleambally, Wakool, Deniliquin and Finley. There was also the opportunity at these meetings to enter data into MapRice.

There were three Rice Industry Field Days held at “Old Coree”, Jerilderie where MapRice was promoted and in 2016 Field day there was a poster presentation.

Throughout the project there were a number of field walks and information days that MapRice was talked about and promoted.

In the last two seasons there were a number of training days and days where growers could get data entered into MapRice.

Rice pre-season meeting – 18 meetings, 813 farmers/agronomists attended

Rice Industry Field Days – 3 field days, 915 farmers/agronomist attended (Appendix 2)

Field walks and training days – 10 days, 97 farmers/agronomists attended

Table 1. Percentage uptake of Maprice over the three seasons.

<table>
<thead>
<tr>
<th>Season</th>
<th>No. of Farms</th>
<th>No. Paddocks entered by Growers</th>
<th>No. Paddocks entered by Grower Services</th>
<th>Total No. Paddocks entered</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013/14</td>
<td>306</td>
<td>23.6%</td>
<td>38.3%</td>
<td>62.2%</td>
</tr>
<tr>
<td>2014/15</td>
<td>242</td>
<td>21.8%</td>
<td>36.5%</td>
<td>58.3%</td>
</tr>
<tr>
<td>2015/16</td>
<td>403</td>
<td>32%</td>
<td>68%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Future developments

The AgDat Web platform was developed on Microsoft Silverlight to provide a rich user experience with the web mapping functionality. This technology is not being supported in the future by most of the currently popular internet browsers, and needs to be replaced with another technology.

Agtrix is looking to replace the current Silverlight AgDat Web with a “Click-once” application that will allow advisors and growers to download a customised but functional GIS to interface with the central databases. This has the advantage that paddocks and crops will be able to be captured and verified on-line, as well as being more tolerant of slow or interrupted internet connections. This will be augmented by the mobile app that will allow growers to record the same data as can be collected in the click-once application, but only against a point or an existing paddock. This app is available for iOS, Android and Windows phones or tablets.
Results

Objective 1: Make MapRice system functional

Working with Agtrix and Sunrice grower services to authenticate the paddock and farm boundaries and with the files from Murray Irrigation and Coleambally Irrigation we have been able to achieve a very usable and functional system. The entering of the farm and paddock boundaries has been a problem for growers particularly with connectivity problems or technology issues. But as more farm and paddock boundaries are entered and authenticated MapRice will become more functional. This means that to record a rice crop, a grower only has to select the field and fill out the details of what is being grown. This approach, along with a financial incentive offered to growers that entered their data, led to a higher participation rate of growers entering their own data.

The streamlining of the sowing, fertiliser and chemical forms has improved over the three years with regular communications with Agtrix and feedback from the grower panel and all users contributing to this improvement in functionality.

Objective 2: Develop data reporting system

An original objective of the project was to enable growers to record their information for the Rice Check program and to be able to:

- provide the required reporting digitally,
- use the recorded data for any other reporting requirements without having to fill out more forms (e.g. Spray Diaries)
- provide the rice industry extension program to have visibility of the practices used to help their growers improve their practices both financially and environmentally.

A set of data recording contexts were set up in AgDat Web (and thus available on the mobile in the last year) to allow growers to do this.

Data “Contexts” or forms were set up to allow growers to record:

- AgChem Applications
- Crop Intentions
- Draw Paddocks
- Fertiliser
- Irrigation
- Planting Details
- (View only) Seed Crop Score Card
- Soil Information
- Water Management
Once the data was recorded once, it could be printed in formats suited to the various reporting requirements.

Agtrix are now able to interrogate MapRice and set up a range of output reports useful to growers, AGS, Sunrice or researchers. Below is a graphic produced from data entered into MapRice. This is a logistics calculation for AGS at their receival depots of Benerembah and Deniliquin.

Figure 4. Estimated receivals by week starting, for Benerembah and Deniliquin.

A report that is available to growers is the spray diary record which is produced after filling in the chemical data and this is classified as a legal document for the grower to document their spray records.

Figure 5. Spray diary record report.
Objective 3: Develop functionality for the NIR tissue test

Since this project commenced Sunrice has made the decision not to develop functionality for the NIR tissue test due to promising developments in assessing crop nitrogen requirements using other technology. It was therefore decided that the cost of developing functionality for the incorporation of the NIR tissue test into MapRice was not warranted given the likelihood that this technology would soon be replaced.

Objective 4: Develop applications for modern media

Agtrix has developed a mobile App that allows growers and advisers to enter data whilst not connected to the internet and this will update to the website when connectivity is achieved. This App is being tested and needs to be fully functional before release so that growers and advisers can use the App without teething problems (see Agtrix report Appendix 3).
Implications and Recommendations

Benefits

Economic

MapRice can be used to improve rice profitability and sustainability by promoting best management practice for growing rice. The key best management practices that contribute to the profitability and the sustainability of growing rice are able to be identified through the web based data collection.

Social

Sharing of information generated from MapRice between growers and research/extension staff and other stakeholders of the rice industry will provide a means of updating best management practices and identify areas that may require either further research or extension.

Environmental

The data collected and information generated from MapRice promotes best management practices of rice growing and incorporates positive benefits for natural resources. There are reduced risks of natural resource degradation through higher water productivity (shorter season varieties, delayed permanent water) and the promotion of best management practice in crops following rice to utilise residual moisture.

Recommendations

1. It is important that the uptake of the use by growers of MapRice continues to be encouraged.

2. The output data from MapRice needs to be analysed to identify areas for improvement but also areas of high performance and related issues, including identifying critical control points in the rice production to appraisal chain. This would inform decisions on research topics and priorities, as well as logistical issues.

3. The output data should be analysed to evaluate research adoption and improved performance after specific interventions or changes of practice.

4. The future release of any web based program or App needs to be fully tested, functional and logical for all users to avoid any technical issues that put-off growers.

5. The Manage Rice crop modelling program is an important tool to be incorporated into the MapRice system.
Appendix 1. Agtrix System Description

The system currently used consists of 3/4 components (see Figure 6).

AgDat Web – which provides a web interface to a mapping web site to allow growers as well as advisors (or even office staff) to record map fields and record where rice is grown; as well as chemical and nutrient applications.

AgDat Pro – a local application that synchronises the data that is on the web to a local machine so that it is available for the GIS mapping program, and from which reports can be extracted.

FarmMap/ CHOMP – a customised GIS to enable staff to be trained in the use of GIS to capture the fields and record the crop grown from information supplied. Automated import systems were developed to bring the data recorded on the web into the GIS, including integrity checking.

AgDat Mobile – a mobile phone app to allow growers to record crop details as well as the same data recordings as available for AgDat Web, e.g. chemical and nutrient applications etc. Data recorded for crop details in AgDat Mobile is available to the GIS through the same pathways as AgDat.
Figure 6. Schematic diagram of the products used, their function and their relationships.
Appendix 2. Field day poster 2016

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David Trolldahl

MapRice GIS:
- 100% Rice crops entered 2015/16 season.

- Output Maps from Maprice

- Reports from MapRice

Estimated delivery times and varieties at Willunga 2016
MapRice GIS user guide
November 2015

1. **First time users: Install Microsoft Silverlight**


   Note: The installation of Silverlight will only occur the first time the mapping application is opened on a particular computer.

2. **Logging In**

   First up, make sure you are able to connect to the internet and can bring up a web browser. Use the Internet Explorer program on a Windows computer. MapRice will NOT work with Apple, on a tablet or in other programs such as Google Chrome.

   Go to the SunRice Web site: [www.sunrice.com.au](http://www.sunrice.com.au) and click on the Grower Services tab at the top of the page. Then click the “Log into Grower Services” button. Alternatively, you can enter the following address into your web browser (you can save this address in your Favourites to make it easier next time).


   If you have forgotten your password, please contact Grower Services on 1800 654 997 to be issued with a new password (you will need your unique grower number found on your SunRice Financial Statement).

   Locate the SunRice GIS icon in the upper right corner and launch the SunRice GIS program.
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