Growers identify that knowledge and confidence in management decisions are major constraints to profitable productivity improvement in the higher rainfall areas of Western Australia

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Abstract
During the 2010 season, grain growers from across the Western Australian southern higher rainfall areas were consulted in a series of interactive workshops designed to identify constraints to improving productivity and profitability. More than 94% of the growers believed there was significant room for improvement in their business. Similar constraints were grouped with the most important groups of these being soil management with 54% of all votes cast by workshop participants. Specific constraints of high importance were non-wetting soils and herbicide resistance. Other common constraints in order of decreasing priority included input efficiencies, soil acidity, soil constraints knowledge, soil water storage, and waterlogging. Growers identified more than 50 constraints during the workshops that can be grouped into four key themes; knowledge, confidence, time and money. Although the latter two, lack of time and insufficient money, can be neutralised by greater knowledge and improved confidence. For the adoption of any new technology or information to overcome a constraint all of these four themes must be adequately addressed.

Key Words
constraints, productivity, adoption barriers

Introduction

It is often perceived that access to relevant information is one of the key challenges to growers acquiring and adopting improved management techniques that lead to improved profitability and long term business and environmental sustainability. Much of the information that growers encounter, such as for soil management or water quality, is not suitable to their enterprises, environments or resources. For grain growers in Western Australia (WA) this is a regular occurrence where new techniques or research from across the world often don't translate well to WA conditions. WA growers are continuously searching for new information that may benefit their business and they have become adept at filtering what is likely or unlikely to be useful.

In 2010 the Department of Primary Industries and Regional Development (DPIRD) initiated a project to consult growers on what they considered were the barriers to profitable improvement in productivity for their businesses. It was thought that if the existing knowledge of growers and the wider industry could be more effectively shared, then many of these barriers can be overcome by accessing the experience of others. The first question that the project sought to answer was "What are the barriers to profitable productivity increases for growers in the higher rainfall (>350mm annual rainfall) areas of south west WA?".

Two strategies for grower consultation were used to answer this question; the first being a detailed telephone survey of WA grain growers' business practices, the second was a series of interactive workshops conducted across the WA grain growing region to identify constraints to production improvement. This paper will focus on the second of these strategies.

Methodology

Facilitated workshops were conducted in 18 locations covering the higher rainfall areas of WA and were hosted by active grower groups (Figure 1). To assist in participant engagement and data collection at all workshop locations except Esperance, an electronic audience response system was used consisting of "TurningPoint" software and response cards from Keepad Interactive (LUL Technology Pty Limited, Homebush, NSW, Australia). The use of electronic response cards enabled participants to anonymously vote for, or provide information on, a presented list of options. Demographic data including occupation, agricultural experience and annual cropping area was collected for all locations except Esperance before participants were asked to develop a list of constraints to increased crop production. Once the participants developed the constraints list, they ranked the importance of constraints for their workshop location using the electronic response cards. The highest ranked constraints were discussed in more detail to explore constraint adoption barriers to new technology or information that could be used to address the constraints. For the Esperance workshop a similar process was conducted without the aid of the electronic response cards.

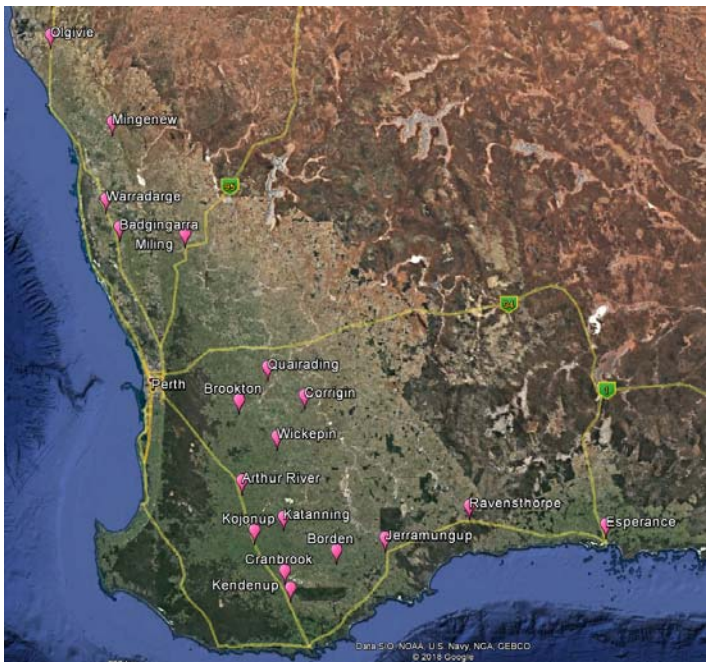

Figure 1. Locations for grower constraints workshops conducted during 2010.

Results and Discussion

Demographics

Of the 269 participants that took part in the consultation workshops (excluding Esperance), more than 82% were growers. The remaining 18% of participants were a mix of professionals directly servicing growers (11%) or other people interested in agriculture (7%). There was a relatively even spread of experience with approximately 25% of participants in each decadal brackets but more participants had greater than 30 years experience than any other experience bracket (Figure 2). While most workshop locations had participants with a range of experience, Jerramungup was different with more than 70% of participants with less than 10 years agricultural experience and no participants with more than 30 years of experience. Of the 214 participants that were growers, 58% cropped less than 2000 hectares annually, and 20% cropped more than 3000 hectares at the time of the workshop consultation. On a group by group basis, only six of the workshop groups had more than half of the growers annually cropping more than 2000 hectares.

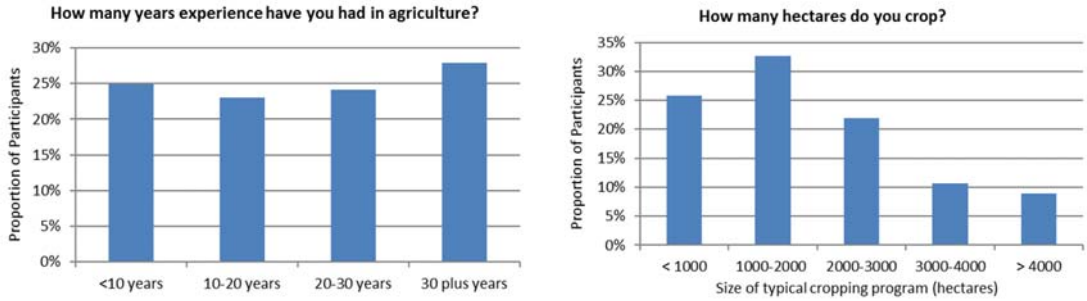

Figure 2. Demographic results for level of agricultural experience (left) and the size of typical annual cropping program (right).

Constraints

In small groups, participants discussed and recorded all of the specific constraints to productivity increases for farm businesses in their area. Participants were requested to be as specific as possible when describing the constraints and to focus on constraints that are manageable with existing resources and could be influenced over the next three to five years. The constraints identified from this small group discussion were then shared with the wider group. Any constraints that were considered to be unmanageable, such as "lack of rain", were removed from discussion and the remaining constraints were grouped where possible.

The grouped constraints were discussed and ranked in order of importance with the 10 (or less) most important constraints voted on by participants using the electronic response cards. Across all 18 workshops, almost 50 constraint topics were identified for inclusion in the voting process. Many of these constraints were similar from one group to another and a summary of these constraints is shown in Table 2.
This process of consolidation from a large number of locally specific constraints to small numbers of amorphous constraints, highlights the disconnect that many growers feel exists between their business and the priorities of funding or government organisations when these organisations publish short lists of priorities that cover all grain growing areas of WA.

Table 2. Constraints summary as identified from consultation and percent of total votes.

Summarised constraints	**Examples of constraints raised by workshop groups**	**% votes**
Plant-water-soil relationships	Non-wetting, establishment, waterlogging, water holding capacity, water use efficiency	26
Nutrient efficiency and management	Management decisions, optimum application rates, canopy management, nutrient availability, nutrient efficiency	15
Managing soils	Acidity, organic matter, soil biology, physical limitations, identifying soil constraints, soil variation, soil structure	13
Crop protection	Herbicide resistance, staggered germinations, efficacy, diseases, insects, in-crop weed management	18
Agronomy	Rotation management, profitable legumes, crop tolerance to abiotic stress, dry sowing, frost management, locally adapted crop varieties	18
Management	Fitting crops and livestock into system, enterprise synergism, matching inputs to yields, risk management, paddock variability, technology limitations, forecasting and climate variability, staff	10

Of the six constraints summarised in Table 2, the first three of these relate to soil management and account for 54% of all votes cast by workshop participants. This highlights a large awareness of the importance of soil management in producing grain crops when rainfall is one of the most limiting factors. The fact that soil management was identified by most growers as a constraint for their business at these 2010 workshops, and is a current priority of the Grains Research and Development Corporation (GRDC), reflects the ongoing demand for relevant soil management information.

From the voting process outlined above, between one and three of the constraints most voted by participants in each workshop was discussed in detail via the following questions;

1. What technologies have participants tried in order to address the constraint?
2. What barriers have participants had to overcome in order to adopt the new technologies?
3. What technologies would participants like to try in the future to address the constraint?
4. What barriers currently exist that have stopped participants from trying these technologies?

This process not only provided an opportunity for participants to pose questions and learn from each other, but it also identified gaps in the participant's collective knowledge. This process identified a list of potential areas for investment that were condensed into 11 main investment areas (Table 3). Many of these have been priority areas in the past and continue to attract investment. The number of soil related investment areas again demonstrates the importance that WA growers and industry place on maintaining and developing the soil resource to enable long term productivity improvements.

Table 3. Investment areas identified by workshop participants.

Soil water repellence	Herbicide resistance management
Soil constraints (general)	Integrated weed management and technologies
Soil biology	Climate risk management (eg predictions, frost)
Soil acidity and liming	Staff management and skill development
Soil chemistry and plant nutrition	Rotations, pastures and mixed enterprises
Soil water management	

Constraint themes

During the course of conducting the workshops and the subsequent workshop analysis, four consistent themes in the constraints became evident. For all of the technology and management options that were identified to address the constraints to production, the four themes of Knowledge, Confidence, Money (cost) and Time could be used to group the adoption barriers identified by participants. Some of the barriers

occurred within more than one of these four themes. A similar conclusion was reached by Cann et al (2018) from a recent online survey of agribusiness consultants and advisors from a range of industries across Australia. These four themes have a logical sequence and all four themes need to be addressed before a new technology or management option is fully adopted.
The simple logic is, KNOWLEDGE builds the CONFIDENCE to invest the MONEY and allocate the TIME to adopt the new technology (Figure 3). If any one of these themes is not adequately addressed, then any new technology or information will not be adopted.

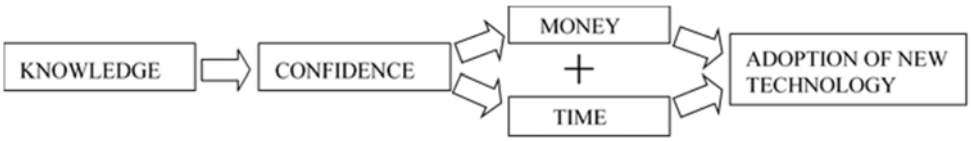

Figure 3. Logical process for the adoption of new technology.

The most important of these constraint themes is "knowledge". Without adequate knowledge of either the constraint or potential solutions to overcome the constraint, there will be insufficient confidence that the desired outcome of adoption will be realised. Furthermore, when confidence in the adoption outcome is reduced, the grower is then even more reluctant to invest either time or money into the adoption process. Most often growers improve their knowledge, and hence confidence, through small scale testing within their business. This small scale testing and evaluation, combined with learning off-farm, will continue until enough knowledge and confidence is acquired to make a decision whether to invest in the new technology or not. Growers can increase their level of confidence in a solution to a constraint, even without a significant increase in their own knowledge, through the trust in others that are believed to be knowledgeable. These other people, whether they are researchers, consultants, agribusiness or growers, when sharing knowledge must ensure that their own level of knowledge is sufficient to understand all of the risks and advantages of any planned change in management. Failure to do this could not only result in lost confidence in their level of knowledge, but it could also be costly in both money and time to the grower concerned.

Conclusions

For anyone to adopt a new technology, whether they are a grower or in a different type of business, the most critical factor to ensure successful adoption is knowledge. Having sufficient knowledge gives decision makers the confidence to invest time and money towards the adoption process. In agricultural businesses this investment could be significant and unsuccessful adoption outcomes can result in great financial and personal cost. Any person who supplies information or advice to growers that enables the increased knowledge and confidence required to complete the adoption process, must understand that their own level of knowledge and confidence must be sufficient to warrant the trust of the grower. Otherwise, not only will the grower suffer business consequences, but the advisor will risk losing the trust of the industry.

References

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