Factors affecting planting decisions in Central Queensland farming systems- lessons from on-farm research

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Abstract

Two on-farm trials were established to compare a 'conservative' cropping approach (crops planted on a full profile of moisture and in a 'traditional' planting window) and an 'aggressive' cropping approach (crops planted whenever a reasonable planting opportunity was available). Neither approach has been shown to be consistently better than the other in terms of gross margin during the life of these trials; however the trials have provided significant insights into farmer decision making.

The 'conservative' cropping treatment has reflected common practice amongst farmers, which has become increasingly more aggressive in recent years due to drought conditions. This has been possible due to improved farming practices including zero tillage, wide rows, higher plant populations and better planting equipment. The trials have highlighted that in practice, cropping decisions are not only based on soil moisture but a variety of management factors including ground cover, weed control, farmer preference, grain price, machinery and labour capacity and capability. This has implications for potential farming system simulation projects as it emphasises the limitations of modelling the two approaches based on soil moisture alone.

This paper outlines the factors influencing planting decisions in central Queensland grain farming systems, drawn from the experiences with these farming systems trials.

Keywords

planting decisions, central Queensland

Introduction

Planned crop rotations are difficult to implement in central Queensland grain cropping systems due to the extreme levels of climatic variability that exists. The decisions if and what to plant are governed by a wide range of factors. Traditional practice has been to delay planting until a near full profile of soil water is present to maximise the chance of producing a profitable crop, however in a variable climatic environment, this practice can result in missed cropping opportunities.

In 1997 two grower groups working with the Central Queensland Sustainable Farming Systems Project (CQSFSP) identified approaches to cropping decisions among their priority issues. Most members of the Gindie grower group were committed to minimum till/zero till farming practices, but all agreed there was still much to learn in terms of cropping frequency, crop rotations and water use efficiency. Some group members believed in conventional planting windows, and others were more aggressive, in that they viewed a reasonable profile of moisture as an opportunity to grow something, regardless of the time of year. The group was very keen to compare both systems side by side under a zero till regime. Several group members expressed desires to maximise use of the limited and erratic rainfall that they receive so the aggressive treatment was designed to trial this (McCosker, 2002). The Capella group also wanted to compare the economics of an aggressive cropping system against a more conservative one (Kuskie, 2002).

This paper reports some results from on-farm trials established to investigate the impact of 'aggressiveness' of crop planting decisions on profitability and sustainability of CQ farming systems and identifies the range of factors that have been shown to influence planting decisions.

Methods

On farm trials were established at 'Moonggoo' Capella in 1998 and 'Kilmore' Gindie in 2000. The 'Moonggoo' site is dominated by a black vertosol with an average depth of 90cm and slope of approximately 1%, and has been farmed since 1950. The 'Kilmore' site is on a fertile brown vertosol with an average depth of 120 cm and slope less than 1%, and has been farmed since 1985.

The trials consist of two treatments: A conservative treatment where we aimed to plant on a full profile of moisture and in a traditional planting window; and an aggressive treatment, to be planted whenever a reasonable planting opportunity occurs. In reality, both are managed using an opportunity cropping system based on rainfall, however the aggressive treatment has had more crops planted in more moisture limiting situations compared with the conservative treatment. The conservative treatment has also had some crops planted on less then full moisture profiles, but it has been a reflection of common practice amongst the farmers. The trial sites cover 230 ha at 'Moonggoo' and 28 ha at 'Kilmore'.

The following measurements were taken for every crop at each site: plant population; grain yield and protein; screenings; test weight; plant available water (PAW) and soil N levels at planting and harvest; and in-crop rain. Gross margins were calculated after each crop using grain prices and input costs applying at the time.

Plant available water capacity (PAWC) down to 90cm is 170mm at 'Moonggoo' and 180mm at 'Kilmore'. When the trial first commenced soil sampling equipment was limited to a 90cm depth, therefore all PAW measurements are all calculated down to 90cm for consistency.

Results

Table 1. % moisture profile at planting (PAW/PAWC to 90cm depth) and gross margin ($/ha) for conservative and aggressive cropping decisions.

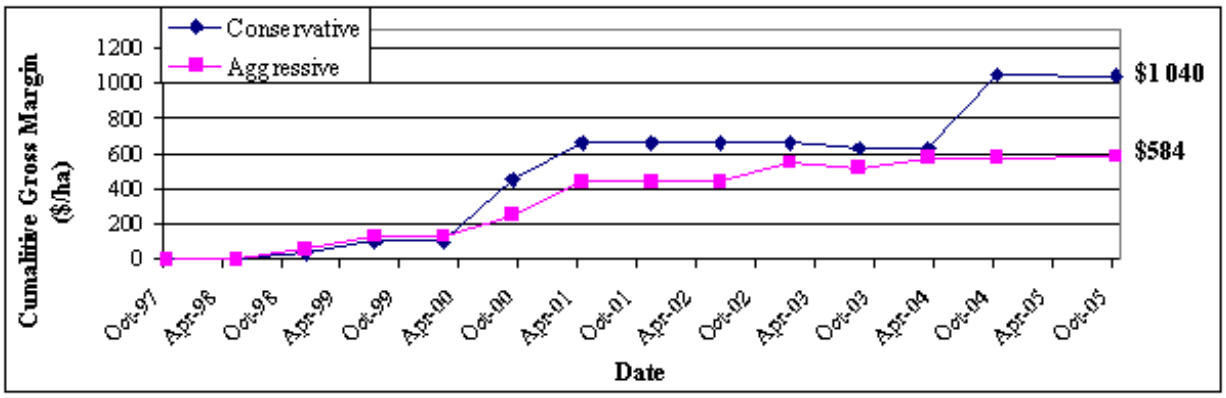
a. Moonggoo' Cropping History 1998 – 2006

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Conservative												
1998					Wheat 58%			$32/ha				
1999	Sunflower 66%				$70/ha							
2000					Wheat 10%				$349/ ha			
2001	Sunflower 59%				$210/ha							
2002												
2003					Chickpea 18%				$-30/ha			
2004	Sorghum 45%					$420/ha						
2005					Wheat 18%					-$11/ha		
Aggressive												
1998		Sunflower 39%					$56/ha					
1999	Sorghum 76%			$74/ha								
2000	Sorghum 79%				$121/ha							
2001	Sorghum 51%				$190/ha							
2002							Wheat 22%			$109/ha		
2003					Chickpea 13%				-$33/ha			
2004	Mungbean 26%				$58/ha							
2005					Wheat 11%					$9/ha		

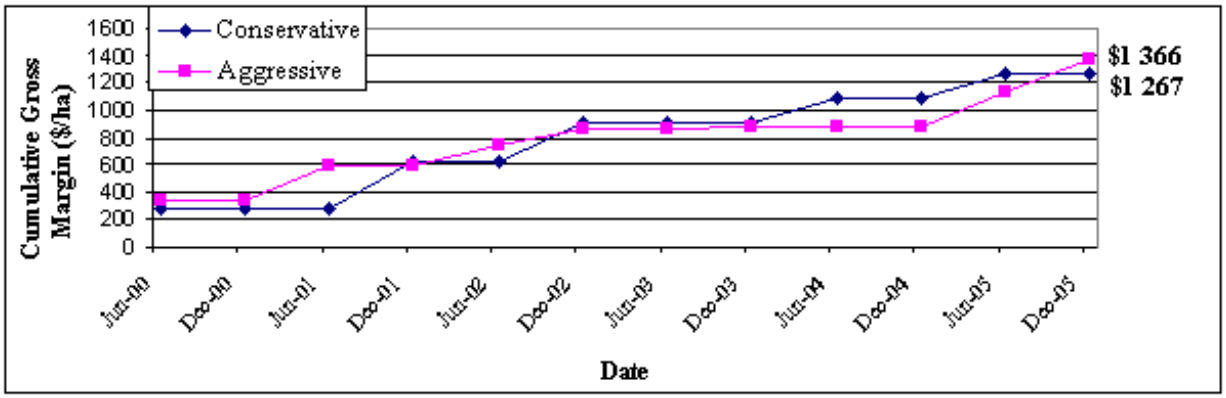
b. 'Kilmore' Cropping History 2000 – 2006

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Conservative												
2000	Sorghum 40%					$279/ha						
2001					Wheat 48%			$334/ha				
2002						Wheat 46%			$299/ha			
2003												
2004	Sorghum 41%				$168/ha							
2005	Sorghum 25%			$187/ha								
Aggressive												
2000	Sorghum 49%					$337/ha						
2001	Sorghum 42%			$255/ha								
2002	Sorghum 23%	$155/ha				Wheat 23%			$124/ha			
2003									Sorghum 29%			$12/ha
2004												
2005	Sorghum 18%			$244/ha	Wheat 26%			$262/ha				

At 'Moonggoo' the conservative treatment produced 7 crops and the aggressive treatment 8 crops (Table 1). At 'Kilmore' the conservative treatment produced 5 crops and the aggressive treatment 7 crops (Table 2). Neither cropping system approach was consistently better than the other in terms of gross margin. The conservative approach is currently more profitable at 'Moonggoo', while the aggressive approach slightly ahead at 'Kilmore' (Figures 1 and 2)



a. 'Moonggoo' site



b. 'Kilmore' site.

Figure 1: Cumulative gross margins of conservative and aggressive systems at the 'Moonggoo' site (a.) and the . 'Kilmore' site (b.).

Discussion

Farmer groups involved with these trials have a preference for large scale on-farm trials, however the owners have an interest in ensuring the large trial area is profitable. This had implications for planting decisions made. For example, if we waited for a full profile of moisture to plant the conservative treatments, there would have been few crops in that treatment during the life of the trial (Tables 1 & 2). Instead, the 'conservative' cropping treatments have reflected common practice amongst farmers which has become increasingly more 'aggressive' in recent years due to drought conditions. Improved farming practices, including zero tillage, wide rows, higher plant populations and better planting equipment have also contributed to farmers successfully making more aggressive planting decisions.

The conservative approach is currently more profitable at 'Moonggoo', largely due to a high yielding sorghum crop returning $420/ha in the conservative treatment and a poor yielding mungbean crop returning $58/ha in the aggressive treatment in 2004 (Table 1; Figure 1). The decision to plant mungbeans was based on the opportunity they provide to double crop into wheat should we get the rain. Mungbeans are a quick growing crop with potential high returns. Unfortunately, the in-crop rain received was insufficient for a highly profitable crop and there was no planting rain in winter for a double crop situation. This shows how one exceptionally high or low-yielding crop in a crop rotation or sequence can significantly influence long-term profitability, regardless of whether conservative or aggressive planting decisions are made along the way.

An annual grass weed problem developed at 'Moonggoo' in the aggressive treatment, when herbicides failed to control sweet summer grass (*Brachiaria eruciformis)* in three successive opportunity-cropped sorghum crops. This necessitated aggressive planting decisions to sow winter crops in 2002 and 2003 to enable the summer grass to be controlled during the summer fallow (Table 1). A missed double-crop opportunity to plant chickpea into good moisture after sorghum harvest at 'Moonggoo' in 2000 (a year of exceptionally high chickpea yields and prices in the district) resulted in a lost profit opportunity in the aggressive treatment, mainly because of machinery and labour short-comings.

The trials have highlighted that, in practice, cropping decisions are not only based on soil moisture but a variety of management factors including ground cover, weed control, farmer preference, crop rotation, grain price, machinery and labour capability, stored seed and seasonal forecast. For example, in 2005 wheat was planted at 'Kilmore' on a low moisture profile (Table 2). Following the season a discussion was held with the farming systems group about taking risks at planting and what influences their decision to

plant. It was interesting that the owners felt they had no option but to plant, and were not concerned about the risk of planting wheat on low soil moisture levels due to a number of factors:

- The fallow was very bare and wind erosion was occurring. Providing stubble cover was vital and a major driver in the decision;
- Excellent planting rain (100mm) was received to ensure establishment and early growth and they were confident that some in-crop rain was likely;
- Wheat seed was on hand and would deteriorate if stored until the following year;
- If wheat was not planted, it would cost money to control weeds in the fallow; and
- The relative cost of planting was small in comparison to the fixed costs of the enterprise.

This aggressive planting decision produced a highly profitable wheat crop returning $262/ha which is responsible for pushing the aggressive treatment slightly ahead at 'Kilmore' (Table 2; Figure 2). This reasserts that one crop can have a significant impact on the cumulative gross margin.

Conclusions

Growers waiting for a full profile to plant on in recent dry seasons may have missed several planting opportunities which would have a large impact on enterprise profitability. Drought conditions over the last six years have necessitated aggressive planting decisions in terms of soil moisture, especially at 'Moonggoo'. By using practices that both capture and use rainfall more efficiently, growers have developed more confidence in producing profitable crops and hence have become more aggressive in their planting decisions. Furthermore, growers value stubble highly because of its impact on improving soil moisture storage and reducing erosion and, on occasions, will make aggressive planting decisions just to increase stubble levels. The cost of maintaining a fallow rather than planting a crop also needs to be considered when making planting decisions.

Aggressive planting decisions can be as profitable as more conservative decisions in a run of drought seasons, as well as helping to maintain higher stubble cover levels. Every planting decision requires balancing the risk of crop failure with the potential for profit and a range of factors are considered. Some of these factors are unique to each enterprise so the most successful decision will vary between individual enterprises.

References

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