The stepped adoption of grazing crops in Western Australia

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Abstract. The process of adoption of grazing crops into Western Australian mixed grains and livestock farming systems demonstrates how new farming practices can be adopted into large farming systems and outlines the critical style of information and support required at each of the three stages. Grazing crops is the practice of grazing planted crops to be harvested at the end of the growing season. Grazing crop benefits include increased available feed for livestock during winter, increased area sown to crops, increased stocking rates and increased grain income. In the three farming businesses studied by the project, there was a three-step process in the introduction of grazing crops into each farming system. It was: 1) Trialling of grazing crops on a small area (<30ha); 2) grazing one or two paddocks of crop; and 3) incorporation of the practice into the whole farming system. The WA case studies show there are large business profits and farming system benefits to be gained from grazing crops in such a mixed farming system.

Keywords: Grains, sheep, whole-farm benefits, grazing crops.

Grazing crops is the practice of grazing planted crops that will be harvested at the end of the growing season. Work with Grain and Graze 2 in WA has shown that grazing crops can lead to large farming system benefits in Western Australian (WA) mixed farming systems.

Grain and Graze 2 was a National development and extension project funded by the Grains Research and Development Corporation (GRDC) and the Australian Government's Caring for our Country Program between 2010 and 2013. It delivered a range of developmental research and extension activities to promote the interaction of cropping and pasture systems in mixed farming businesses.

Grazing crops, stubble management, summer sowing pastures and pasture cropping were all researched during Grain and Graze 2 in WA. The project explored these practices in the WA farming system by partnering with local consulting agronomists who managed paddock-scale demonstration sites; and a Relative Advantage project officer who supported the demonstration sites with extension and communication activities. This developmental research was complemented by work being undertaken by other research organisations in the State on the same topics over the same time period. In the case of grazing crops, paddock-scale demonstrations were hosted in Esperance, Mingenew, Moora, Kojonup and Mount Barker. These sites were supported with farmer workshops, industry forums, paddock walks and a range of printed information through the Adaptive Management project.

Nationally, CSIRO modelled the benefits of grazing crops to feed availability at three WA locations; Merredin, Wickepin and Kojonup (Thomas et al. 2012). This modelling showed that grazing crops reduced supplementary feeding in the farming system. The modelling also showed the benefits of grazing spring cereal varieties, rather than winter cereal varieties; that growers in lower rainfall farming systems are able to graze in 47 per cent of years (rather than only for 20 per cent of years in the high rainfall zones); and that barley provided a greater opportunity for grazing than wheat because it had better early vigour and could be grazed for longer. All of these attributes of grazing crops in the modelling is backed by WA farmer experiences.

These experiences are supported by Grain and Graze on-farm research which showed farmers can expect, on average, a 10 per cent yield reduction by grazing crops. This is a well-publicised and discussed fact in the industry and is a barrier to adoption for most advisors and farmers. In single-paddock-on-farm, or small plot, research, it would appear that grazing crops is not worthwhile adopting in the WA farming system.

However in a whole farming system context, the area cropped per season is increased to account for the tonnages 'grazed', returning more tonnes of grain at harvest to the farming business. This additional tonnage is more than the total yield lost due to grazing. The system provides the farming business with additional grain income and allows for the improvement of the productivity, profitability and efficiency of the livestock enterprise at the same time. The successful implementation of crop grazing across a farming system requires forward planning of the whole farming system, integration of sowing times, crop varietal choices, livestock management, crop grazing management, and pasture management and improvement.

But how do you move farmers and their advisors from looking at the paddock-scale 10 per cent yield loss in grazing crops, to the farming system benefits experienced by others in the industry? In order to answer this question, the adoption pattern of three farming businesses who had adopted grazing crops into their whole farming system was studied. Their experiences and outcomes are outlined here, along with their information and learning needs as they made these on-farm changes. Their experiences are then compared to the information and learning needs of their advisor who supported the farmers through these changes.

Grazing crops in the WA farming system

In the mixed farming systems of WA, grain production varies between 60 and 90 per cent of the total arable area. Volunteer pastures make up the remainder, feeding a predominantly Merino ewe sheep flock. Together they make up the total cropping rotation in a farming business.

In a farming system without grazing crops, the key decision maker (farmer) will allocate pasture area in a cropping rotation according to annual livestock numbers, seasonal outlook and the need to address issues such weeds, disease or nutrient management in individual paddocks. Pastures in WA farming system tend to consist of volunteer weeds, with annual, improved pastures rarely planted (rainfall patterns and farming systems do not generally allow for perennial pasture species). This is a reflection on the profitability of the sheep enterprise in comparison to the cropping enterprise, where the sheep enterprises generate much lower average profits. The lack of improved pastures in these systems means lower stocking rates per winter grazed hectare and lower livestock productivity.

In farming systems that use grazing crops, less area needs to be allocated to pastures as the crops provide the early winter feed (the time of most limiting feed availability in a winter lambing ewe flock). In these systems, pastures are viewed as 'spring holding paddocks', where livestock are kept until the grain is harvested in early summer. Livestock feed requirements throughout winter are provided almost purely by crops, reducing the need for supplementary feeding. Livestock are removed from the crop at the point of grain head development and these crops are then harvested for grain.

Western Australian case studies

Originally the idea of grazing winter wheat came from a New South Wales farmer, but management in his farming system has been honed by experience and networking with other WA farmers using grazing crops, especially the Esperance 'guys'.

Rob Egerton-Warburton - Kojonup

Rob began grazing crops in 2006 with 200 hectares of Wedgetail winter wheat. The next year he started grazing other wheat and barley and now grazes his entire 2,000ha cropping program, including canola. The only paddocks that don't get grazed are those with a heavy weed burden. Over the seven year period, the farm has increased with lease land. The cropping area has grown by 30 per cent to 70 per cent of the farming area, and the pasture area has remained at 30 per cent of the farm. This farming system supports about 7,000 merino ewes and 2,000 wethers.

Grazing crops has meant the ewes are able to lamb down in the crops, where they have access to unlimited feed. He no longer uses Wedgetail in the system, siting it as 'agronomically difficult', preferring instead to graze spring varieties or early season Oxford barley if an early sowing opportunity arises. He has changed his grazing pattern, learning that spring cereal varieties prefer 'tip grazing' as opposed to crash grazing, as was the original recommendation for the winter cereals.

Rob believes grazing crops is a 'fail safe' technology, as he knows in June and July his sheep will have feed, moving the feed shortages to late spring before the crops are harvested. Grazing crops has reduced the intensity of his sheep operation during winter, yet increased his stocking rate per winter grazed hectare. In the past the farming system used strip grazing and urea to reduce the winter feed gap, this took one full time labour unit during winter. By introducing grazing crops into the system, the labour required has reduced to about one day a week.

Rob is an early adopter of grazing crops. He didn't get any support in the early days (mainly because there wasn't any around), he just made it up. Every year Rob tries something different in a paddock. Some years it works, some years it doesn't. In 2006 it was grazing crops, and it worked.

David Cox – Nerridup

David knows he can grow more dry matter per hectare using a barley crop than he can by growing a pasture, and over time he has refined his grazing system to suit soil types, grazing time, varieties and even season. David first saw grazing crops during his Nuffield tour in 2004 to Texas, where wheat was the only pasture option for local farmers. During his tour he learnt a lot about the physiology of cereal crops and how US farmers were manipulating it through grazing.

Armed with a little bit of knowledge and a lot of enthusiasm, David teamed up with local agronomist Angus Sellars and set about adapting the system to suit his south coast farming system.

David stocks his crops at 1 cow/calf unit per hectare in July, with the excess cattle sold directly off the crops. Calves are weaned onto the fresh stubbles in November, with most stock only seeing pastures during grazing periods in May and September/October. This system has allowed David to reduce the amount of hay fed during winter, increase his winter grazed stocking rate, and the tonnages of grain delivered. In 2009 David averaged A$1,000/ha on his grazed crops; made-up of A$300/ha in calf sales and A$700/ha in barley sales. In 2013 David is grazing Urambie barley, long season Canola, normal canola and Baudin barley, planting the 'right variety for the right time of the year'.

David, like Rob, is another example of an early adopter who has trialled the technology of grazing crops in his farming system, and has found a system that has worked for him, his farming system and his business. He is also happy to share this information with fellow farmers and other advisors.

Fowler family - Condingup

The Fowler family began grazing crops in 2010 because they recognised the need to increase the productivity and profitability of their livestock enterprises. In 2009 they introduced themselves to grazing crops by grazing half a paddock. This season (2013) they are cropping 18,000 ha, and grazing about half as good seasonal conditions will allow the pastures to be grazed earlier. The adoption of grazing crops into the whole-farming system is outlined in Table 1.

Table 1. Farming system changes at Fowlers

	2009	2010	2011	2012
Area grazed (ha)	150	3,300	6,100	17,000/9,000
Area increase (%)		220	185	278
DSE (total)	150,000	150,000	150,000	150,000
Stocking rate (DSE/wgha)	12	16	18	
Stocking rate increase (%)		130	112	

This stepped adoption of grazing crops across their farming system has allowed the Fowlers to develop the skills and confidence to graze crops successfully. It has given them confidence to be able to plant extra crop area (1,000ha in 2010 and 1,500ha in 2011), which generated an additional A$1m in cropping income per year. Plus, there were additional savings in supplementary feeding costs and improved livestock efficiencies through increased weight gains.

Livestock manager, Simon Fowler, said trialling the system yourself, and working out what worked in your environment was a critical part of the adoption process for them. They received key support from their advisor and other farmers using grazing crops in their region.

Industry support

Angus Sellars, Esperance Rural Supplies, is a consulting agronomist who has been working with farmers in the Esperance region for the past 10 years refining the practice of grazing crops in local farming systems. Angus said grazing crops completely removes the risk from high stocking rates and he works with individual farmers to find a system that suits them. Angus now has about 14 clients in the Esperance region on the south coast of WA using grazing crops in their farming system. The support they receive from Angus includes both crop and grazing planning.

Angus said it was important to plan crop planting (to ensure a staggered maturity and grazing), varieties (long and short season), pesticides and herbicides (to ensure withholding periods are met), and pasture management during its rest period. Monitoring throughout grazing was also important as stock must be removed once the critical crop growth stage was reached to minimise damage to yield.

This level of one-on-one support was important in allowing the technology to move from an individual paddock to a whole-farm system. Together the farmer and agronomist made and learnt from their mistakes and adapted the practice to suit the individual farming system. Angus was able to share the lessons learnt with other clients, provide scientific background and industry knowledge about the system in his area. His enthusiasm, confidence and methodology, provided his clients with the opportunity to succeed, where other farmers without this support were likely to take longer in their adoption, or give-up after their first 'mistake'.

What it shows

WA Grain and Graze 2 was designed around the SGS Farm Practice Change Model (Nicholson et al. 2003). Extension information and activities were designed to support farmers as they moved through its three stages: 1) motivation; 2) exploration and trialling; and 3) farm practice change. This work shows that different information and support is needed at each of these three stages.

At stage one, motivation, growers are looking for general information about the practice (grazing crops in this example), and observing how it is working on other farms. In stage two, exploration and trialling, farmers needed more detailed information on how to try grazing crops on their farm. At this stage growers choose to trial the practice in one paddock. They may choose to plant a specialist winter grazing variety or graze an existing spring variety. They inevitably over-graze or get despondent about the yield penalty experienced. Others however, manage to 'get-it-right' and recognise the potential of the technology across the whole-farm. It is at this stage that some growers dis-adopt grazing crops, citing reduced yield or poor varietal performance as the reason.

Others however learn from their trial and continue to trial and gain confidence in the practice over a number of years. They can see its opportunities and begin to use it across the whole farming system. Adoption support at stage two may include grower group discussions, publication of local trial site results and stories and individual support from agronomy or livestock consultants to ensure the grazing system suits the farming system. At this stage any support that will allow local issues associated with the practice to be solved should help growers move to stage three.

Once growers are confident with the use of grazing crops, they will move themselves into stage three, incorporation of grazing crops into their farming system. Firstly they will adopt the practice across a couple of paddocks, then across the majority of the farming system. It is at stage three where industry one-on-one support is critical. Advisors and leading farmers can provide technical input into the practicalities of grazing crops at stage two, but more in-depth knowledge and farming system planning is required for stage three. At this stage, advisors use their experience to design a system for the whole-farm, recognising the importance of the right mix of crops, varieties, sowing dates and monitoring. Advisors provide a sounding board for learning and help the farmer to refine the practice to suit their farm and farming system.

In all of the case studies discussed, these farmers are the early adopters of grazing crops in Western Australia (Rogers et al. 1983). They have taken an 'idea', tested and refined it on their farm and adapted it to their farming system. All have bought-in outside advice in one form or another. They have created an informal network amongst themselves and freely swap and share ideas about the technology.

The development of practices such as grazing crops is being driven by these leading farmers and advisors. They are frustrated at the current research focus at the paddock level and the lack of understanding the research industry shows regarding the benefits of grazing crops to the whole farming system (and business). Whole-farm research tends to focus on modelling and grazing crops modelling has had a livestock rather than grains focus, choosing to study the effects of additional pasture growth and supplementary feeding reductions rather than additional grain income to the farming system. Yet the whole-farm grains industry modelling has not occurred because of the yield penalties shown at the paddock-scale trials.

Adoption levels for the practice of grazing crops in WA were modelled using the ADOPT Adoption Prediction tool in 2012 by Grain and Graze (England, 2012). The adoption level for grazing crops is expected to increase to 52% of the target audience (mixed farming businesses) in the WA medium and low rainfall areas over the next 10 years. This is a very high predicted adoption rate and corresponds directly to the practices' ease of trial-ability, ease of reversibility, little to zero up-front investment, use of existing machinery and skills in the business. See Table 2 for predicted adoption levels.

Table 2. ADOPT predicted adoption level of grazing crops in Western Australia's medium and low rainfall areas with 70pc crop and 30pc sheep enterprise mix

Prediction attribute	
Predicted years to peak adoption	18.4
Predicted peak level of adoption	55%
Year innovation first adopted or expected to be adopted	2010
Predicted adoption level in 5 years from 2012	31.7%
Predicted adoption level in 10 years from 2012	52%

This corresponds to modelling done by CSIRO Livestock Industries where 74% of years would support grazing spring cereal crops at Binnu in WA's Northern Wheatbelt and reduce supplementary feeding of livestock in this low rainfall area (Thomas et al. 2012). This was the highest number of years in the Thomas et al. (2012) national study.

Given the history of the practice in WA, the predicted adoption levels and modelling results, it is important for any future development and extension project to recognise the methodology of adoption of grazing crops into the whole-farm system and the information and support required to do this. This is outlined in Table 3 below.

Table 3. Information and support required for the adoption of grazing crops into the whole-farm system

SGS Farm Practice Change Stage	Information & Support required
Stage 1 – Motivation	Fact sheets, demonstration sites, paddock walks, industry field days and Crop Update presentations.
Stage 2- Exploration and trialling	Information on how to implement a paddock-scale trial; fact sheets; paddock walks to discuss with others who are doing it.
Stage 3 – Farm practice change	One-on-one support to plan: • Crops, varieties, sowing dates, chemical with-holding periods, rotational issues • Crop monitoring program during grazing • Pasture management in Autumn and Spring and during rest

Conclusion

The benefits of grazing crops to mixed farming systems in Western Australia's medium and low rainfall regions are large. By adopting grazing crops into the whole-farming system, the case study farmers have shown increases in stocking rate, crop area and tonnages harvested. They have adopted the practice by:

1. trialling the practice in one-paddock
2. demonstrating it across a series of paddocks (4-6)
3. refining the system and using it across the whole farm.

The adoption of grazing crops has neatly followed the SGS Farm Practice Change Model (Nicholson et al. 2003).

To date this work has been driven by the early-adopters, with research support provided at the paddock scale, rather than the whole-farm scale. It shows that information and industry support can be tailored to meet the requirements of both the farmer and the advisor at each stage; and that further modelling needs to be completed to demonstrate the benefits of the practice to the grains enterprises.

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References

England D 2012, 'ADOPT: the adoption and diffusion outcome prediction tool. Grazing Crops in WA Adoptability Report 2012', Unpublished report in the hands of the author.

Nicholson C, Barr N, Kentish A, Dowling P, McCormick L, Palmer M, Simpson I, Simpson K and Walsh J 2003, 'A research-extension model for encouraging the adoption of productive and sustainable practice in high rainfall grazing areas', *Australian Journal of Experimental Agriculture*, 43(1): 685-694.

Rogers EM 1983, *Diffusion of innovations,* Free Press, New York.

Thomas D, Descheemaeker K and Moore A 2012, 'Grazing spring variety cereal crops reduces supplementary feeding in mixed cropping and sheep farms', in I Yunusa (ed.), *'Capturing Opportunities and Overcoming Obstacles in Australian Agronomy', Proceedings of 16th Australian Agronomy Conference 2012*, 14-18 October 2012, Armidale, NSW, Australia.