

FINAL REPORT

GOA00001

GRDC Grower Solutions for Central NSW

PROJECT DETAILS

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Summary

The Grower Solutions Group (GSG) Central West New South Wales (NSW) project undertaken by Grain Orana Alliance (GOA) has achieved two main goals over the five years of the project.

Firstly, it has given growers and advisers an opportunity to identify and prioritise research and knowledge gaps in current grain production systems. This in turn helps ensure that the limited research funds are appropriately directed to the key issues.

Secondly, the project itself has been able to address quickly and efficiently some of those issues identified that are within the scope and capabilities of the organisation.

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Conclusions

This project model has again proven to be successful in its aims - firstly to identify research priorities and secondly to investigate potential solutions to some of those issues raised when within the scope of the organisation.

The Local Research Update (LRU) meetings have shown to be an effective vehicle to draw together key advisers and growers from the local industry to raise and prioritise research and knowledge gaps for the local grain production systems.

From these meetings, Research and Extension Priority Lists (REPLs) are compiled which are invaluable in ensuring that the research undertaken by GOA, as well as other investments by the GRDC, are targeted at worthwhile and desirable outcomes.

GOA has demonstrated the GSG project funding structure is capable of designing and executing trials to achieve sound research outcomes based on empirical evidence in a cost effective and efficient manner. The project has also demonstrated the funding structure allows a research idea to move from its initial identification through the design and implementation phases and then the development of a solution and its extension in a very rapid and efficient manner.

The LRU meetings then form an integral part of the model using the networks of advisers attending and the influence that key growers can have on their peers.

Recommendations

Brief key recommendations stemming from the research undertaken from this project include:

Canola nutrition - Sulphur (S) additions should be reduced to maintenance levels and nitrogen (N) additions should be increased.

Canola windrowing - Growers should target as a bare minimum previously accepted timings of 40%-60% seed colour change, however targeting the later end of this range or up to 90% may in many cases bring further yield increases.

Direct heading of canola - Growers should consider direct heading of canola as it will offer some cost savings and possibly better machinery and labour capacities at harvest.

Windmill grass control - Growers have the option to use an application of Targa[®]# followed by a double knock of paraquat[#] to control windmill grass, however timing is absolutely critical for efficacy. Early data suggest that the new novel mixture of isoxaflutole[#] and paraquat may offer another effective option for growers pending registration.

Fleabane - The use of a double knock of paraquat is essential to achieve acceptable and reliable control of medium to mature plants. Glyphosate[#] in the first knock is often ineffective alone and the inclusion of a mix of partners is required. Differences exist between mix partners, but 2,4-D[#] based herbicides are often the best performing options. The use of paraquat and mixtures containing paraquat were surprisingly effective on maturing fleabane and may offer significant value as a salvage option.

Sow thistle control - Very few alternative herbicides are effective on this weed in fallow situations with the exception of paraquat or paraquat based mixtures. Trials showed paraquat could be effective as a standalone option or used as part of a double knock strategy to control sow thistle and to slow the development of resistance or in resistant populations.

Pre-emergent control of annual ryegrass - Standard district practice for pre-emergent choice was achieving little control of populations. Changes in products often brought increases in control, but the highest levels of control were best achieved by combining multiple products. In some cases, control was good enough to remove the need for and post emergent control.

Herbicide resistance surveys - This work showed that there are significant levels of herbicide resistant ryegrass and wild oats in the region. In the majority of populations tested, multiple resistances were present in both species.

Outcomes

Over the five years of this project, GOA has facilitated 27 separate meetings of both growers and advisers from right across the GOA region. With an estimated attendance at these meetings of more than 273 people, and encompassing more than 80% of advisers in the region, GOA has developed a strong insight into the local region's production issues, but it also forms a strong platform to influence the region with research outcomes.

At each of these meetings, attendees have been asked to identify and prioritise research and knowledge gaps in the current grain production systems. The compilation of these prioritised issues produced a REPL. These REPLs form a powerful tool that can help direct the limited research funds to areas that have been identified as key areas of interest and the most potential to bring benefit. It would also serve to avoid unwarranted investment in areas of less importance.

The other main aspect to the GSGs is that they undertake research themselves. GOA has investigated a wide variety of topics right across the key agronomic themes of weeds, pests, diseases, nutrition and farming practices, having investigated more than 70 different research themes and more than 250 separate trials. Some of the major research areas that GOA has worked in are set out below.

Canola nutrition - This work has shown that redirecting expenditure from S to N often resulted in returns on investment in the order of 4:1. This work has also highlighted the level of N deficiency in many canola crops and given growers confidence to increase N application rates.

Canola harvest management - GOA's trial work demonstrated significant yield penalties from common district windrow timings. In many cases, more than 30% yield penalty was measured, resulting in up to 500kg/ha yield differences.

Windmill grass and fleabane control - Two problem weeds that have challenged zero tillage (ZT) cropping systems. GOA identified effective herbicide strategies to manage these weeds which in many cases has allowed fallow efficiencies to be maintained.

Herbicide resistance - GOA has championed the issue through firstly identification and identification through significant weed resistance surveys, but also has been a very strong advocate of the tools to manage the problem. GOA's work has been undeniably important in the rate of uptake of narrow windrow burning in the region.

However, GOA has also been active in a number of other smaller research areas such as yellow leaf spot management, stripe rust management, clethodim[#] damage, annual ryegrass control, fallow efficiency, sow thistle management, and canola desiccation. The potential benefits from many of these topics would be much less than the more major ones listed above, but the gains made are still important. They are also good examples of issues that may not gain enough traction to warrant a larger scale investment and would have in the past been most likely overlooked.

Achievement/Benefit

The GSG Model

The GSG projects were designed to be both a vehicle to identify research gaps or research priorities, as well as to undertake research in their own right. The project has successfully fulfilled both these roles.

The project has been run on a circular model where it consults members of the local industry as to what they see as major constraints or knowledge gaps in the grain production system. They are also asked to score these issues for their perceived level of importance. This then gives a clear guidance within the project as to what issues will potentially bring the greatest value back to the industry if investigated. Because the issues are forwarded to the GRDC, it will also help guide GRDC's investment across the wider industry.

Following on from industry consultation, the GSG is able to make an informed decision on research topics to invest in. In consultation with industry experts, other research agencies and research and development (R&D) providers, the GSG is able to design and undertake activities to investigate and develop solutions to the issues identified. Once solutions are identified, the findings are then reported back to the local industry - the same industry sectors that identified the issue in the first place to adopt into practice. This completes the circular model:

'Identify the issue >investigate the issue >answer issue >extend the findings >identify the next issue'.

This also accommodates an opportunity for the issue to evolve, that is the first part may be solved but revealing a new aspect to the issue that can in turn be investigated.

GSG - Central West

The GSG project for the Central West of NSW has been undertaken by GOA running from 2010 to 2016. GOA is a not for profit incorporated association that was purpose built to undertake a predecessor GRDC project in 2009 and continued with this current project which has now reached its completion. As an organisation, it is 100% focused on the fulfilment of project aims and outcomes as this GSG project is its only source of funding.

The model is described in more detail below.

'Identify'

GOA has run twice annually a series of LRUs as the key opportunity to engage with growers and advisers to workshop what are the major research and knowledge gaps. During this project, GOA has facilitated 27 LRU meetings, engaging more than 400 growers and advisers from the GOA region. From all of these meetings, more than 550 total issues (many are the same issue raised at different meetings or times) have been raised and prioritised by those attending. These issues have been formalised into REPLs for each round of meetings. The culmination is a very powerful insight into what are the major research and knowledge gaps in the local industry.

'Investigate'

GOA has investigated or worked on more than 70 different areas of interest. GOA's efforts to seek solutions to the issues identified have ranged from small plot replicated trials to larger scale farm demonstrations. Much of GOA's research has used small plot trials as they offer greater precision and statistically analysable outcomes.

GOA has undertaken more than 250 separate small plot trials over the five year period of this project. Once the research issue has been identified, GOA will set out to develop a trial protocol using existing knowledge but also consulting with other industry experts, R&D companies, other agronomists, biometricians and other research bodies to ensure a sound approach is engaged.

This process has shown that it is also good at identifying opportunities to partner with other persons or organisations. Throughout this project, GOA has partnered with other research entities at various levels on a range of topics.

The CSG project, however, is not only limited to conventional research. For example, GOA twice facilitated herbicide resistance surveys, collecting and testing more than 130 ryegrass and 80 wild oat samples and testing them to a wide range of herbicide options. Another example is the facilitation of a number of field days demonstrating techniques used for narrow windrow burning.

'Answer'

GOA has grown from an organisation of just one employee to three in 2016, but still remains above its weight in terms of research output to capital base or annual funding. GOA has shown what can be achieved by working closely with growers and other industry participants and through utilisation of contract trial service providers.

GOA trials have been designed as simple, well thought out trials to provide outcomes that are clear and easily adaptable to current farming systems. The combination of staffing with practical, agronomic and farming backgrounds, coupled with a management board, all help guide the organisation's research program to develop clear and evidence based messages for the industry's growers.

GOA has also demonstrated itself to be able to respond quickly to developing issues. With its current structure, resource and staffing, GOA has shown that it can establish a trial within days from first conception.

'Extend the findings'

GOA utilises a wide range of mediums to extend its findings, however, the key pathway for the GSG model is back through its established networks at the LRU meetings. These meetings aim to attract the key influencers in the region - both key growers, but more importantly from an extension aspect, the key advisers from the region.

The specific targeting of advisers is in part unique to this project model. Previous models have concentrated on direct extension (straight to the growers) pathways, which are often limited as growers can be reluctant or unable to attend extension forums. Advisers are playing an ever increasing role in the decision making in farming businesses and their influence over many businesses is an aspect worth exploiting when it comes to extension as it can bring significant efficiencies.

GOA conservatively estimates that it has contact and influence with more than 90% of the advisers in the GOA region who can directly influence 90% of growers that use agronomists in the region. However, this is not the only extension pathway. GOA has had a strong and consistent presence at the GRDC Updates, both regionally but also interstate. GOA also has a web site which forms a central access point for interested parties to access written trial reports or other material. GOA has its own YouTube channel and has published a number of informative videos, as well as a presence on social media via Facebook and Twitter.

Key Outcomes

REPLs

From this project, GOA has developed ten separate REPLs, one from each round of LRU meetings. These documents offer GOA and GRDC a strong insight into what is seen as key research and information gaps in the industry.

Research

Some of the key research findings from this project are listed below:

Canola nutrition - The lack of responsiveness of canola in the GOA region to applied S was identified. Sulphur was previously recommended as virtually a mandatory requirement, but has now been shown to be economically unjustifiable in most cases. The research, however, showed canola to be highly responsive to applied N and arguably the unreliability and often low profitability of canola was most likely contributed to by lack of N. Although it is not a new concept to suggest N was a key driver in canola performance, GOA was arguably the first to start highlighting the importance in current farming systems. This work has now been validated by the current GRDC project 'Optimising canola profitability', a project possibly in part motivated by some of GOA's research work.

Canola harvest management - Research undertaken by GOA showed that common district practice windrow timing of canola was leading to significant yield penalties. Some trials demonstrated yield gains of approx. 30% through simply delaying of windrow timing. These findings have also been since validated by the 'Optimising canola productivity' project. Again the interest and inclusion of a harvest module in this project would almost confidently be attributed by GOA's pioneering work in this area.

GOA has since gone on to investigate the harvest management of canola with trials looking at direct heading of canola. GOA's work showed that direct heading is a viable alternative to windrowing and that in many cases it optimised yields and avoided much of the complications and yield penalties associated with windrow timing. GOA's work has investigated other associated aspects, such as the performance of desiccation and yield penalties with delayed direct heading. GOA also trialled the performance of the new PodGuard™ varieties. Preliminary data suggest that direct heading of canola has risen from less than

5% of crop to more than 60% for some advisers.

Weed control - Windmill grass, fleabane, sow thistle and annual ryegrass. These four weeds are noted nationally as key weeds of concern, but they have continued to plague local growers for some time.

Windmill grass probably first rose to prominence in the Central West of NSW as a weed of ZT grain growers. It is a summer growing weed with a natural tolerance of glyphosate[#] that is beginning to infest and dominate large areas of summer fallow. GOA trials were the first to investigate options for control and successfully identified the group A herbicide Targa^{®#} followed by a double knock of paraquat[#] as effective in its control. GOA also successfully applied and held a minor use permit for the use of this option to control windmill grass, giving growers the only effective legal herbicide option.

GOA has investigated the use of residual herbicides for the control of windmill grass. This work has not been able to identify a reliable option, however, this work was the first to identify the effectiveness of a novel herbicide combination to control mature windmill grass. A mixture of isoxaflutole[#] (Balance^{®#}) and paraquat has shown in numerous trials to be effective at controlling this problem weed. This finding has now been validated by a range of other researchers, as well as its effectiveness on a range of grasses beyond just windmill grass.

Fleabane is another weed with an increasing incidence in current farming systems. GOA's collaborative work with Rohan Brill of NSW Department of Primary Industries (DPI) was the first to highlight the effectiveness of clopyralid[#] for pre-emergent control of fleabane in winter cereals and canola. This practice is now widespread across much of the cropping belt. Other work demonstrated the requirement for a double knock of paraquat to control medium to large plants, but also the use of paraquat and mixtures with paraquat can also be very effective as a single pass control option on larger maturing plants.

Sow thistle, unlike both windmill grass and fleabane, was previously much easier to control, although its incidence was increasing rapidly. However, with recent identification of its developing resistance to glyphosate, alternative strategies were obviously required. GOA has been screening herbicides for alternatives with very few identified except that of paraquat or paraquat based mixes. This work is ongoing.

Annual ryegrass has rapidly become the dominant weed in winter crops. It was identified that pre-emergent herbicides were under-utilised by many growers in the region. GOA investigated pre-emergent control options in winter crops. This work helps growers gain confidence in using them, helps set expectations when using, but it also identified the more effective options available to them. Two key findings were demonstrated in this work - common district pre-emergent choices were literally achieving no control on ryegrass and that control could be improved, not necessarily by changing products but actually combining products.

Herbicide resistance surveys - It was identified from GOA's LRUs that many growers were questioning the presence and severity of herbicide resistance in the local area. During the harvest of 2013 and 2014, GOA facilitated the collection and testing of 130 annual ryegrass and 80 wild oats populations from the local region that were in turn tested for their resistance status. The results from the testing were alarming and provided the empirical evidence needed for some growers to acknowledge the presence of resistance. Furthermore, it gave an insight into the types of resistances present and what products were most at risk from resistance.

However, three main findings were the most concerning:

- o Not one ryegrass sample submitted was not resistant to at least one herbicide tested.
- o 64% of ryegrass samples submitted were resistant to four or more herbicide groups.
- o In the 2014 samples, 57% of ryegrass samples were resistant to 1L of glyphosate.

This work was invaluable in promoting a change in attitude to resistance management in the GOA region and offers an insight into the serious challenge for growers and advisers ahead to manage such populations.

Many other topics have been researched under this GSC project that cannot be detailed in this report. However, all research undertaken by GOA has been extended where appropriate, primarily through the LRU meetings, but also a variety of other mediums.

In summary, the GSC project was designed to identify research priorities to help guide research both internally and externally to GOA. Secondly, it was designed to answer some of those issues raised in a timely and efficient manner. GOA has also clearly fulfilled both these goals and in doing so addressed and answered some major issues facing grain growers. In doing so, it has brought a rise in productivity, profitability and subsequent sustainability for growers. Investment in the GSC projects has

provided significant dividends to growers for their levies invested.

Other Research

This project identified a range of other R&D opportunities through the issue identification process within the LRU meetings. Summaries of the issues identified are compiled into REPLs which have been forwarded to the Northern Grower Services Manager following the completion of each round of meetings.

This project also identified further R&D opportunities stemming from some of the research work initially undertaken by this project. An example is the harvest module of the 'Optimising canola productivity' project investigating validating the findings from GOA's research that demonstrated significant yield impacts in response to windrow timing. The same project also has further investigated the responsiveness of canola to increasing N rates.