Independent expert witness report

regarding

Stephen William Marsh v
Michael Owen Baxter

On instruction of

Slater & Gordon
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Melbourne

Prepared by

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of

3D-Ag Pty. Ltd.

August, 2013

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Contents

1 Introduction

This report has been prepared on the instructions of Mark Walter of Slater & Gordon lawyers for Stephen William Marsh, for the purpose of an expert opinion in relation to:

1. specific questions raised in Mr. Walter's instructions

in relation to a dispute between Mr. Marsh and his neighbour, Michael Baxter.

The crux of the matter as pertains to this report relates to the growing of Round up Ready Canola by Mr. Baxter in paddocks adjacent to Mr. Marsh's property "Eagle Rest" near Kojonup, Western Australia.

My involvement in the case commenced on 27th May, 2013 when instructions were issued to me by Mr. Walter on behalf of the plaintiff, Stephen Marsh.

My investigations are limited to a review of the information provided by Slater & Gordon. I have not interviewed the growers, Mr. Marsh or Mr. Baxter, nor have I seen the farms or inspected any machinery. Further the brief provided did not include information such as defendant's farm rotation or soil test results, which would have assisted me to form a more complete view. My opinion was further limited by a lack of specific information related to the herbicide group/s to which the Wimmera ryegrass on Mr. Baxter's farm has developed herbicide resistance because no herbicide resistant tests have been performed.

I have made all inquires that are appropriate to this matter. All relevant information has been provided in my report and, to my knowledge, nothing of significance has been withheld from this report to the court. My qualifications and credentials are attached in Appendix II.

2 Expert opinion on specified questions as per instructions

1. What is Wimmera ryegrass?

Wimmera ryegrass, scientific name *Lolium rigidum*, is an annual grass species. Annual meaning the plant germinates, grows, reproduces and dies in a single 12 month period. It is alternately known as Annual ryegrass (ARG) by which it will be referred to in this report hereafter.

It is a native of the Mediterranean region of the world and was introduced to Australia in the early 1900's. It is a very desirable grass species when present in pastures and has in the past, been widely sown by mixed farmers i.e. those farmers with both crop and pasture enterprises.

It is very well adapted to most Australian cropping soils and the temperate climate regions and as such has become a dominant grass weed species in crops grown in the cropping zones of Australia.

2. How and why does Wimmera ryegrass develop herbicide resistance?

All weed species, not only ARG, have the capacity to develop resistance to a herbicide or herbicides, just as the so called 'super bugs' in humans have developed resistance to antibiotics that previously controlled them.

What has made ARG the ideal candidate for developing herbicide resistance includes:

- the initial frequency of resistant individuals within a population, combined with
- relatively large populations (meaning more potential resistant individuals are present);
- growth habit, pollination method and the large number of seeds produced per plant.

As background - herbicides are grouped by their mode of action (MOA) i.e. the way in which the herbicide acts to disrupt the function of or kill the plant to which it is applied. Groups are indicated by letters A through to R plus Z. Herbicides can be specific "selective" to grass or broadleaf weed species or "non-selective" meaning they kill indiscriminately.

To appreciate how resistance works an understanding of some fundamental genetics and population dynamics is necessary. Individuals within any population, in this case of weeds, have different genetic make-ups and can contain mutations that allow them to survive rates of herbicide that normally successfully control the weed species to which they belong. For example, one plant in 17,000 ARG plants (initial frequency*), that have never been sprayed with a Group B herbicide (representing a selection pressure*), are inherently resistant to Group B herbicides.

***Some definitions**:*

***Initial frequency** *... the number of individual plants within a wild population, i.e. a population that has not been exposed to a particular selection pressure e.g. Group B herbicide, that are inherently 'immune' to its effects.*

***Selection pressure** *... An agent of differential mortality or fertility that tends to make a population change genetically. (Oxford dictionary)*

This can be induced by a process or practice, such as herbicide use, that changes the chance of a certain characteristic being perpetuated / inherited.

***Herbicide efficacy** *... the percentage of weeds killed by a particular herbicide, if applied correctly e.g. Glyphosate efficacy is around 95%*

By applying selection pressure, such as exerted by repeated use of a particular herbicide group for example, creates increasing opportunities for resistant individuals to breed and multiply as susceptible individuals are killed.

As a matter of mathematics, the larger the weed population, present in a field, the greater the potential number of resistant individuals present.

In addition, if the trait is a dominant trait, as is often the case with resistance characteristics, the population of resistant individuals can multiply even more rapidly under continuing selection pressure.

As an example…

A resistance characteristic is present at an inherent level, initial frequency, of one in one million within the population. Assuming an initial density of 100 ARG plants/m^2 which is 99% controlled by herbicide (herbicide efficacy*), and has survivors setting a conservative 50 seeds per plant

Year	Start	Susceptible	Resistant	End
1	1,000,000	999,999	1	10,001*
Method: 1,000,000 x 99% controlled=(10,000 susceptible survive + 1 resistant) x 50 seeds each =*				
2	500,050	500,000	50	5,050
3	252,500	250,000	2,500	5,000
4	250,000	125,000	125,000	126,250
5	6,312,500	62,500	6,250,000	**6,250,625**

Courtesy of John Broster, Charles Sturt University, Wagga Wagga

Note: Herbicide resistant individuals physically look no different to susceptible ones so there are no early visible warning signs that a population has increasing numbers of resistant individual until the numbers of plants not dying after an application of what should be a lethal rate of herbicide becomes of concern. At which point a herbicide resistance test should be used to confirm the level and extent of resistance.

All herbicides are susceptible to the development of resistance. The difference between groups is the speed at which herbicide resistance develops.

Table 1 Susceptibility of herbicide mode of action groups to developing resistance

Estimated number of years of application before resistance evolves (based on Preston et al 1999)		
Herbicide Group	Number of years	Herbicide resistance risk
A	6 - 8	High
B	4	High
C, D	10-15	Medium
F	10	Medium
L	>15	Low
M	15	Low

Integrated Weed Management in Australian Cropping Systems CRC Weed Management

The 'better' a particular herbicide (as influenced by: it's relative ease of use; it's effectiveness in killing the target weed and how cost effective it is) the more likely it is to be used, and the quicker resistance tends to develop.

Note: 'Under-dosing' or using sub-lethal rates of herbicide i.e. using less than recommended rates of herbicide as per the label and/or poor herbicide application can compromise the effectiveness of killing even susceptible individuals and speed up the development of resistance.

It is important to note that *not* using a particular chemical for 4 or 5 years WILL NOT revert weeds back to being susceptible to it!

As relates to ARG - it is a common weed and widespread across the cropping regions of Australia. Where integrated weed management strategies incorporating both herbicide and non-herbicidal tactics have not been consistently applied, numbers of ARG can 'blow out' as discussed above.

3. Please comment on the statement, "~~conventional~~ herbicides are largely ineffective in eradicating or controlling Wimmera ryegrass".

Point 1… This question implies that the herbicide used in Roundup Ready (RR) canola is unconventional. This is not the case, the active ingredient, the Glyphosate molecule, was developed by Monsanto more than 30 years ago and is the same as in the various products that have been marketed in Australia since the early1980's as Roundup albeit under various names and formulations including Roundup CT, Roundup Max, Roundup DST and Roundup Attack.

Therefore, Roundup Ready is not new per se nor is it 'unconventional'. What is new is the Canola variety that has been genetically modified to tolerate Glyphosate.

Point 2… Once herbicide resistance is established eradication is not really an option as mentioned above …*not* using a particular chemical for 4 or 5 years WILL NOT revert weeds back to being susceptible to it, meaning management involving a consistently applied Integrated Weed Management (IWM) program is the only way to manage the threat of or increasing presence of herbicide resistant weeds.

Note: hereafter the use of ~~conventional~~ herbicide has been struck through.

In particular:

(a) is the statement generally true or does the effectiveness of ~~conventional~~ herbicides to control Wimmera ryegrass depend on the particular patterns of crop rotation and herbicide control in a given paddock where Wimmera ryegrass is found?

No, the statement is generally not true. The issue is that one cannot rely *solely* on herbicides in an attempt to manage herbicide resistance.

The fact that an increasing number of farms that regularly grow crops have some degree of Group A, B, C, D, F and M resistance in ARG (see Table 2) is in large part due to the lack of timely action upon recognition of a resistance issue.

As a first step when herbicide resistance is *suspected* is to collect seed from the weed species with suspected resistance and have it tested to confirm the presence of herbicide resistance and the extent of that resistance i.e. to which herbicide mode of action groups it is resistant.

I am informed Mr. Baxter has not had any herbicide resistance testing done which means Mr. Baxter is operating without a full understanding of the extent of the problem or the full range of options available to his business. No knowing the resistance profile of the ARG population on his farm severely limits Mr. Baxter's ability to develop an effective *long term* weed management strategy in terms of sustaining a viable cropping operation as well as the effectiveness of the herbicide groups not currently compromised by resistance.

Actions in the field may need to include:

- cutting or spraying out a crop, in which resistant weeds have gotten away, instead of allowing it to run through to harvest, thereby allowing resistant weeds to set seed and add to the seed bank;
- as well as moving quickly to implement an IWM plan, that uses the full array of tactics including strategic use of herbicides *in combination with* non-herbicidal methods, is essential to combat the spread of herbicide resistant weeds.

A well considered rotation that includes a diversity of crops and/or pasture across the whole farm/s that targets the rotation of herbicide groups as well as the implementation of a more diverse range of cultural practices is key component of any herbicide resistance management strategy.

Importantly most businesses already have the 'technology' to prevent the buildup of herbicide resistant weeds revolving around **using a combination of tactics integrated into the whole farm system as a matter of routine** including**:**

A. Employing practices that decrease the potential for resistance

- Sound diverse rotation
- Competitive crops and pastures
- Rotating herbicide Mode of Action groups
- Spraying weeds while their numbers are few
- Avoiding increasing selection pressure

B. Managing the seedbank

- Restrict weed seed set
- Reduce weed seed bank numbers
- Eliminate survivors
  - Apply the Double knock*

C. Strict farm hygiene practices to manage weed sources and potential to spread

- Sow with clean seed
- Clean machinery including contractors equipment
- Clean fodder supplies (for livestock)
- Manage weed harbours (fencelines, buildings, waterways, round trees)

Double knock*… for preference, using herbicide followed by non-herbicidal tactics or vice versa to get a greater weed kill by eliminating survivors of first tactic with the second. For example follow up a pre-sowing knockdown herbicide, by using full cut-out sowing.
Note: The terminology broadly also includes the use of one herbicide followed by another with a different mode of action.

For discussion of the suite of tactics see Cooperative Research Centre for Weed Management's Integrated Weed Management in Australian cropping systems training manual (hereafter referred to as IWM Training Manual) – particularly the sections Agronomy and Tactics and Implementing IWM,. The manual can be accessed on the Australian Glyphosate Sustainability Working Group's (AGSWG) website www.glyphosateresistance.org.au under the tab Resources.

(b) if the effectiveness of ~~conventional~~ herbicides to control Wimmera ryegrass depends on the particular patterns of crop rotation and herbicide control in a given paddock, what patterns or factors will diminish the effectiveness of ~~conventional~~ herbicides?

i) Being entirely reliant on herbicides for weed control rather than a range of tactics including non-herbicidal measures;

ii) Over reliance on any one herbicide or group will intensify the selection pressure favouring an increase in herbicide resistant individuals in a weed population and ultimately leading to the failure of that herbicide.

iii) having insufficient diversity of crops within a crop sequence. A more sustainable rotation incorporates diversity and should include a legume phase whether pasture, pulse or manure crop, which allow for the rotation of herbicide mode of action groups and the use of a variety of cultural practices to limit the opportunities for an increase in herbicide resistant weed populations.

From the information provided regarding Mr. Baxter's paddocks - in the last 11 years (not including 2007 for which there was no information) the Big dam paddock has grown cereal crops in 8 years of 10 and canola twice in the last three years. While over the same period, Two dams has grown five cereal crops, four canola crops and one year of clover. Neither sequence exhibits a desirable degree of diversity to facilitate an appropriate rotation of herbicide groups or cultural practices as necessary to mitigate the development of herbicide resistance.

iv) trying to treat large numbers of weeds rather than spraying while weed numbers are relatively low.

4. Please comment on the statement, "RUR is very effective in controlling Wimmera ryegrass" in particular:

Note: Roundup Ready Canola and Roundup Ready, Glyphosate based herbicide, should be considered as a technology package, Roundup Ready is not used in isolation.

While Roundup Ready herbicide as used in conjunction with Roundup Ready Canola is effective, in my opinion, it is a technology that is too often used as a strategy of last resort to manage herbicide resistance - 'after the horse has bolted' so to speak.

Glyphosate is the key 'knockdown' non-selective herbicide active used to control weeds prior to sowing or at fallowing on the majority of non-organic farms in Australia. Therefore, maintaining Glyphosate as a viable herbicide active, for the long term is too important to squander on a short term fix for a herbicide resistance paddock.

Given that the industry has known about herbicide resistance for more than 20 years every farm should have adapted their farming systems by now to incorporate an IWM plan containing a suite of tactics, as appropriate to their herbicide resistance status.

(a) Is there evidence in Australia of Wimmera ryegrass developing resistance to Glyphosate?

Yes, the first occurrence was documented in 1996 (AGSWG website).
The following information in Table 2, is drawn from Page 17 of the IWM Training Manual

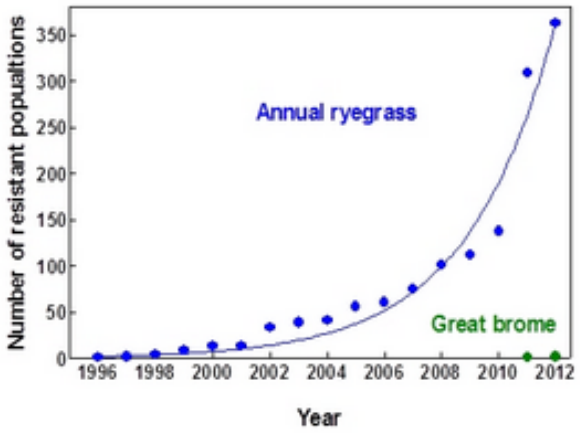
Table 2 Known populations of herbicide resistant grass weeds in Australia (compiled by Stewart 2005) - *Abridged to show only ARG*

Herbicide Group	***Example herbicide***	**WA**	**SA**	**Vic**	**NSW**	**Tas**	**Qld**
A - fops	*diclofop*	X	X	X	X	X	
A - dims	*sethoxydim*	X	X	X	X	X	
B - sulfonylureas	*chlorsulfuron*	X	X	X	X		
B - imidazolinones	*Imazapic, imazapyr*	X	X	X	X		
C - triazines	*simazine, atrazine*	X	X	X			
C – substituted ureas	*diuron*		X	X			
D – dinitroanilines	*trifluralin*	X	X	X	X		
F – triazoles	*amitrole*	X	X				
M - glycines	*glyphosate*	X	X	X	X		

The AGSWG's website www.glyphosateresistance.org.au, under the tab Resistance, contains 'Australian glyphosate resistance register summary' which records the current confirmed populations of ARG with Glyphosate resistance as 363 Australia wide, 105 of which have been recorded in winter grain crops in NSW, Vic, SA and WA. WA is listed as having 43 known Glyphosate resistance populations of ARG.

Of real concern, with 17 years having past since the first confirmed case of glyphosate resistant ARG, is that regular use of glyphosate has reached that critical point where the number of repeated applications (identified as being indicative of being required to see the development of herbicide resistance to glyphosate - Table 1) is being approached or exceeded on an increasing number of farms. This is borne out by the graph below which, until about 2008 – 2010 showed a steady rising trend, but in the last two years has entered a period of rapid escalation in the number of confirmed cases of Glyphosate resistant populations of ARG.

The increase in confirmed cases of glyphosate-resistant annual ryegrass between 1996 and 2012:



Courtesy: Australian Glyphosate Sustainability Working Group - www.glyphosateresistance.org.au

This highlights that farmers *and others* need to more carefully consider their use of Glyphosate to control weeds not only in crop, but also around buildings and tracks, railway lines or roadsides, as there is a risk of Glyphosate resistance developing and from these points of origin spreading into surrounding crop land.

(b) Is the effectiveness of RUR in controlling Wimmera ryegrass subject to Wimmera ryegrass becoming resistant to RUR?

Yes, see above and refer to Group M in Table 1

(c) In any given paddock, if ~~conventional~~ herbicides are ineffective to control Wimmera ryegrass, can the extent to which and the time frame over which Wimmera ryegrass will become resistant to RUR, be predicted?

Not definitively, but Table 1 gives an indicative timeframe for the development of Glyphosate resistance if products based on Glyphosate are used repeatedly.

5. On the information provided, can you say whether and over what time frame the control of Wimmera grass on Sevenoaks by RUR will be affected by resistance to RUR?

As discussed above resistance to Glyphosate takes many applications to develop due to relative rarity of the inherent resistance to Glyphosate in an ARG population that has not been exposed to Glyphosate. However the common usage of Glyphosate as a knockdown herbicide prior to sowing most crops and fallowing means that selection pressure is being imposed and numbers of resistant individuals will be on the rise.

While I cannot say absolutely that Glyphosate resistance will develop or over what timeframe, I can say that based on experience and data previously referenced that Sevenoaks will develop ARG that is resistant to Glyphosate UNLESS substantial changes to the farm program and practices take place including:

- greater diversity in the crop choices integrating IWM strategies; and
- Additional non-herbicidal measures, beyond the use of chaff carts and windrow burning.

Of note: In 2012, both Two Dams & Big Dam paddocks, were sown to Hindmarsh Barley and treated with heavy doses of products designed to stop ARG. This was followed by RR Canola in 2013 with three separate herbicide groups used at standalone lethal rates. In addition, it appears the canola herbicide program includes Propizamide, which is not registered for use in Canola.

These factors would seem to indicate that weed control is under extreme pressure and I would strongly suggest that there will be Glyphosate resistant individuals being selected due to the pattern of herbicide use on these paddocks.

6. What types of canola are grown in Australia and to what herbicides are they naturally resistant?

It is important to recognize the difference between resistance and tolerance…

More definitions…

Herbicide resistance* *is the inherent ability of a plant to survive and reproduce following exposure to a dose of herbicide normally lethal to the wild type (Heap 2006).*

Herbicide tolerance* *is the inherent ability of a species to survive and reproduce after herbicide treatment at a normal rate (Heap 2006). There is no selection involved (through the herbicide application) because the species is naturally tolerant.*

IWM Training Manual

There are four 'types' of canolas grown in Australia, all of which are naturally tolerant* of some herbicides:

- Conventional canola which is not naturally resistant* to any herbicide
- Triazine tolerant (TT) canola has been conventionally bred to resist Group C chemistry
- Imadizioline tolerant (Clearfield) canola that has been conventionally bred to resist Group B chemistry
- Roundup Ready (RR) canola is the only genetically modified (GM) canola commercially available in Australia and is tolerant of Group M chemistry

The herbicide groups registered for use in these crops to control ARG (in other words the herbicide groups each is tolerant of) are as follows:

- conventional canola - Groups A, D and J.
- TT canola has members of Group C in addition to A, D and J.
- Clearfield canola has a Group B herbicide registered for use in crop, as well as A, D and J.
- RR Canola - Group M as well as Groups A, D and J.

7. If RUR is used to control Wimmera ryegrass, can it be used on the field prior to sowing conventional canola?

Presumably, this question refers to using Glyphosate as a knockdown on the crop following RR canola.

Two points:

i) The Nufarm RR stewardship program states that Glyphosate should not be used as the pre-sowing knockdown on the crop following RR canola.

ii) Canola should not follow canola because of the potential to magnify disease issues.

8. If you can, on the basis of your experience, please comment on the statement, "the RUR herbicide program used with RUR canola is far more effective and significantly less expensive than the conventional herbicide programs associated with the growing of non-GM canola".

The program for the RR canola paddocks in 2013 includes a registered Group D product, Trifluralin, the registered Group M product, Roundup Ready (with plant shield) as well as the unregistered product Propizamide. At face value, there is an inferred conclusion that the owner is already concerned about the viability of RR Canola.

Looking holistically and from a sustainability point of view over the longer term, RR technology should be used *strategically* to manage herbicide resistance, it is not a cure all – in fact it could be quite the opposite if consistent use becomes relied upon. It indicates weed control using herbicides alone is reaching its limits.

If farmers lose Glyphosate as an effective knockdown and fallowing tool the agricultural industry will be in serious trouble.

The only viable solution if the plan is to continue cropping is to adopt IWM and utilize the full suite of tactics to get on top of herbicide resistance before it reaches the point where cropping is no longer a viable option.

In terms of RR canola being **"significantly less expensive than the conventional herbicide programs associated with the growing of non-GM canola"** I would point out that herbicide program is only *one part* of what contributes to whether a crop is profitable or not.

The following table looks at some of the key attributes of hybrid canola types and particularly focuses on those areas differences that as a whole determine the bottom line of crop revenue.

Table 3 *Summary of relative attributes and costs associated with hybrid canola types*

	Hybrid canola types		
	Triazine tolerant TT	Imidazolinone tolerant IT	Roundup Ready RR
Herbicide tolerance	Triazine (Gp C)	Imidazolinone (Gp B)	Glyphosate (Gp M)
Genetically modified	No	No	Yes
Fitness penalty*	Yes	No	?
Seed cost	$23 - $28/kg		
Seed technology fee			+$6.80/kg
Herbicides & application *[1] $/ha	$45/ha	$56/ha	$47/ha
Price penalty	No	No	-$10.00/t*[2]
Delivery sites	Unrestricted	Unrestricted	Limited*[3]
Freight *[3] $/t	$26/t	$26/t	$41/t

*Note *[1] The herbicide and application costs indicated are indicative of best practice program using the full registered rates of herbicide to effect maximum weed control.*
In the case of Mr. Baxter's IT canola program for 2013 the program indicates the use of a half rate of Intervix which would not be a lethal dose on ARG. We have also excluded the cost of Propizamide (indicated for use in Mr. Baxter's farm program document) because it is not registered for use in Canola.

*Note *[2] A price penalty of $10/t is currently indicated in pricing (ex CBH website pricing 2013-14) for genetically modified canola of which Roundup Ready Canola is the only one commercially available in Australia. CBH website: www.cbh.com.au*

*Note *[3] Some delivery sites do not accept Roundup Ready canola meaning additional freight or logistics costs may be incurred in delivering grain. From the Kojonup area, RR Canola can only be delivered to Darkan (north-east of Kojonup) while IT canola (and other canolas) can be delivered to Cranbrook which is closer to both Kojonup and the port at Albany. In dollar terms this means additional freight charges apply, which in turn reduces the cost per tonne revenue. A cost has not been assigned for any additional logistics costs associated with delivering grain to Darkan which is the opposite direction to the port of Albany and the apparent closest delivery site at Cranbrook.*

Definition

Fitness penalty* *where a mutation endows a restriction on growth / function when compared to those without the mutation.*

*For example "triazine resistance has a fitness penalty because the resistance mechanism involves a mutation in (*connection with*) photosynthesis, the engine for plant growth. Hence, triazine-tolerant canola varieties have a lower yield potential compared with conventional lines." IWM Training Manual*

In summary, the basic seed price for hybrid canolas regardless of type fits within the same range (Table 3).

With regard to yields, the National Variety Trial site near Kojonup (2012) indicated no significant difference in yield potential between the hybrid types represented.

While the herbicide programs associated with RR canola show a lower cost per hectare than IT canola by $9 per hectare (or around 16%), the cost of TT canola herbicide program is around $2 per hectare less than that for RR.

In terms of identifiably specific costs associated with RR canola these include:

- the seed technology fee $6.80 per kilogram of seed purchased
- freight and logistics due to location of the delivery site that accepts RR, in this case estimated at an additional $15 per tonne.

In terms of revenue:

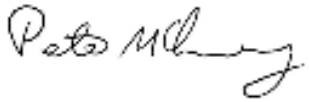
- a price penalty exists for RR canola in the order of $10 per tonne.

In real bottom-line figures RR canola has a higher cost structure and price penalty meaning why would you grow it unless herbicide control options were severely limited.

In addition, there are flow-on effects to the following season e.g. glyphosate cannot be as the knockdown herbicide, meaning the more expensive alternative in Sprayseed must be used at around double the cost of Roundup. This is assuming that weeds numbers are such that there is a capacity to grow a crop, which as stated previously cannot be RR Canola again.

9. If you can, on the basis of your experience, please comment on the statement, "growing RUR canola in conjunction with the use of RUR herbicide will result in significantly higher yields of RUR canola compared to the yields if non-GM canola was grown in the same paddock particularly where HRWR is present".

If herbicide resistant ARG has reached levels where it would out-compete conventional, Clearfield and TT canolas then yields would necessarily be reduced by competition between the crop and weeds for moisture, nutrients and light. Under these circumstances, as long as the ARG population did not also have high levels of Glyphosate resistant individuals RR Canola should be expected to perform better. However, this is a short-term fix! Round up ready varieties, cannot be used year after year or Glyphosate resistance will be inevitable. Other solutions must be introduced as already discussed at length.



Peter McInerney
Senior Consultant.

APPENDICES

APPENDIX I

Instructions from Slater & Gordon Lawyers

Not attached to email copy

APPENDIX II

Peter McInerney

Business profile

The profile following on the next page is general in nature. My specific experience as relates to herbicide resistance dates back to the mid 1990's.

My day to day consultancy work has me closely associated with my clients businesses including planning and implementing sustainable rotations which integrate weed management strategies in order to: minimise the risk of developing herbicide resistance, for those farms currently without herbicide resistance; or bringing resistant populations under control where they have been identified.

In the early 2000's our company developed and delivered the first farmer training workshops looking at managing herbicide resistance. Topics covered range from how herbicide resistance develops, through the extent of the problem, to the various counter measures (tactics) that need to be taken to avoid or combat herbicide resistance. This is followed by a case study demonstrating the financial implications of herbicide resistance and a practical exercise where groups work to build a sustainable rotation that manages herbicide resistance.

Subsequently, Andrew Storrie and I were employed by Nufarm to train their NSW based territory managers to raise their awareness of herbicide resistance and its management.

Peter McInerney -

Principal and Snr. Consultant

With **over 25 years experience** in the agriculture and agribusiness sector Peter has developed **a rare combination of skills** capable of encompassing wide ranging issues from the physical, financial and marketing to personal concerns facing today's rural sector. This, together with an effective communication style has seen him work successfully with a wide range of clients and develop an extensive network of associates and contacts across the nation.

Peter's ability to draw together information from the global level (markets and financial trends) to in-paddock specifics about crops, pastures and soil as well as the appropriate technology provides clients with a genuine holistic perspective. Applying this accumulated knowledge and whole farm thinking to realise potential in farm businesses and the ability to support clients at every stage from plan to implementation is Peter's strength. These fundamental principles underpin 3D-Ag's vision of promoting positive and sustainable change in agricultural landscapes and profitability.

Background

Peter's agricultural training began on the family wheat / sheep farm outside Forbes NSW and after a time led him to the first degree course in Agriculture at Charles Sturt University. This degree incorporated a strong 'systems' (holistic theory) approach to agriculture and including subjects from agronomy to extension communication. Since graduating Peter's expertise has been honed by exposure to **both public and private enterprise** including NSW Agriculture, the national accounting firm, Bird Cameron and most recently his own consulting businesses – M.O.R.E. and now 3D-Ag.

Peter's flair for original thinking and practical approach to delivery of farmer information made him an effective and respected **District Agronomist** during his time with NSW Department of Agriculture. Based initially at Griffith and then Jerilderie his districts covered both dryland and irrigated cropping. Beyond the day to day agronomic extension work **a significant contribution during this period was the design and development of the highly successful Grain $ense, grain marketing workshop program.** Grain $ense was the first of its kind in Australia to integrate production with market risk – educating farmers in how to minimise the volatility of production and price through sound risk management.

The topic of price risk management continues to evolve with workshops adapted to suit the audience including those in other states. Peter continues to **design and deliver practical farmer training** as areas of need are identified – more recently combining with wife, Hazel to devise **Managing Herbicide Resistance** and initiating the 'Learning from the Land' soils series of workshops with 3D-Ag partner and soil scientist, Phil Mulvey.

Get the whole picture with 3D-Ag

As Bird Cameron's first appointed Rural Management consultant in the Eastern States Peter's responsibilities extended beyond the local Wagga area where he was based, to consulting with Bird Cameron practices in Victoria, SA, WA as well as NSW. This demonstrates that the fundamentals of the whole farm philosophy Peter has developed can usefully be employed in different environments.

The combination of Peter's financial and agronomic skills and understanding has seen him called on as an expert witness as well as utilised by corporate agriculture to conduct **feasibility studies on large scale property purchases including associated capital investment strategies and performance assessments on existing multi-million dollar property investments.**

In 1998, in association with wife, Hazel, Peter founded M.O.R.E. Together, they were determined to deliver genuine whole farm advice believing that integrating all elements of the farm business into planning and decision making made for better, more sustainable outcomes.

M.O.R.E. developed a good track record with its select farm family clients working with all members of the family to help them achieve their goals.

Peter and Hazel also undertook assignments for groups, corporate bodies and government agencies conducting **needs analysis focus groups** as well as a comparative analysis and feasibility study of an environmental project.

Peter's 'tell it like it is' way of speaking and ability to tie together diverse topics has made him a much called upon **seminar presenter and facilitator.**

As principals of M.O.R.E., Peter and Hazel **formed a dynamic team with a comprehensive and diverse range of skills and an understanding from the big picture to individual farm and environmental issues.**

Now with an expanded team in 3D-Ag Peter and Hazel hope to extend their sphere of influence – working to build more productive and profitable businesses tailored to the individual needs of their clients in environmentally sound and sustainable ways.

Qualifications and Associations

Bachelor of Applied Science (Agriculture), Charles Sturt University, Wagga Wagga;
Member of the Australian Institute of Agricultural Science and Technology (AIAST) &
Certificate IV in workplace training & assessment.

Get the whole picture with 3D-Ag