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A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

Tessa Dimond, 2023 Nuffield Scholar
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Scholar contact details

Name Tessa Dimond

Address 12 Kilroy Street, St George Qld 4487

Phone 0457 039 126

Email tess_dimond@icloud.com

In submitting this report, the Scholar has agreed to Nuffield Australia publishing this material in its edited form.

NUFFIELD AUSTRALIA Contact Details

Nuffield Australia

Telephone: 0402 453 299

Email: enquiries@nuffield.com.au

Address: PO Box 495, Kyogle, NSW 2474

Executive Summary

The Australian grain industry is significantly important to the national economy, with approximately 70% of its production aimed at export markets. Navigating the complexities of Maximum Residue Limits (MRLs) for agricultural chemicals is essential to maintain access to these international markets. The challenge is in balancing Australia's risk-based MRL framework with the varying standards of other countries, particularly the European Union's (EU) approach, which aims to significantly reduce pesticide usage by 2030. Ensuring compliance with these differing standards is crucial to avoid trade disruptions.

The grain industry's focus on sustainable farming practices and innovative technologies, while strictly following product label directions, is key to managing these challenges. Access to essential crop protection products is critical for effective weed and pest management, which is necessary for producing high-quality grains. The investment in precision agriculture and Integrated Pest Management (IPM) demonstrates the industry's commitment to improving productivity and sustainability.

Consumer preferences are increasingly leaning towards products with minimal chemical residues and strong environmental credentials. Major companies like Kellogg's and Nestlé are responding to this trend by setting goals to reduce pesticide usage in their supply chains. Australian growers must adapt to these evolving demands while maintaining efficient food production.

The grain industry has put efforts in to align with global sustainability movements, such as the European Green Deal and the United Nations' Sustainable Development Goals. Practices like minimal tillage, crop rotations, and variable rate application improve soil health and biodiversity, helping the industry meet stringent international standards and maintain market access.

Effective communication and traceability of chemical usage throughout the supply chain are crucial. Bulk handlers play a significant role in ensuring grain quality, complying with MRLs, and managing risks. The National Residue Survey (NRS) supports these efforts by providing independent testing and insights, helping to reduce potential export risks. The industry's focus on continuous learning and innovation is important for maintaining its competitiveness and ensuring the sustainability of Australian agriculture in the global market.

In conclusion, this report finds the Australian grain industry must continue to prioritise responsible pesticide usage and alignment with international MRL standards to maintain market access and ensure sustainable farming practices. By embracing innovation, improving communication, and adapting to consumer trends, the industry can navigate global trade complexities and secure its position as a leading producer of high-quality, sustainable grain.

Keywords: maximum residue limits, grain industry, crop protection products, market access, farm to fork, international markets

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

Table of Contents

Global perspective of Maximum Residue Limits (MRLs) effect on Australian grain price and access to international markets

.....	1
Executive Summary	3
Foreword	5
Acknowledgments	8
Abbreviations	10
Objectives	11
Introduction	12
Australian Grain Industry	13
Market dynamics and demand	14
Sustainability and environmental stewardship	15
Crop protection product’s usage in grain production	16
What are Maximum Residue Limits?	17
Setting and compliance with MRLs	17
Domestic	17
International	19
Case Study – Top Farms International, Poland	21
Challenges to international trade	22
How is this issue being tackled?	24
Growers	24
Case Study – Cichowlas, Poland	24
Bulk Handlers	25
Case Study – CBH Group	25
Industry	26
Case Study – “Keep It Clean” Campaign - Canada	26
Case Study – Australian Mungbean Association	27
Case Study – “Dog Book”, Australian Wine Industry	27
Crop specific challenges and opportunities	29
Conclusions	31
Recommendations	32
References	33

Foreword

From an early age, agriculture captivated me, but my journey into the industry wasn't typical. While I was surrounded by agriculture in my youth, I never experienced it fully. Growing up in Goondiwindi, Queensland, my family later moved to the Sunshine Coast for education. This transition, though beneficial for schooling, distanced me from the agricultural lifestyle I idealised. Yet, during school breaks, I found refuge at my grandparents' farm, Glenalva, near Roma, Queensland. Those visits, exploring the farm with my grandfather, observing the wheat crops and Hereford cattle, deepened my passion for agriculture.

While studying on the Sunshine Coast, I decided to switch to an agricultural high school, a notable step in my education. Looking back, I see this change as a practical move, though my experience with the agricultural science department was not as supportive or inclusive as I had hoped. Girls were accepted into the agricultural courses but weren't actively encouraged to engage beyond basic tasks like tending to animals. Despite these challenges, my interest in agriculture remained strong. After completing high school, I relocated to the west.

Over the span of 18 years in St George, my agricultural career has developed steadily. It began with my role as a cotton bug checker, which laid the foundation for my journey in agriculture. While working, I pursued higher education, completing a Bachelor of Business. Additionally, I gained valuable experience as an operations manager at a aerial application business. Seeking further challenges, I shifted into a trainee agronomist role under the guidance of an independent consultant, enhancing my practical skills and knowledge in the field.

My commitment to learning continued with a postgraduate certificate in agriculture and Master's of Science in Agriculture from the University of New England. I recently embraced a new opportunity as a agronomist with AGnVET Rural, specializing in winter grains and pulses and cotton, sorghum and mungbeans over summer. Joining their team allows me to apply my knowledge and passion to serve growers to achieve their farming productivity targets.

Throughout my agricultural career, I've dealt with chemical management, from safe mixing and aerial application to aligning agronomic recommendations with label directions. It's important agronomists understand how our decisions in the field affect productivity and post-farm gate commodity quality. Simply following chemical label directions in Australia doesn't always ensure compliance with MRLs in importing countries. That's why there's a need for awareness and communication from exporters to growers and agronomists along the supply chain. Each step in my career, I have been committed to making a positive impact in the agricultural industry, leading me to apply for a Nuffield Australia Scholarship.

Table 1. Travel itinerary

Travel date	Location	Visits/contacts
February 20-23, 2023	Australia: South Australia Adelaide	EvokeAG Conference Strahman Webster – Steve Mackinlay – ESG's

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

		Michael Anderson – GrainCorp – Head of Sustainability
February 24 – March 3, 2023	Canada: Alberta Calgary	Red Shed Malting - Matt Hamill – Nuffield Scholar GrainsConnect – CEO and grain marketers Alison Armeter – grain grower Rahr Malting – Alix Terminal GrainsConnect – Husxley Terminal – Terminal manager and grain buyers
March 7th – 10th, 2023	Canada: British Columbia Vancouver Island	Pre-Contemporary Scholars Conference
March 11th – 17th, 2023	Canada: British Columbia Vancouver	Nuffield International Contemporary Scholars Conference
March 20th – 23rd, 2023	New Zealand Wellington	Pre-Triennial Tour
March 24th – 1st April, 2023	New Zealand Christchurch to Queensland	Nuffield International Triennial Conference
June 7-8, 2023	Australia: Victoria Melbourne	Australian Workers Party for Grain Protectants Conference
July 8th – 15th, 2023	Australia: Western Australia, Wheat Belt (Geraldton to York)	Rebecca Kelly, Nuffield Scholar, Grain Grower CBH Geraldton Port Bob Nixon, Nuffield Scholar, Grain Grower Brian McAlpine, Nuffield Scholar, Grain Grower Dylan Hirsch, Nuffield Scholar, Grain Grower

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

		<p>Daniel Dempster, Nuffield Scholar, Grain and Sheep</p> <p>Kathryn Fleay, Nuffield Scholar, Agronomist</p> <p>CBH Lab, Perth</p> <p>AEGIC, Perth</p>
July 16th – 19th, 2023	<p>Australia:</p> <p>South Australia</p> <p>Adelaide</p>	Innovation Generation Grain Growers Conference
September 3rd – 10th, 2023	<p>Chile:</p> <p>Santiago</p>	<p>Jose Manuel</p> <p>Antonio Bunster Zegers, Nuffield Scholar, Cherry grower</p>
September 10th – 17th, 2023	Argentina	GFP
September 17th – 24th, 2023	Ireland	GFP
September 24th – October 1st, 2023	France	GFP
October 1st – 7th, 2023	Poland	GFP
October 7th – 14th, 2023	Netherlands	<p>Rogier Scherpbier, Nuffield Scholar, Grain Buyer/value add</p> <p>Edwin Smits, Nuffield Scholar, Pumpkin seed grower</p>
October 16th – 20th, 2023	<p>Italy:</p> <p>Rome</p>	UN FAO WFF Conference
October 21st – 23rd, 2023	<p>Switzerland:</p> <p>Basel</p>	Biologicals Conference
October 24th – 30th, 2023	<p>Scotland:</p> <p>United Kingdom</p>	<p>Angus Soft Fruits, John Gray, Nuffield Scholar</p> <p>Thomas Clark, Nuffield Scholar, Mixed farmer</p>

Acknowledgments

My Nuffield Australia Scholarship has truly been a game-changer, profoundly impacting both my personal and professional journey. What began as a quest to overcome my fear of public speaking has evolved into a profound transformation. As I approach the culmination of this remarkable journey, I find myself not only a seasoned agronomist from western Queensland but also a confident, independent thinker. Balancing my agronomy work with my newfound role as Scholarship Manager at Nuffield Australia has been a rewarding challenge, pushing me to grow in ways I never anticipated.

I am deeply grateful for the generous support of GrainCorp, my Nuffield scholarship sponsor. As GrainCorp's first Nuffield Scholar, I have been privileged to receive invaluable support and guidance from your company throughout my scholarship journey. Without your unwavering support, my participation in this transformative experience would not have been possible. I eagerly anticipate our continued collaboration and partnership as I near the completion of my scholarship.

I would like to thank AGnVET RURAL for their steadfast support during my Nuffield journey. Since the beginning of my Nuffield application, St George Branch Manager Scott Haynes and the team have offered unwavering encouragement. Their assistance in managing tasks during my travels, such as field inspections and soil tests, has been invaluable. As I near the end of my scholarship, I made the challenging decision to transition to a role at Nuffield Australia, reducing my agronomy responsibilities at AGnVET RURAL to part-time. Despite this change, their support remained constant throughout the transition.

Thankyou to my understanding growers and clients for recognising the value of my scholarship and supporting me throughout my extensive travels. Our conversations over the phone have been a highlight, keeping me informed about farm operations and eagerly awaiting updates on my travels. I hope that the insights I gain from my scholarship will contribute positively to each of your farming operations.

I would like to acknowledge the dedication of the Nuffield Management team, including Jodie Redcliffe, Nicola Raymond, and Carol Millar, along with the generous support of Chair, Rob Bradley. Administering up to 20 scholars a year for 14 weeks of international travel is no small feat, but Nuffield Australia has managed to keep the program running smoothly post-COVID. I consider myself fortunate to have been part of the first cohort to complete our scholarship without lockdowns or travel restrictions. Additionally, I express my gratitude to all our country hosts during my Global Focus Program in Argentina, Ireland, France, and Poland, as well as the 11 scholars who journeyed around the world with me: Luke Chaplain, Sarah Crosthwaite, Daniel Dempster, Tim Houstin, Bec Kelly, Parmindar Singh, Pieter van Jaarsveld, Miriam Villen King, Patrick Wade, Kerry Worsnop, and Aaron de Long.

Thankyou to the wonderful individuals I encountered during my scholarship. The generosity of providing a bed, meal, and conversation to a tired Nuffield scholar won't be forgotten, with special thanks to Canadian scholar Matt Hamill for his immediate offer of accommodation and a comprehensive itinerary upon a single email request. To all researchers, agronomists, growers, scientists, advisors, industry bodies, and businesses who shared their knowledge, especially Paul McIntosh, your mentorship sparked my interest in MRLs and their impact on the Australian grain industry.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

Finally, thank you to my amazing parents, Jan and Ray Dimond, who have supported my agricultural passion from the beginning. I am also deeply appreciative of their efforts in maintaining my Airbnb with the assistance of Heather Ryan, tending to my lawn, caring for my dogs, and accommodating any tenants residing in my house during my travels.



Figure 1. Global Focus Program, Glubczyce, Poland (source: author)

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

Abbreviations

AWRI	Australian Wine Research Institute
CBH	Cooperative Bulk Handlers
CSC	Contemporary Scholars Conference
EU	European Union
FAO	Food and Agricultural Organisation
MRL	Maximum Residue Limit
WHO	World Health Organisation
WTO	World Trade Organisation
WFF	World Food Forum
GFP	Global Focus Program
GRDC	Grains Research and Development Corporation
GTA	Grain Trade Australia
GPA	Grain Producers Australia
UN	United Nations

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

Objectives

- What are MRLs
- How MRLs are set domestically and globally
- How are growers, agronomists and bulk handlers tackling the international misalignment of MRLs
- What are the impacts of reducing MRLs to Australian grain growers
- Opportunities for growers

Introduction

The interplay between Maximum Residue Limits (MRLs) for agricultural chemicals and the imperative to maintain access to international markets is a complex one, particularly for a country like Australia where approximately 70% of grain produced is destined for export.

The Australian framework for establishing MRLs involves a comprehensive risk assessment that considers multiple factors including exposure, data, proposed usage, and the risk to trade. This differs significantly from the approach of markets such as the European Union (EU), which utilises a hazard-based approach and has set ambitious targets to reduce pesticide usage by 50% by 2030 under its Farm to Fork strategy.

The challenge for Australia lies in reconciling these divergent regulatory frameworks and risk assessment methodologies to ensure compliance with the MRLs of importing countries. Non-compliance with these limits can lead to serious trade repercussions. Therefore, a nuanced strategy is required to maintain access to essential chemicals for grain production while ensuring that the agricultural exports meet the varied and stringent MRL standards of international markets. This could involve close collaboration with international bodies, adaptation to alternative farming practices, and investment in the development of new crop protection products.

As the world's population continues to grow, especially in Asia and Africa, the international market for Australian grain is expanding. This growth presents both unique opportunities and challenges for Australian growers, who must navigate a complex landscape of consumer preferences, sustainability standards, and trade regulations. Integral to this balance is the industry's commitment to following product label directions, ensuring spray quality, and minimising drift – cornerstones of pesticide application that protect people, the environment and access to crucial crop protection products.

The fate of chemical residues from the point of application to the final exported commodity is a matter of growing importance, influenced by diverse conditions of pesticide application, label adherence, and the handling of grains throughout the supply chain. Moreover, the industry faces the ongoing task of aligning these practices with international MRL requirements, which sometimes diverge from domestic standards. The Australian grain industry's response to these challenges is not just about crop safety and yield; it's increasingly focused on residue levels, market requirements, and the sustainability of the grain industry into the future.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

Australian Grain Industry

The Australian grains industry holds significant importance in the national economy, cultivating a diverse range of grains, notably wheat, barley, oats, canola, sorghum, and pulses. Emphasising export, a considerable portion of the harvest is directed to global markets across Southeast Asia, the Middle East, North Africa, and the Indian subcontinent. Renowned for its innovative and sustainable farming methods, the industry leverages modern technologies to optimise yield, efficiency, and environmental stewardship.

Despite its resilience, the Australian grains industry encounters various challenges, including volatile global commodity prices, climatic uncertainties, evolving trade regulations, and biosecurity concerns. Its substantial contribution to the economy extends beyond mere production, fostering employment, bolstering rural communities, and driving research and development endeavors aimed at enhancing competitiveness and resilience.

Industry organisations play a pivotal role in advocating policies, allocating research funds, and expanding market opportunities. Overall, the Australian grains sector presents a multifaceted landscape characterised by diverse production practices, continuous innovation, a strong export orientation, and an unwavering commitment to sustainability and product quality.

A notable illustration is the EU indication in 2023 to reduce the MRL for haloxyfop on canola from 0.2mg/kg to 0.005mg/kg. Observing how this crucial information has been disseminated and the subsequent advisory from peak industry bodies against using haloxyfop over canola from the 2023/24 season is insightful. The ripple effect of these MRL adjustments necessitates growers and agronomists to explore and devise alternative weed control strategies.

Market dynamics and demand

In the current global market landscape, the focus on chemical residues on food is intensifying. This heightened scrutiny is evident in both domestic and international markets, with an increasing demand for transparency regarding the residue status of Australian grain. Consumers are not only increasingly conscious about environmental sustainability standards within the grain industry but are also seeking products labelled as "free-from" or "non-glyphosate" certified. A study commissioned by CBH underscores this trend, revealing that 91% of consumers prioritise chemical residues as of paramount concern, with 36% considering it extremely important and 55% very important (CBH Group, 2021). This surpasses other factors such as traceability, nutrition, and accreditation. Notably, the concept of 'regenerative' agriculture, despite its growing prominence, ranked seventh in terms of importance among consumers.

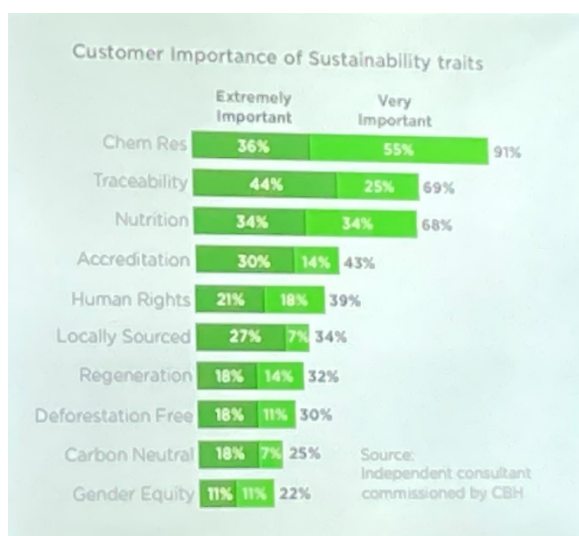


Figure 2. Customer Importance of Sustainability traits (source:CBH, 2021)

This consumer-driven shift is influencing major industry players. Companies like Kellogg's and Nestlé are setting ambitious targets to reduce pesticide usage in their supply chains. Kellogg's, for instance, has committed to phasing out glyphosate as a pre-harvest drying agent in wheat and oats by 2025 and aims to reduce overall pesticide use on crops (Siegener, 2020 & LaMotte, 2023). Similarly, Nestlé is actively engaging with its suppliers to control pesticide use and manage any resultant residues, alongside assisting growers in transitioning to regenerative agricultural practices (LaMotte, 2023).

However, this shift towards stricter pesticide usage standards and sustainable practices must be carefully balanced against the needs of a growing global population. There is an ever-present demand for low-cost, efficient and sustainable food production, particularly in developing nations. This dichotomy presents a significant challenge for the Australian grain industry, which must navigate the complexities of meeting these evolving consumer demands and sustainability goals while maintaining its competitiveness in efficient food production.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

Sustainability and environmental stewardship

Globally countries are in the pursuit of standardised sustainability measures, driven by the need to validate and demonstrate that grain production adheres to sustainable and ethical practices. This movement, crucial for maintaining access to key international markets like the EU, aligns with broader environmental goals. The European Green Deal, introduced in 2019, epitomises this shift, aiming to transform the EU into the first climate-neutral continent by 2050. This initiative dovetails with the United Nations' 17 Sustainable Development Goals, particularly through its 'Farm to Fork' strategy (Koundouri, *et al.*, 2021). This strategy seeks to revolutionise food systems, making them fairer, healthier, and more environmentally friendly. A central ambition of the 'Farm to Fork' strategy is to lead a global transition towards reduced reliance on pesticides, targeting a 50% reduction in pesticide usage by 2030.

In response to these global trends, the Australian grains industry has established the Australian Grains Industry Sustainability Framework, encompassing 12 goals focused on environmental stewardship, safety, wellbeing, and enhancing consumer confidence. This framework is supported by Sustainable Grain Australia, which has adopted the International Sustainability and Carbon Certification (ISCC) scheme, recognised globally for its stringent sustainability criteria. However, the Australian context presents unique challenges and opportunities. The industry's adoption of practices such as minimal tillage, stubble retention, controlled traffic, variable rate application, crop rotations, and integrated pest management (IPM), positions it as a leader in sustainable farming, even considered radical by standards in regions like the Mid-West USA and the United Kingdom. This leadership presents Australian farmers with the opportunity to showcase their sustainable agriculture credentials to customers.

Nevertheless, the Australian grain industry faces the challenge of balancing the use of pesticides that underpin sustainable practices with the need to maintain grain prices and access to international markets. This balancing act is pivotal, as it impacts both the industry's competitiveness and its alignment with evolving global sustainability standards.

Crop protection products usage in grain production

The role of crop protection products is foundational to the Australian grains industry, underpinning both food security and economic and environmental sustainability. Their judicious application throughout the grain production process – prior, in-crop, and post-harvest – adhering strictly to label directions, is critical. Herbicides, insecticides, and fungicides are indispensable in feeding a growing global population. However, the fate of these chemicals from application to the final exported grain encompasses a myriad of variables: diverse conditions of application, adherence to label rates, selective application across paddocks, the challenge of unregistered pesticide use, and the practice of segregating or blending grains along the supply chain.

Amidst economic pressures like rising input costs, interest rates, labor costs, and machinery expenses, and the looming threat of pesticide resistance, Australian farmers are turning to cutting-edge technology for profitability and global competitiveness (Grain Growers, 2023). Innovations such as selective spraying solutions equipped with intelligent sensors – such as ‘green-on-brown’ in fallows have dramatically reduced overall herbicide usage (Fulwood, 2019). The adoption of IPM strategies within the grains industry has also been pivotal in mitigating pesticide resistance and reducing application rates (MacFayden *et al.*, 2014). With further innovations such as ‘green-on-green’, and alternative weed removal methods such as lasers, chemical usage could be reduced further.



Figure 3. Swarm Farms Robot with RBE trailer 18m (source: Col Hogan)

The potential removal of key crop protection products from the Australian grains industry would be a retrogressive step, compelling farmers to revert to more conventional methods, including increased frequency of cultivation and crop residue burning. Such a shift could lead to a stark decline in crop yields, increased labour and fuel costs, environmental damage and heightened drought impacts for many grain growers. Crop protection products, thus, are not mere inputs but are integral to fulfilling the global demand for food security and sustainability. Their considered use is important not only in maintaining but also enhancing the natural capital of Australia's farmlands, ensuring a legacy of productivity and environmental stewardship for future generations.

What are Maximum Residue Limits?

MRL's are established legal thresholds that are applicable to the entirety of food items available for sale (FAO 2022). These limits are determined via residue trials that mirror the principles of sound good agricultural practice (GAP). They are established considering the highest permissible quantity of chemicals necessary for the effective management of pests and/or diseases. How crop protection products are registered and regulated and therefore how MRLs are established differs globally, causing potential exporting issues and challenges

Setting and compliance with MRLs

Domestic

Chemical regulation in Australia relies on a risk-based approach, grounded in scientific studies and data, and is designed to be impartial, free from political and commercial influence. The Australian Pesticides and Veterinary Medicines Authority (APVMA) plays a pivotal role in this system, tasked with approving and registering crop protection products for safe utilisation in food production within Australia (APVMA 2023). This process involves an assessment of the chemicals' safety for both people and the environment, potential impact on trade, and overall efficacy. A key aspect of this regulation is the setting of MRLs, which the APVMA defines as “the maximum concentration of a residue resulting from the registered use of an agricultural or veterinary chemical which is legally permitted or recognised as acceptable to be present in or on a food, agricultural commodity or animal feed”. These MRLs are established based on the approved use pattern when the product is applied in accordance with GAP.

Australia's commitment to a rigorous, science-based evaluation system is further reinforced by the National Residue Survey (NRS), an independent testing program established in 1992, with a specific grains program initiated in 1993 (DAFF 2024). Unlike regulators, the NRS operates independently, providing valuable insights and advice on export risk while assisting the industry in mitigating potential damage from rejected loads. Serving as an educational tool for the industry, the NRS offers guidance and support to enhance compliance with domestic MRLs and maintain Australia's reputation for clean, green agricultural practices.

The 2022-2023 NRS results, derived from 7,024 grain samples, showcased an impressive 99.52% compliance rate with domestic MRLs (Norwood, 2023). This underscores the industry's steadfast commitment to upholding high standards and adhering to GAP. Notably, the NRS has observed evidence of industry outreach efforts effectively reducing MRL detections through educational initiatives. By helping to mitigate risks associated with chemical residues, the NRS contributes significantly to safeguarding Australia's clean green reputation and ensuring ongoing market access.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

11.2 Registered products

Table 2 details the registered herbicides for use when desiccating pulses.

NOTE: It is imperative that only registered products are used at label rates.

Exceeding maximum label rates will lead to the detection of chemical residues in excess of the allowable Maximum Residue Level (MRL) jeopardising market access and the future of the Australian grains industry.

Figure 4. Example of how the Australian grain industry communicate following pesticide labels impacts to the grain industry (Source: GRDC, 2017)

Moreover, the NRS results play a crucial role in supporting export certification, facilitating market access, and bolstering domestic quality assurance programs. By demonstrating the long-term integrity of Australian exports, the NRS reinforces confidence in the safety and quality of Australian grains, both domestically and internationally.

Post-harvest industry management systems Australia implements to measure and ensure grain is shipped to markets with chemical residue levels below the limits of each destination market which include; use of commodity vendor declarations from growers on crop protection products used on the growing crop, grain segregation, stock selection, laboratory chemical residue analysis of grain stock and commingling of grain during outturn.

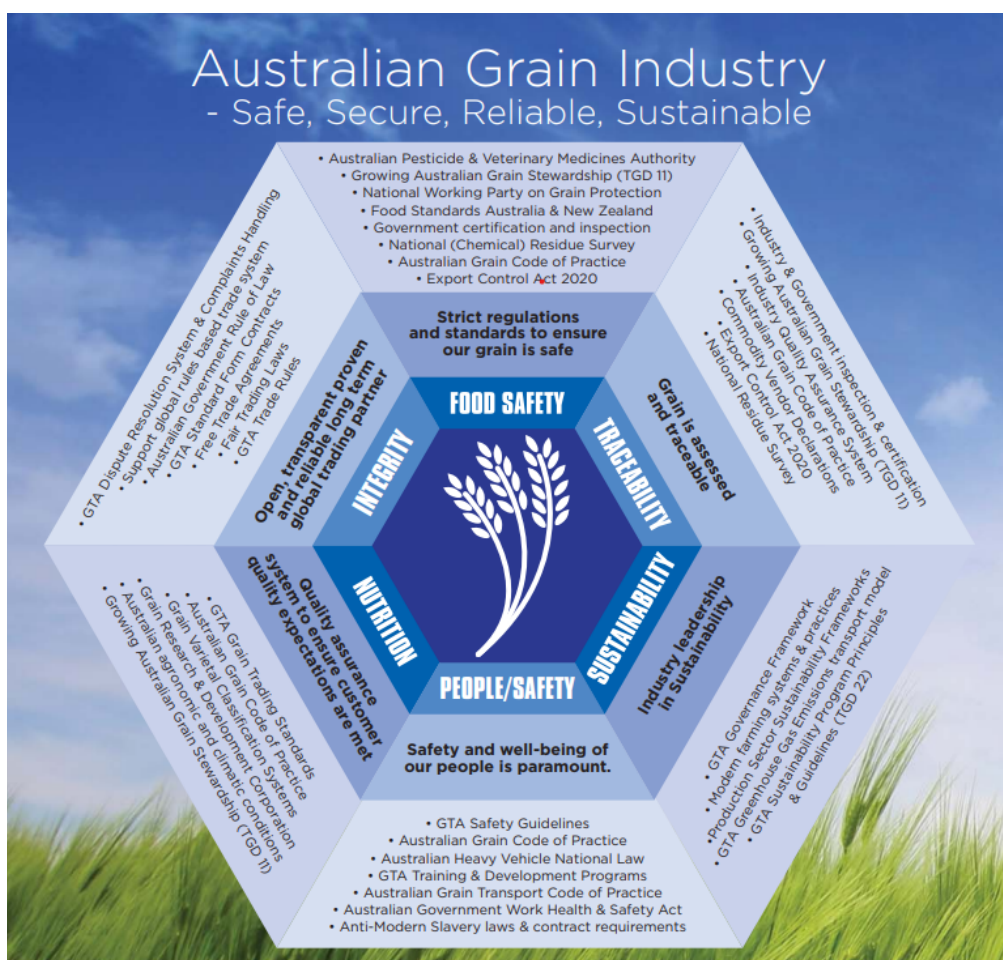


Figure 5. Australian Grain Industry Environmental Societal Governance (Source: Grain Trade Australia)

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

In Australia, the framework for grain standards is supported by a range of strict regulations and standards. As illustrated in Figure 5, key players in this framework include the APVMA, Growing Australian Grain Stewardship, National Working Party on Grain Protection (NWPGP), Food Standards Australia, and various government inspection and certification bodies. The adherence to these standards, alongside compliance with the Australian Grain Code of Practice and the Export Control Act 2020, ensures the ongoing quality of Australian grain in both domestic and international markets.

International

Internationally, the setting of food safety and quality standards, including MRLs for pesticides, is largely overseen by the Codex Alimentarius Commission (FAO 2022). The Codex Alimentarius Commission, established by the United Nations (UN) and the World Health Organization (WHO), is an international entity aimed at enhancing and streamlining global food regulations (FAO & WHO 2024). Within its framework, Codex MRLs have been established for certain crop protection products across various crops. Additionally, many countries recognise and adopt Codex MRLs when their own standards are not available, Figure 6 illustrates how Codex aims to harmonise MRLs through National Pesticide Risk Management Framework.

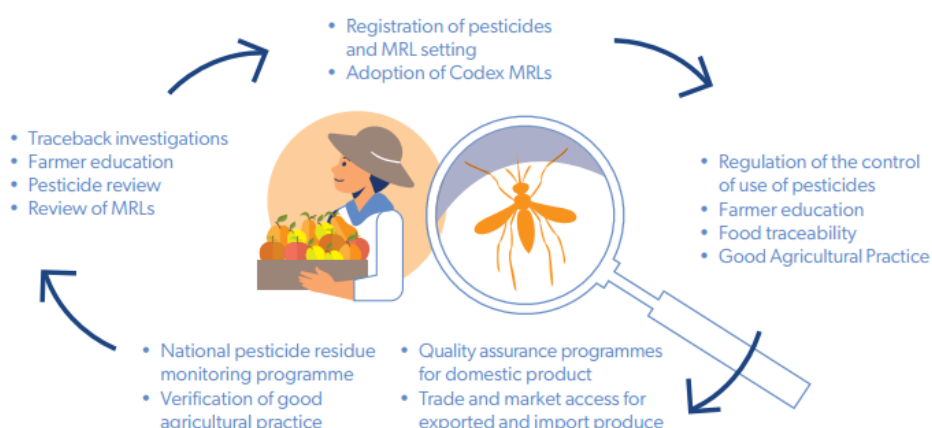


Figure 6. Pesticide Risk Management Framework (Source: FAO 2022)

This body focuses on ensuring consumer health and promoting fair practices in global food trade. Efforts by organisations like CropLife International towards the global harmonisation of MRLs are ongoing, to increase consumer confidence, develop efficient and consistent MRL processes and improve international access to markets (CropLife Australia 2011).

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets



Figure 7. Illustration of CODEX (Source: Bopp, S 2019)

Challenges emerge, particularly with the EU’s approach to chemical regulation, which often prioritises the intrinsic properties (hazard) of chemicals over a comprehensive risk-based assessment, not considering exposure pathways, which can be inconsistent with science (Bopp, S 2019). All member nations of the EU must follow MRLs set by the European Commission (European Commission 2023). Additionally, when no EU MRL exists, the European Commission has set a general default MRL of 0.01 mg/kg. This stance can create unofficial trade barriers, emphasising the importance for the Australian grains industry to encourage the Australian government’s active engagement with Codex. Such engagement aims to facilitate MRL harmonisation and mitigate trade risks. In April 2024, India has made a submission to the World Trade Organisation (WTO), that stringent MRLs can act as trade-restrictive non-tariff barriers, especially affecting exporters from developing countries (Menafn, 2024). The submission suggests that guidelines should not rely on ‘hazard-based approaches’ and should be developed with the Food and Agriculture Organisation (FAO) and Codex Alimentarius (Menafm, 2024).

Table 2. List of European Union Countries

The European Union Countries			
Austria	Belgium	Bulgaria	Croatia
Cyprus	Czechia	Denmark	Estonia
Finland	France	Germany	Greece
Hungary	Ireland	Italy	Latvia
Lithuania	Luxembourg	Malta	Netherlands
Poland	Portugal	Romania	Slovakia
Slovenia	Spain	Sweden	

Case Study – Top Farms International, Poland

Top Farms International in Poland illustrates the impact of removing certain seed dressings (neonics) on oilseed rape crops. Since 2013, the European Commission has restricted three neonicotinoids, affecting their use as a seed treatment for protecting oilseed rape. This restriction is notable given oilseed rape's susceptibility to pests like cabbage stem flea beetle, which already have limited control options. Top Farms and all European farmers, faced with this restriction must choose between reducing the area planted to oilseed rape or increasing foliar in-crop applications. Studies suggest an average of 0.73 foliar applications per hectare increase in foliar crop protection products, indicating a growing reliance on in-crop insecticides (Noleppa 2017).

The removal of neonics has led to increased economic costs and significant environmental impacts (Noleppa 2017). With a rise in the use of foliar insecticides such as pyrethroids, farmers are dealing with the consequences of shifting away from a previously effective pest management tool. This change has compelled farmers to explore alternative, often pricier, pest management solutions despite their limitations in resistance management. Consequently, the widespread adoption of pyrethroids has resulted in direct effects at the farm level, raising questions about Europe's commitment to sustainable agriculture.

This dilemma highlights the discrepancy between regulatory decisions and the EU's broader goals of revolutionising food systems. The 'Farm to Fork' strategy aims to create fairer, healthier, and more environmentally friendly food systems, targeting a 50% reduction in pesticide usage by 2030. However, the removal of essential tools like neonics conflicts with these objectives, challenging Europe's ability to produce safe and affordable food sustainably.

Despite these challenges, Top Farms International remains committed to sustainable agricultural practices. Their proactive embrace of regenerative farming methods and investment in precision technologies demonstrate their dedication to achieving agricultural sustainability while ensuring food safety and traceability.



Figure 8. Rapeseed crop in Poland (Source: Markowicz, M, 2024)

Challenges to international trade

International trade is a complex political minefield, various challenges persist including MRLs, with many countries upholding protectionist regimes under the guise of measures related to MRLs, effectively serving as trade barriers. The misalignment of MRLs across different regions further impairs these obstacles, posing significant challenges to industries reliant on global trade. Notably, certain crop protection products commonly used in the grain industry are now undergoing regulatory review internationally, resulting in the removal or significant reduction of MRLs. Requiring the evaluation by Australian grain growers and agronomist to find alternative chemicals or adjustments in agronomic practices to maintain yield while balancing access to international markets. Increased testing and scrutiny from importing countries using highly sensitive equipment to test for residues, detecting levels close to one part per billion or increasingly parts per trillion (Keep it Clean, 2024).



One part per billion = nine canola seeds in a super B truck

Figure 9. Illustration of residue testing down to one part per billion (Source: Keep it Clean, 2024)

A prime example of this is the EU's indication in 2023 to reduce the MRL for haloxyfop on canola from 0.2mg/kg to 0.005mg/kg (Grains Australia 2023). Haloxyfop, a selective post-emergence herbicide crucial for controlling key annual and perennial grass weeds in various crops, including canola. Haloxyfop is legally registered in Australia, figure 10 shows the label directions and requirements to apply haloxyfop to winter crops. However, compliance with the new EU MRL presents a significant challenge, as residue detections are expected to exceed the revised limit (Grains Australia 2023). Industry stakeholders, including bulk suppliers, grain industry bodies, and chemical companies, have proactively communicated these challenges and urged the exploration of alternative solutions.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

TABLE 1A.
Winter Crops – Canola, Chickpeas, Faba beans, Field peas, Lentils, Linola, Linseed, Lupins, Lucerne, Vetch, Medic and Clover pastures or Seed crops.

WEEDS CONTROLLED	WEED GROWTH STAGE	RATE (mL/ha)		CRITICAL COMMENTS
		With Uptake* or Hotwire® Spraying Oil	With a non-ionic wetter	
Annual Ryegrass	2 - 4 leaf	75	100	<p>CANOLA, LINOLA AND LINSEED DO NOT apply after the 8 leaf stage of the crop. DO NOT apply after the commencement of stem elongation. This means that application must not occur after the 8 leaf stage, or if stem elongation commences before the 8 leaf stage, application must not occur after stem elongation has commenced. DO NOT apply more than 1 application of herbicide containing haloxyfop per crop. DO NOT apply after grazing.</p> <p>See GENERAL INSTRUCTIONS, Spraying oils/wettors section. FIELD PEAS AND CANOLA: The only oil recommended for use with FIREPOWER is Uptake or Hotwire Spraying Oil. FIREPOWER® + Victory® 750 SG + Uptake* or Hotwire® Spraying Oil are compatible and selective to canola. The tank-mix is also compatible with atrazine and selective to triazine tolerant canola. LUPINS AND FIELD PEAS: Mixtures with Bonanza® Elite or Simanex® may cause crop yellowing and separate applications are recommended. CHICKPEAS, FABA BEANS, LENTILS AND VETCH, LINOLA, LINSEED: Broadleaf herbicides should not be added to FIREPOWER®. Apply FIREPOWER® and broadleaf herbicides at least a week apart. LUCERNE, CLOVER OR MEDIC PASTURES: If grazed or cut for hay immediately prior to treatment delay application until all grasses have fully expanded leaves. Use 75 mL + spraying oil or 100 mL + wetter/ha. (See GENERAL INSTRUCTIONS, Spraying Oils/wettors section). If Silver Grass (<i>Vulpia</i> spp.) is present in pasture, Simanex should be tank mixed with the higher rate of FIREPOWER® plus a non-ionic wetter.</p>
	Early tillering	100		
Barley Grass, Brome Grass, Paradoxa Grass, Volunteer Cereals	2 - 4 leaf	50	75	
	Early tillering	75	100	
Wild Oats (WA, SA, Vic, Tas, Southern and Central NSW)	2 - 4 leaf	37.5	50	
	Early tillering	50	75	
Wild Oats (Northern NSW, Qld)	2 - 4 leaf	75	100	
Early tillering				

Figure 10. Firepower 900 (Active ingredient Haloxyfop) (Source: Adama, 2021)

Despite efforts by the Australian government to engage with the EU on haloxyfop MRLs for canola, submissions advocating for a more favorable MRL have been unsuccessful (Grains Australia 2023). Consequently, growers and agronomists are compelled to devise alternative weed control strategies to navigate the regulatory landscape effectively.

Another crop protection product under recent review is carbendazim, a systemic fungicide commonly used in pulse crops to control fungal diseases. However, its registrations have been revoked in key markets such as the EU and North America, prompting international scrutiny and regulatory recommendations for withdrawal of some MRLs by Codex (GRDC 2024). The APVMA supported the continued use of carbendazim in pulse crops and macadamia nuts but deregistered its use in other crops, reflecting the evolving regulatory environment impacting agricultural practices globally (APVMA 2012).

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

How is this issue being tackled?

Navigating the challenges associated with MRLs requires collaboration among various stakeholders in the agricultural industry. From growers and brokers to industry bodies and suppliers, each plays a vital role in addressing these hurdles. Efforts can be observed across varying different industry sectors, including berries, nuts, malt, pumpkin seeds, vegetables, and wine, where MRL compliance remains a common concern. Despite the varying scales of enterprises involved, there is a shared acknowledgment of the importance of adhering to MRL regulations imposed by importing countries or customers, such as supermarkets. Moreover, the removal of key crop protection products essential for production has spurred the exploration of innovative solutions aimed at maintaining quality and productivity. For example, in the potato industry within the EU, the withdrawal of diquat prompted growers to explore alternative tools like mechanical desiccation. These proactive measures highlight the industry's commitment to overcoming MRL-related challenges while ensuring the sustainability of agricultural practices.

Growers

Compliance with MRLs can start from the grower and agronomist in the paddock, but how can growers navigate compliance and identify opportunities within international market requirements? Effective communication and traceability along the supply chain are essential, with a strong emphasis placed on transparent customer vendor declarations. In the Australian grain sector, there's a common emphasis on adhering strictly to label instructions to meet domestic MRL standards. However, ensuring alignment with international market requirements remains a nuanced challenge, raising questions about responsibility and navigation.

Case Study – Cichowlas, Poland

"Cichowlas," is a leading vegetable supplier and packer situated in Poland. Originally a modest farming operation spanning 20 hectares, Cichowlas has experienced significant growth, expanding to 100 hectares over the years. Specialising in vegetable production, they packed an impressive 35,000 tons of produce in 2022. The company relies on a network of 100 local farmers who supply their produce, which is then packed and distributed to middle-position Polish supermarkets.

One of their major customers, the Polish supermarket chain "Liddells," imposes stringent MRLs, which are notably lower than the national standards. Liddells tests for a comprehensive list of 800 active ingredients, with testing conducted in Germany. The process, from sampling to obtaining results, takes approximately 38 hours. In 2022 alone, Cichowlas underwent 408 residue tests, a mandatory requirement for any new farm supplier. Additionally, random tests are conducted throughout the year, with increased testing during environmental changes or heightened disease events necessitating greater fungicide use.

To maintain transparency and foster cooperation along the supply chain, Cichowlas actively communicates with its suppliers, offering field days and grower groups for farmers. They have also embraced precision agriculture techniques, incorporating lasers for precise weed control.

Despite historical challenges with MRL compliance, Cichowlas has achieved an impressive compliance rate of over 99%. Past issues stemmed from off-label chemical

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

use and the reluctance of some chemical companies to register or extend product labels. While growers may believe certain practices are safe, they can inadvertently lead to MRL non-compliance.

Notably, the market landscape is evolving, with a growing emphasis on sustainability certification. Both consumers and customers are increasingly demanding sustainable practices. While Cichowlas does not receive a premium for meeting lower MRL standards, compliance has become a prerequisite for market access, highlighting the importance of adhering to these standards to maintain competitiveness in the industry.

Bulk Handlers

Bulk grain handlers play a critical and multifaceted role in the grain supply chain, connecting producers with markets and influencing a country's agricultural reputation. They ensure grain quality through rigorous testing and proper storage, maintain compliance with MRLs, and manage associated risks. By implementing traceability systems, they provide transparency and accountability.

The role of bulk handlers varies by country. In Australia, bulk handlers store most of the grain harvested, whereas in Canada and the United States, the majority of grain is stored on-farm. Regardless of the setup, their responsibility in preserving grain quality and ensuring timely market access is essential. They identify new market opportunities, adopt sustainable practices, and facilitate communication among stakeholders, ensuring the efficiency and reliability of the grain supply chain.

Case Study – CBH Group

CBH Group, or Cooperative Bulk Handling, is a Western Australia-based cooperative that plays a pivotal role in the handling, marketing, and processing of grains in Australia. As one of the largest grain export businesses in the country, CBH handles millions of tonnes of grains annually, providing critical services in the agricultural supply chain. The cooperative is actively involved in ensuring grain quality and market access by employing a host of strategies, including engaging with agronomists and growers and conducting comprehensive in-house laboratory testing.

CBH employs a comprehensive strategy to minimise the risks associated with accessing international grain markets. They utilise an in-house agronomist, who liaises with farmers and agronomists to monitor crop quality and seasonal challenges. This close collaboration allows CBH to pre-emptively identify and mitigate any potential issues that could affect the quality of the grain including chemical residues. In addition to this, CBH's involvement in the NRS gives them a broader perspective on potential risk factors like chemical residues, helping them to make informed decisions. They also maintain in-house laboratory facilities in Perth for quick and accurate testing of grain samples. These labs are crucial in ensuring that the grain meets the stringent quality requirements of international markets. By combining these various elements—expert consultation, data from national surveys, and their own rigorous testing—CBH is able to effectively manage and reduce the risks that could otherwise limit their ability to access key markets, thereby securing a more stable and expansive market presence.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

Industry

Industry advocacy of MRLs is essential and relies on effective communication channels. Various agricultural industries worldwide have developed their own initiatives to inform growers about MRLs, their impact, and compliance requirements. These programs emphasise the importance of maintaining industry and country reputations. These efforts demonstrate the critical role of education and communication in ensuring that agricultural products meet international standards, supporting the sustainability and profitability of the industry.

Case Study – “Keep It Clean” Campaign - Canada

The "Keep It Clean" campaign is a joint initiative led by the Canola Council of Canada, Cereals Canada, Pulse Canada, and the Prairie Oat Growers Association, funded in part by the AgriMarketing Program under the Canadian Agricultural Partnership. This initiative provides growers and agronomists with essential tools and updates to help produce crops that meet the standards of both domestic and export customers.

Canada exports the majority of its grain and oilseeds. Specifically, 90% of their canola, 65% of their wheat, barley, and oats, and 85% of the Canadian pulse harvest are sent to international markets. Meeting international standards is crucial for these exports.

The "Keep It Clean" program assists farmers in navigating these standards by offering practical tools, updates on potential market risks, and calculators for on-farm practices. With increasing global scrutiny on market access issues, the burden of ensuring crops meet high standards falls heavily on farmers (Norman, 2023).



Figure 11. Example of communications of changes to products (Source: Keep it Clean, 2024)

The campaign emphasises five key tips for farmers, the use of acceptable pesticides, advocating for always reading and following label, have an integrated approach to managing pest and disease pressures, maintaining quality and minimising cross-contaminants by storing your crop properly and finally highlighting that the Canadian Declaration of Eligibility affidavit is a legal document and individuals can be traced back to the farm gate.

Farmers need to manage various aspects throughout the growing season to maximise yields (Norman, 2023). However, it is equally crucial to ensure that the harvested grain meets market standards for sale. The "Keep It Clean" campaign underscores the importance of best practices in ensuring that Canadian grains and oilseeds meet

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

international market demands, thereby supporting the sustainability and profitability of Canadian agriculture.

Case Study – Australian Mungbean Association

The Australian Mungbean Association (AMA) represents various sectors of the Australian mungbean industry, aiming to uphold food safety standards, enhance traceability, promote superior cultivars, and provide valuable production and marketing insights. A key objective is to ensure robust market access by safeguarding the industry's reputation through Vendor Declarations, aligning with MRL for exports. With a significant increase in production and demand over the past decade, the export-centric supply chain handles close to 100% of mungbeans for human consumption, with 95% being exported, primarily catering to processing and manufacturing sectors. These exports are mainly directed towards Asia and the Indian sub-continent, with a noticeable shift towards Southeast Asia reflecting evolving market dynamics (AMA, 2020).

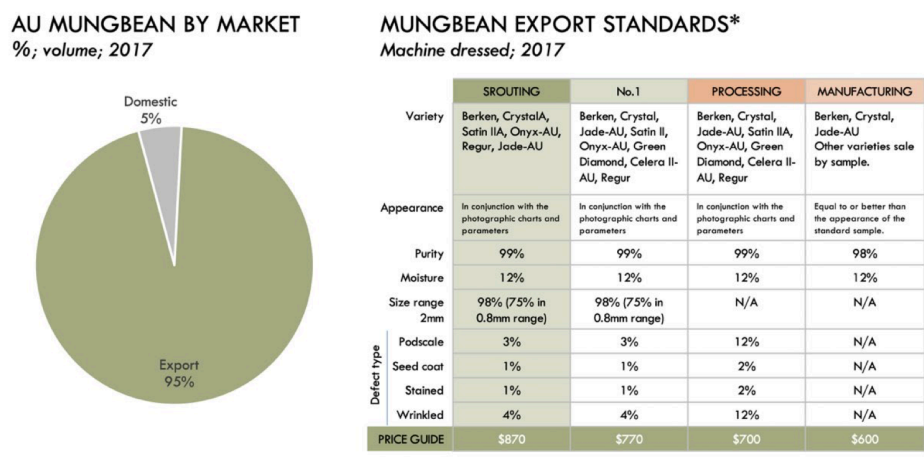


Figure 12. AU Mungbean by market & export standards (Source: AMA, 2020)

The AMA facilitates the Certified Agronomy Scheme, launched in 2000, which plays a crucial role in educating agronomists with the skills necessary for reliable and profitable mungbean production, addressing industry feedback on agronomists' proficiency gaps. Through workshops, field monitoring, and ongoing support, the scheme educates agronomists about the risks associated with MRLs and the importance of adhering to labelling instructions. By providing training on MRL regulations and emphasising compliance to ensure product safety and market access, the scheme equips agronomists to navigate MRL-related challenges and risks to exporting markets. Additionally, the scheme underscores the importance of meticulous adherence to label instructions, particularly in pesticide application corresponding to crop growth stages. These efforts strengthen agronomists' knowledge and expertise, fostering sustainable mungbean production practices.

Case Study – “Dog Book”, Australian Wine Industry

The Australian Wine Research Institute (AWRI) plays a important role in this advocacy effort by producing the Agrochemicals booklet, commonly known as the "Dog book" within the wine industry. This resource is also available as a user-friendly phone app, providing easy access to essential information for winemakers.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets



Figure 13. AWRI "Dog book" (Source: AWRI)

One challenge in grape production in Australia is the absence of MRLs in overseas markets for some crop protection products. This is often because grapes are not commercially grown in these countries, leading to a lack of registration for certain crop protection products. Consequently, the absence of MRL requirements for grapes can pose challenges for wine exports, as MRL values may vary between countries. Therefore, careful planning of spray programs is essential to ensure compliance with the standards of Australia's major wine markets.

The "Dog book" holds particular significance for the industry, especially for winemakers exporting products to the EU, where stringent regulations apply. Supported by Wine Australia and funded by levies from Australia's grapegrowers and winemakers, as well as matching funds from the Australian Government, the AWRI agrochemicals project is crucial in safeguarding the reputation and success of the Australian wine industry (AWRI 2024). It serves as a vital tool for ensuring compliance with export requirements and maintaining high-quality standards.

In addition to the "Dog book," vineyards have access to web-based programs like Grapeweb and Grapelink to monitor, record and verify chemical applications. These tools enable vineyards to track their practices accurately and share essential information with wineries. Some wineries even implement strict policies, such as "no spray records = no harvest/delivery," highlighting the importance of meticulous chemical management in vineyard operations.

Crop specific challenges and opportunities

In the Australian grains industry, evolving agronomic management practices are opening new avenues for distinguishing Australian grain in the international market. This differentiation has the potential to set Australian products apart from global competitors. For instance, mechanically desiccated (swathed) mung beans have the potential to command a premium, reflecting a market preference for certain production methods. Similarly, glyphosate-free sorghum is gaining traction, particularly in light of MRL exceedances noted in exports to Taiwan (Grain Trade Australia, 2021). Another example is sun-ripened oats, which are emerging as an alternative to glyphosate-desiccated oats, a practice more common in Canada (Grain Central, 2022).



Figure 14. Swathed mungbeans in St George, Qld (Source: author)

There's also an increasing interest in reducing the use of paraquat in pulse crops such as lentils and lupins, providing a paraquat-free alternative to meet differing international standards. The misalignment of MRLs for paraquat between Australia (1.0 mg/kg) and the EU (0.02 mg/kg) underscores the need for such adjustments (European Commission, 2023; Australian Government, 2023). Major customers like Kellogg's and Nestlé are showing a growing demand for glyphosate-free grains, potentially leading to premium pricing (LaMotte, 2023, & Siegner, 2020).

However, these agronomic shifts come with their own set of challenges. Moving away from chemical desiccation or spray topping for weed seed control requires careful planning and execution. For example, avoiding glyphosate to even out grain sorghum maturity necessitates ensuring even emergence at planting. Likewise, omitting paraquat from weed seed control in lupins and lentils means that pre-plant and in-crop weed control must be more effective, or alternative methods for removing or destroying weed seeds at harvest need to be implemented. These changes in practice not only reflect market demands but also require adaptability and precision in agronomic management to maintain crop quality and yield.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

EXPORT OF TREATED PRODUCE

Growers should note that MRLs or import tolerances do not exist in all markets for produce treated with Roundup UltraMAX Herbicide. If you are growing produce for export, please check with Bayer CropScience Pty Ltd for the latest information on MRLs and import tolerance before using Roundup UltraMAX Herbicide.

Figure 15. Example of pesticide product label communicating risks of product use to export (Source: Bayer)

Conclusions

The Australian grain industry, facing the dual challenges of a growing global population and evolving market demands, must navigate a complex landscape of international trade regulations and consumer preferences. Key to this is the industry's commitment to responsible pesticide usage and adherence to product labels, ensuring market access. Maintaining access to key crop protection products is crucial for sustainable farming practices, enabling the production of high-quality grains and pulses. These crop protection products support effective weed and pest management, which are essential for optimal yield and crop health.

With increasing global focus on environmental sustainability and reduced pesticide reliance, as highlighted by initiatives like the European Green Deal and consumer trends towards "chemical-free" products, Australian growers are positioned to adapt and innovate. This includes embracing technologies such as selective spraying and IPM, while also aligning with international sustainability standards.

Looking forward, the Australian grain industry's success hinges on effective communication, continuous learning, and adaptability to market shifts. As the industry responds to consumer demands for sustainable practices and navigates regulatory landscapes, it must balance these with the imperative of efficient food production. Ensuring the availability and proper use of key crop protection products is integral to this balance, as it directly impacts the ability to produce safe and affordable food. The role of Australian growers will be pivotal in this evolution, as they adjust agronomic practices and explore new market opportunities, ensuring the continued competitiveness and sustainability of the Australian grain industry in a dynamic global market.

Recommendations

- Enhance communication and consultation: It's important to continually improve communication and consultation within the industry. This effort helps in understanding market requirements and staying informed about consumer preferences
- Educate on market requirements: There should be a concerted effort to provide growers and agronomists with up-to-date information about market demands. This education is crucial for keeping pace with evolving consumer trends
- Adapt to consumer trends: Growers are encouraged to adapt to changing consumer preferences. This might include adopting new farming techniques, experimenting with different crops, or implementing more sustainable practices
- Focus on innovation: The industry should focus on innovation, not just to meet current market demands but to anticipate future trends. This proactive approach can help maintain Australia's position as a leader in the agricultural sector
- Collaborative effort for continuous learning: All stakeholders should engage in continuous learning and knowledge sharing. A collaborative approach is key to exploring and adopting innovative practices that align with market trends.

A Global perspective of how Maximum Residue Limits (MRLs) affect the Australian grain price and access to international markets

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