March 2021

A Report on Wheat Quality Management in a Post Single-Desk Era

Lessons from Australia

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Acknowledgment: The authors would like to acknowledge the research funding by Genome Prairie and Genome Canada to support this works under Activity 5.4 of CTAG2 research project

EXECUTIVE SUMMARY

In an effort to modernise the regulatory framework of the Canadian grain industry the Canada Grain Act is currently under review. Since the last review of 1985, the grain industry has undergone significant changes, most notably the removal of single desk marketing powers of the Canadian Wheat Board (CWB) in 2012. This review takes place in the context of an increasingly competitive international market, the changes in the broader quality management system, and changing roles and incentives within the grain marketing value chains. The question is to how regulations could be amended to effectively and efficiently meet current industry needs in a highly competitive environment.

One critical consideration of the review is its effect on the perceived quality of Canadian grains. The Canada Grain Act gives the Canadian Grain Commission (CGC) the authority and the resources that enable it to provide a number of industry goods related to grain quality. In addition to its direct role in variety registration and in management and enforcement of grading standards, the CGC interacts regularly with other organizations and industry stakeholders that impact grain quality. Until 2012, the CWB also played a central role in quality management, not only through direct activities in marketing, logistics and customer service, but also through its funding for the Western Grains Research Foundation and for the Canadian International Grains Institute (Cigi). Many of these activities are currently performed by other industry players including the private grain trade, the newly established provincial Wheat Commissions, and new funding model for Cigi.

Focusing on the critical importance that other industry goods play in achieving a well-functioning quality assurance system, we draw some lessons from the Australian case. Australia followed the deregulation path earlier than Canada and had to redevelop new organizations to carry out valuable industry functions. Until 2008 the Australian Wheat Board (AWB) played a central role in quality assurance and provision of numerous industry goods. In addition to administering the classification system and variety registration and publishing the trading/grading standards, the AWB was deeply involved in market development and analysis, market intelligence and feedback to breeders, technical training of end-users, all of which enhance and maintain the reputation of a quality product. Under the single-desk regime, the adequate provision and funding of these complementary industry functions was easily achieved within AWB's centralized structure.

After the elimination of AWB, new organizational and institutional arrangements were needed to fill the void of providing industry goods pertaining to quality. They were relatively fast to emerge for industry goods that were deemed critically valuable by all industry players. These include maintaining the integrity of classification, which has been administered by the Wheat Quality Australia (WQA) since 2012. Additionally, without any governmental directive, publication and administration of the Trading Standards was taken over by Grain Trade Australia (GTA), whose core mission is to facilitate grain trade. While GTA membership is open to all firms operating in the grain industry, membership tiers would place bulk grain handling and marketing companies as significant players.

Other industry goods such as market intelligence, generic promotion and technical training for using Australian wheat, complement the quality assurance and their adequate provision enhance the performance of the quality management system. However, being more prone to free riding, organizations to perform these services were much slower to emerge. Overcoming some initial challenges, the Australian Export Grain Innovation Center (AEGIC) has established itself as the chief provider in this space in the last few years.

A major industry development took place in March 2020, with the founding of Grains Australia (GA) through negotiation among major industry stakeholders. As an independent company, GA aims to consolidate and streamline industry services. The inaugural Board of Directors was put in place in August 2020 and the scope of industry functions and the extent of transition of services from other organizations into the new model has yet to be determined and operationalized.

GRDC has continuously played a central role in leading the provision of industry goods primarily through funding. GRDC is the sole funder of WQA, despite the equal ownership stake with GTA. In addition, GRDC has provided a significant portion of the AEGIC financing in partnership with Western Australia State government. This financing facilitated their operations amid many uncertainties and afforded them the time and opportunity to evolve, mature and establish themselves as organizations that add value for the industry. It is understood that GRDC will provide the entire funding for GA's operations.

After more than a decade of organizational and institutional changes in Australia, the industry has come full circle. The prevailing model has undeniably an element of centralization that was present in the single-desk era. The most recent consolidation of industry functions under Grains Australia, which is funded single-handed by GRDC, signifies the need for coordination and joint provision of complementary industry goods, which can be achieved more effectively in a centralized structure.

Recent funding surpluses of the CGC, combined with the general thrust towards deregulation within the industry, has resulted in grain marketing firms advocating for a smaller role for the CGC in quality assurance system. The private trade in Canada has been critical of the CGC outward inspection in terms of service levels and higher fees than those charged by the third-parties. The CGC higher inspection fees include the overhead costs of providing other industry services with public good characteristics. If regulatory changes would limit CGC's role in inspection activities, that could in turn curtail its ability to fund the provision of other industry related services.

The Australian experience would suggest that quality assurance entail many complementary functions that together enable the grain sector to develop, market and deliver quality grain to its customers. Having explored a number options to "do more with less" these functions have each been restored and eventually have been centralized as a means to coordinate these activities effectively. Notably the GRDC, has funded most of these initiatives, signifying the need to design funding mechanisms for these industry goods.

The developments in Australia beg three questions for policy makers engaged in the review of the Canada Grain Act. If the CGC activities are curtailed, will industry goods related to quality assurance still be delivered at an adequate level? If so, what organisations will perform these functions? Perhaps most importantly, who will fund these activities in a sustainable manner?

Table 1: Grain Quality Organizations, Australia and Canada

Abbrev.	Organization	Governance and Mandate/Mission	Funding Source, Annual budget
AEGIC	Australian Export Grains Innovation Center	AEGIC is an independent, not-for-profit company established in 2012. Its core mission is to add value to grain industry through market insight, analysis, sharing market intelligence with industry players, taking a long term strategic view of market competitors and customer preferences; AEGIC also provides end-user training and customer support and commercial services in quality analysis	GRDC, WADPIRD
AGDAWR	Australian Government Department of Agriculture and Water Resources Federal Government		Australian Taxpayers
GRDC	Grains Research Development Corp	Established in 1989, as a commonwealth entity, the GRDC is responsible for planning, investing in and overseeing research, development and extension for grains. Directors (8) of the Board with regional representation are nominated by producer orgs and selected by the Selecting Committee appointed by the Federal Minister; Chair is selected and appointed by the Minister. Regional and National Panels ensure R&E investments taken in best interests of growers.	1% Levy +.5% Commonwealth Government Annual Budget of ~$200 M
GTA	Grain Trade Australia	Formerly known as NACMA (est. in 1991), in 2009 GTA set its core mission to facilitate grain trade. Board consists of Directors nominated by ordinary (A, B, C Type) members (5), merchant orgs (3), special qualifications and ordinary members (up to 8). The Industry Code of Practice, developed by GTA, and funded by AGDAWR is a self-regulating mechanism for the industry; it provides guidelines and expectations for managing the grain and assuring quality throughout the SC and is mandatory for GTA members since 2014.	Fees from tier membership of grain companies and other firms operating in the grain trade
WADPIRD	Western Australia Department of Primary Industries and Regional Development State Government		W.A. Taxpayers
WQA	Wheat Quality Australia	Independent company founded in 2012. Equally owned by GRDC and GTA, each of which appoints a Director of the Board (DoB). A third DoB, independent and skilled-based, serves as the Chair oB and of the Classification Council. The Council includes reps from industry stakeholders (growers' orgs, grain trade, breeding, milling, AEGIC, GRDC) and determines the classification policy framework. The Classification Panel consists of cereal experts and undertakes the technical assessment of the new varieties submitted for registration	Since 2014, fully funded by GRDC
AAFC	Agriculture and Agri-Food Canada, Federal Government		Canadian Taxpayers
CC	Cereals Canada	CC is a national, not-for-profit organization created in 2013 to provide coordination of players in the cereals sectors in guiding the growth and development of Canadian cereals research, production and market outreach and support. CC's two major members are producer organizations and industry (handling, seed, processing) with equal representation on the 16 member Board of Directors	Funded by producer organizations and industry members
CGC	Canadian Grain Commission	The CGC, is a federal government agency whose core responsibility is the regulation of grain handling system, as well as establishing and maintaining science-based quality standards.	90% funded by inspection fees and 10% from taxpayers Annual budget of $66M
Cigi	Canadian International Grains Institute	Cigi is a not-for profit institute created in 1972 to support domestic and international end-users with milling, quality and end-use functionality expertise of Canadian grain. In 2020 Cigi merged with CC, but maintains the brand, as a division of CC, as the trusted source of such expertise.	Funded by producer organizations and industry members of Cereals Canada

Table 2. Participating Organizations in Quality Assurance

FUNCTIONS	Organizations	
	AUSTRALIA	CANADA
Wheat Classification Maintains a system of wheat classes based on a number of inherent (genetic) quality attributes that focus on the end-use functionality such as milling extraction, baking performance and noodle color; asses the new varieties and determine the class they should be registered	Wheat Quality Australia	CGC- Classifications are established by the Standards Committees. Grain varieties are registered in a wheat class by the CFIA upon the recommendation from regional crop recommending committees.
Grading/Trading Standards Determination and publication of grades at harvest based on quality parameters like protein content, moisture, screening, falling number. These serve as the basis for trade and contract specification with end-buyers.	Grain Trade Australia Grain Trading Standard Committee reviews and publishes grading standards annually to account for the crop quality of the season.	CGC- grades are established by Western and Eastern Standards Committees, standard annual primary and export samples. CGC - third party grade dispute resolution
Enforcement of Grading Standards Physical measurement of the crop quality parameters at receival sites/elevators and at outrun/outward to determine the grade	Bulk Handlers Grain Companies, following the Industry Code of Practice	CGC for export shipments Producer grades are decided by mutual agreement but are subject to official CGC grading if requested by a producer.
Inspection of Shipments for Contract Specification	Third-parties if it is specified in contract	CGC Outward inspections, issue certificate final or other specifications if requested
Trade Disputes Resolution Services	GTA Certified arbitrators for violation of GTA stipulated trade rules; limited to domestic trade actors and typically for non-quality related contract terms	CGC. When there is customer dispute about product quality and/or contamination the CGC will send a technical team to help resolve the issue
Market Analysis/ Market Development/ Generic Promotion Analyzing market dynamics in term of competitors' positions and traditional and new consumers; understanding emerging trends in consumer preferences and new opportunities.	AEGIC – long term Grain companies - short term with their own customers	Cereals Canada/ Industry Canada – long term Grain companies - short term with their own customers
Technical Training of End-users Understanding the quality properties of different wheats and learn how to work with them in various applications to achieve certain desired functionality in milling and baking.	AEGIC	Cigi – provides resources and trains end users to work with Canadian grains
Market Intelligence for Breeders Information feedback from end-users to breeders to target desired functionalities in their breeding programs	AEGIC WQA Council	CGC, Cigi, Cereals Canada annually meet with breeders at Prairie Grain Development Committee meetings.

Table of Contents

A Report on Wheat Quality Management

in a Post Single-Desk Era: Lessons from Australia

Abstract

Until 2006, the Australian Wheat Board played a central role in providing numerous industry goods, including a comprehensive system of quality assurance. This case study examines the evolution of wheat quality management system in the post single-desk era. While industry collective actions were successful in maintaining wheat classification and grading standards, the provision of other industry goods related to quality management developed more slowly. The most recent consolidation of many of these industry functions under Grains Australia signifies the need for coordination and joint provision of complementary industry goods, achieved more effectively in a centralized structure, while the levy funded GRDC has played a critical role in the funding. As Canada contemplates regulatory changes to the Canada Grain Act, perhaps the greatest lesson to be learned from Australia, is that while their industry explored many options, it eventually redeveloped a well-funded, effective quality management system that provides many of the same functions we currently see in Canada.

Key words: Wheat quality, complementary industry goods, marketing deregulation, AWB

1. Introduction

In an effort to modernise the regulatory framework of the Canadian grain industry the Canada Grain Act of 1985 is currently under review with Federal Minister of Agriculture and Agri-Food Canada Bibeau launching the industry consultation phase on January 12, 2021 (AAFC, 2021). Since 1985, grain industry and marketing channels have undergone numerous significant changes including the removal of single-desk marketing powers of the Canadian Wheat Board (CWB) and the implementation of Plant Breeders Rights. Today Canada faces global competitive pressures not only from traditional exporters, but also from emerging new players like Black Sea states. All these beg the question of how regulations could be amended to effectively and efficiently meet current industry needs in a highly competitive environment.

One critical consideration of the review is the effect of regulation on the perceived quality of Canadian grains. As mandated by legislation, the Canadian Grain Commission (CGC) has played a very important role in the management of Canada's grain quality not only through its direct role in variety registration and management of grades, but also as it regularly interacts with other organizations and industry stakeholders that impact grain quality. Until 2012, the Canadian Wheat Board also played a central role in quality management, both through direct activities in marketing, logistics and customer service and through its support for the Western Grains Research Foundation and for the Canadian International Grains Institute (Cigi). With the elimination of the CWB, many of these activities have been shifted to other industry players including the private grain trade, the newly established provincial wheat commissions, and new funding model for Cigi. The review of regulation will take place in the context of an increasingly competitive international market, the changes in the broader quality management system, and changing roles and incentives within the grain marketing value chains.

In this paper, we hope to make a small contribution to the Canadian review by drawing some lessons from Australia after the dissolution of the Australian Wheat Board (AWB), which played a central role in quality assurance and provision of numerous industry goods.

More specifically, we look into the evolution of Wheat Quality Management System (WQMS) in Australia throughout the Supply Chain (SC) during a period of marketing deregulation in 2008 and of the development of private breeding companies. We undertake a case study, employing qualitative data collected through expert interviews with key organizations. Based on publicly available sources, we conducted additional analysis on various developments in the industry, which occurred beyond the interview time.

Our research concludes that the removal of the AWB impacted the quality assurance system in a number of ways. For activities deemed valuable across all industry players, such as wheat classification and managing the wheat trading standards, the industry continued to provide them under different organizational arrangements. However, for industry goods that were more prone to free-riding, such as market intelligence, generic promotion, technical training for use of Australian wheat, their adequate provision was slower to occur in the most recent years. Grain Research and Development Corporation (GRDC) has played an instrumental and leading role in funding and facilitating the working of organizations that provide these industry goods.

The remainder of the paper is organised as follows. Section 2 outlines the research design and the theoretical framework for understanding deregulation and evolution that followed. Section 3 outlines the structure of WQMS in Australia and identifies various aspects in the new system. Section 4 outlines a number of emerging issues in the deregulated environment that have important implications for quality. Lastly, we make few concluding remarks and offer some general lessons for the Canadian context.

2. Theoretical framework for deregulation, study design, and data collection

In this case study we employed qualitative data collected through expert interviews with representative organizations across the SC, from the pre-production stage such as pre-breeding R&D, wheat breeding companies, producer organizations, representative organizations of marketing, handling and export companies, to end-use customers. In

addition, we ensured participation of crucial organizations such as, Wheat Quality Australia that manages the wheat classification process, Grain Trade Australia that administers the trading standards, and Australian Grain Export Innovation Center that provides other quality related industry services. Participants were identified by utilizing public information available on organizations' websites as well as following leads from academics, public servants in Agriculture and senior managers/executives in the industry. In addition, we used the snowball sampling technique by which few initial participants suggested additional ones.

To avoid bias the interview questions aimed to primarily obtain factual information regarding the inner workings of the Australian system rather than experts' opinions on the issues examined. However, as reasonably expected, many participants, particularly those in leadership positions, had agency (choice and deliberate intent) in their organizations which meant that their take on various issues would influence the functions of their organizations, and the level and quality of coordination among other parts of the system, wherever applicable. These interviews took place in various locations in Australia (Canberra, Melbourne, Adelaide, Sidney, and Perth) in 2016 and 2017. In compliance with research ethics requirements, we maintain the strict anonymity of our participants when referred in our analysis. Additional analysis on industry developments which occurred beyond the interview time was conducted based on publicly available sources.

Institutional and organizational economics framework guided the design of interview questions and our approach to analyzing the information obtained. Our reference to institutions and organizations follows definition by North (1990).[1] In addition, to fully appreciate the nature of changes and the various challenges arising from deregulation of export wheat marketing in 2008, we consider the deregulation as an institutional change in

[1] Institutions are defined as the humanly devised "rules of the game" that govern and constrain human interactions; and organizations are defined as the deliberate (political, economic, social, educational etc.) bodies or group of individuals that pursue a common objective. Inevitably these two come together in a symbiotic relationship since institutions determine the set of opportunities that an organization could pursue, and feedback effects ensure that evolving organizations initiate institutional changes to further their interests (North, 1990).

the form of displacement,[2] which according to Mahoney and Thelen (2009) can be radical (due to an external shock), or more gradual.

In the Australian context, one could argue that this displacement was a combination of both gradual and abrupt changes. Various study participants noted that the grain handling industry actively lobbied for marketing deregulation, while pressures to maintain single-desk came primarily from grower communities, hence continuously shifting public attitudes on the issue. However, the drastic change was the result of the Cole Inquiry findings on the Oil for Food program of AWB and served as a strong catalyst in abruptly removing the single-desk marketing function in 2006 (Honey, 2012).[3]

This meant that grain handling companies which were advocating for such institutional change, were prepared to take advantage of new economic and marketing opportunities. While the marketing function was the chief purpose of this institutional change, the provision of other industry functions that were normally undertaken by AWB did not carry much weight in the decision to deregulate, nor in the transition plans. As one participant noted, the insufficient attention to address the industry good provision within the marketing freedom legislation was not for lack of acknowledging their benefits in public consultations. Rather, it was mostly due to the difficulty in quantifying them in monetary terms. Nevertheless, their value become increasingly apparent at the start of deregulation period when the provision was often fragmentized, inadequate and uncoordinated.

Brynjolfsonn and Milgrom (2013) shows the importance of complementarity in enhancing the economic performance of an organization. Additional functions to the core function are

[2] Mahoney and Thelen (2009, p. 15) define displacement as "the removal of existing rules and introduction of new ones." Displacement takes place in a political context of weak veto possibilities interfacing with low level of discretion in interpretation/enforcement of the institution. Under such conditions, insurrectionary agents who actively and openly aim for displacement are likely to be better positioned to overwhelm efforts of those that want the status quo."

[3] The AWB single-desk marketing powers were removed in December 2006. During the interim period toward the deregulated marketing regime these powers rested with the Minister of Agriculture until the Wheat Export Marketing Bill, which gave growers the right to market their wheat with any accredited exporter of their choice, became effective on July 1, 2008 (Honey, 2012).

provided jointly within an organization and are encompassed within a "matrix." Organizational performance is enhanced when these functions are complementary in nature, so that the joint provision creates positive synergies. In such complex interdependent structures, changes that affect a part of this "matrix" could adversely affect the entire system since the capacity to enhance the overall performance is curtailed.

Consider the export wheat marketing function as the core function performed by AWB before deregulation. Under a single-desk, the administrative fiat played an important role in accumulation and delivery of grain (Fulton, 2011). In addition to this core function, the functional "matrix" included a number of industry goods that enhanced the core function of marketing due to their complementarity nature. These industry goods include variety registration and classification, and quality management that provided assurance for a quality product; market intelligence that directed sales in markets generating the highest value; generic promotion of Australian wheat and end-user technical training for using the Australian wheat, all of which ensured continuity and stability of customers' expectations and future commitments in buying a trusted product.

Furthermore, these services have characteristics of public goods with some degree of non-rivalry and non-excludability. In the presence of positive externalities and free-riding, a single-desk organization like AWB was well positioned to provide them at an adequate level. Provision of these industry goods required obtaining relevant information and mechanisms to effectively disseminate the information across various structures of the system. As the sole seller, AWB had developed long standing relationships with the final or end-use customers and therefore, was well positioned to receiving relevant and timely feedback from them with relative ease. Additionally, internal coordination for transmitting the relevant information across the various structures of the organization can be achieved more effectively and at a lower cost since all these functions were embedded within the same (fairly centralized) organization, as was the case with AWB.

After deregulation, under a competitive marketing regime with multiple players providing the core function of marketing, price signals are important in driving market transactions

and exchanges of market participants. Marketing is more transactional in nature and pricing signals will drive the grain accumulation and delivery in the system in a given crop year (Fulton, 2011). Although the effective transmission of market signals across the supply chain becomes more difficult to obtain, it is critically more important for achieving coordination and efficiency in a market driven system.

With free-riding, complementary functions previously performed along the core function, become too costly for a single player to provide them for the entire industry. Consider how any player that undertakes generic promotion or provides technical training for using Australian wheat, will not be able to benefit advantageously from such a costly activity. Similarly, gathering market intelligence creates an advantage, which can only be maintained if it is not shared with others. As a result, from the onset of deregulation, there was a need for collective industry actions to provide the industry goods that were traditionally embedded within AWB activities.

Particularly, managing wheat quality throughout the SC, including administering of wheat classification, is an industry good that adds value for all involved. A market-based classification system requires that information pertaining to quality flows effectively across all relevant participants in the SC. Information channels pertaining to wheat quality, between breeders and growers, growers and marketing/traders, marketers and end-users, end-users and breeders, are all important in ensuring that SC participants are responsive to market changes/challenges and the SC is efficient and effective in creating value for them. The effectiveness of such information flow in both directions, partially depend on the willingness of key industry players to participate and cooperate in building and maintaining well-defined information feedback processes.

When interests of players across the SC are well aligned in increasing value for all and individual benefits are captured accordingly, such feedback processes can be established and operated with less difficulty. However, since these processes have public goods features, incentives for free-riding could potentially diminish its provision and result in a breakdown of information flow. While players may acknowledge the need for collective

action to further the common interest of increasing value, financing the provision of the industry goods and establishing cost-sharing mechanisms can often be problematic in practice (Sandler, 1992). The data collected through interviews support these notions and the following analysis outlines the concrete challenges and their resolves.

3. Wheat Quality Management System in Australia

This section outlines the management of wheat quality[4] system across the SC in a similar fashion shown in the WQA website. We pay special attention to wheat classification since it provides critical links between the pre-production (breeding) and production stages of the SC on one side, and breeders and quality attributes valued by end-user on the other. We also identify other industry goods that facilitate various feedback information channels needed in an integrated and well-functioning system.

Figure 1 overleaf, depicts the WQMS across various links of the SC providing a summary of functions performed. Subsections that follow profile key organizations in the system with the interview data serving as a major source of information. In order to identify the organizational evolution of this system, whenever appropriate, we compare and contrast its various aspects with the single-desk regime, in which AWB played a central role. Given its critical role, we start our discussion with Wheat Quality Australia (WQA) and its work on wheat classification.

3.1 Wheat Classification System

The wheat classification system plays a central role in managing quality. First, the wheat classification system provides clear guidelines to breeding programs on targeting varieties that can be grown in Australia, with quality attributes that are desired by end-users both domestically and internationally. Second, it ensures that growers cultivate wheat varieties demanded in the marketplace to maximize their returns, in terms of combined yield and

[4] According to WQA (2021a) "Wheat quality refers to the performance of grain to meet requirements of its use in flour milling, breads, noodles cereals, pasta or animal feed. Quality is defined by the genetic attributes of the variety grown and the environmental conditions during the crop growth."

quality. Well-defined wheat classes with certain expected quality attributes provide assurance to international and domestic end-users that they are purchasing a product which will perform in a predictable manner within a narrow range of functional performance.

The classification process involves assessment of inherent quality characteristics of the new variety, focusing on processing and the end-use performance. The assessment is based on 30 quality parameters that are evaluated against a number of control varieties (high and low performers) for three growing seasons (WQA, 2016). The new varieties are assessed through a comprehensive classification process which, when successful, concludes with their inclusion in the Variety Master List (VML) (WQA, 2016; 2021b). Since only VML varieties are accepted at delivery for human consumption in domestic and/or export markets, registering a variety is practically essential for ensuring its production and sale.

The new variety is classified in one of the wheat classes listed below within one the following Classification Zones: Western, Southern, South Eastern, and Northern classification zones. The Australian Wheat classes are included in three main categories:

1. Premium Hard Wheats category includes the following classes: Australian Prime Hard APH, Australian Hard AH, and Australian Premium White APW.
2. Multipurpose Wheats includes the Australian Standard White, ASW class
3. Specialty Wheats category include the following classes: Australian Premium Durum ADR, Australian Soft ASFT, Australian Standard Noodle ANW, Australian Premium Noodle APWN (WQA, 2021c)

Prior to deregulation of marketing, the wheat classification system was created and managed by AWB. An expert Panel, composed of cereal experts, managed and administered the new variety registration process. Breeding programs (either the state funded programs prior to privatization or private breeders afterwards) had a Breeders Group as a point of access to the AWB policies pertaining classification. The market information in terms of desired functionality by end-users was fed back to breeding programs through the interaction of AWB with the Breeders Group.

Figure 1. The Australian Wheat Quality Management System across Supply Chain

After losing the single-desk powers, there was no reason for AWB to continue providing a function with industry wide benefits at its own private cost. Various study participants indicated that consensus emerged quickly among industry groups, that maintaining the classification system was very important in ensuring the continuity of good reputation for the Australian wheat. At the onset of transition, the expert Panel was folded under GRDC, an arrangement that allowed the Panel to continue its work amid drastic changes in the industry. In 2012, GRDC and Grain Trade Australia (GTA), the industry organization whose membership constitutes of grain marketers, partnered in founding the WQA as an independent company responsible for managing the wheat classification process. WQA owns and publishes the Variety Master List (VML) every September at its website (WQA, 2021).

WQA core business takes place primarily through two bodies: the classification Panel and the classification Council. The Panel continues its work in assessing the new varieties submitted for classification as described earlier. As expected, its work has a very strong technical aspect, but it occasionally provides input to Council regarding technical aspects of a policy issue under consideration (WQA interview data).

The Council is responsible for setting the policy framework pertaining to classification. As noted by various participants, the Council holds considerable discretion on setting classification policies. Although the WQA Board of Directors is the final body that approves/rejects the policies brought forward, almost all the work leading to policies is undertaken by the Council.

Council consist of various industry stakeholders that provide in-kind (uncompensated non-financial) contributions. More specifically, at the time of the interviews in 2016 the Council members consisted of two representatives from wheat breeding, four marketers (GTA members by the virtue of co-ownership), one from the baking/milling sector (end-user sector) and one from Australian Export Grain Innovation Center (AEGIC). Since then, the composition of the Council is altered with an additional (fifth) representative from marketers, three grower representatives and one representative from GRDC, perhaps

reflecting the WQA's funding model by which GRDC funds the whole operation despite the joint ownership with GTA (WQA 2021; Interview data).

Although the overarching goal in assuring quality is important for all Council members despite their industry affiliation, players have sometimes competing interests regarding more specific issues pertaining to classification policy. The classification requirements for Late Maturity Alpha Amylase (LMAA) are a good illustration of competing positions taken by different stakeholders, such as breeders and marketers.[5]

While WQA ownership structure of GRDC and GTA being equal partners remains the same, the funding arrangements have changed considerably overtime. At the start, WQA partners contributed equally and initially had much higher financing requirements since it aimed for the American U.S. Wheat Associates (USWA) model. GTA financed its portion through substantial fees paid by its largest members (typically the grain companies such as GrainCorp, CHH, Viterra, Cargill etc.). While there was continuous support for the classification system, overtime, GTA largest contributing members, questioned the value proposition in regard to activities beyond classification. Given the difficulty to replicate in a short period of time, a well-established organization with long history and rich institutional memory such USWA, the funding arrangements for WQA to maintain the broad scope of providing various industry goods eventually broke down.

Reflecting on this development, one participant indicated that a better path would have been for WQA to expand incrementally, by originally starting with the classification function, which received wide support from the industry. Upon demonstrating the added value to the industry, the organization could have grown gradually to provide other

[5] While current LMAA requirement was strongly advocated by traders, breeders viewed this quality problem more as an environmentally expressed trait than a genetic one to be assessed in the classification. Including such requirement in the classification process requires testing for it which has created considerable bottleneck issues for advancing lines in trails. This has caused breeding programs to discard elite lines with other attractive quality attributes. To resolve the issue, GRDC has supported LMAA research which could better assist WQA in placing LMAA requirements in a way that strikes the proper balance in controlling for LMAA, while ensuring that elite lines are not discarded prematurely (various participants' interviews data).

services and meet additional needs. Such gradual growth could have ensured a more systematic, comprehensive and financially viable provision of other industry goods related to quality.

Amid negotiations to resolve the funding in early 2014, GRDC took the lead and entirely financed the WQA activities pertaining to classification. The GRDC is jointly funded by producers and federal government contributions, and represents the parties most interested in benefiting from, or responsible, for the provision of this public good. The new funding arrangement did not alter the ownership structure as it was deemed important to maintain traders' participation and representation in the Council. To this effect, GTA provides in-kind contributions through the work of Council members. The WQA funding arrangements are expected to continue in this or similar forms for the foreseeable future. A potential model that requires breeders to pay registration fees for new varieties to cover the operating cost of the Panel was also contemplated (WQA Interview data). Overall, despite the early difficulties WQA has established itself as an industry organization that provides a critical function in the WQMS.

3.2 Wheat Quality Management System along the Supply Chain

3.2.1 Breeding

Privatization of breeding and the R&D technological advancement through genomics are the major drivers in shaping the nature and performance of the current institutional arrangements in the R&D space in Australia. At this pre-production stage (Fig 1) the main actors developing new wheat varieties are private breeding companies, most notably Australian Grain Technologies AGT, Intergrain,[6] LongReach, and Advantage Wheats (formally HRZ). In the last decade, there has been a consolidation of the private breeding activities through a number of mergers and acquisitions. Sufficient time has now elapsed for private breeding programs to produce new and superior wheat varieties, which

[6] AGT and Intergrain originated from the privatization of state-run breeding programs in early 2000s, with GRDC and Universities taking an active ownership stake in them. Therefore, both the federal government and producers, through their funding and governance of GDRC, and Universities have a large stake in these breeding companies.

growers have adopted to receive concrete benefits in yield increase and/or disease resistance.

The predetermined wheat classes, currently managed by the WQA, continue to guide breeding programs. Breeders clearly stated in their interviews, that in developing new varieties they target a certain wheat class and therefore would strongly focus on the parameters required to fall into that class. Therefore, maintaining the integrity of wheat classification is very important for breeding activities.

Breeding companies have organized a Breeders Referencing Group (BRG) as a lobbying group that provides a unified voice for common concerns in dealing with various governmental and industry entities. Two BRG representatives in the WQA Council inform the classification policy from the breeders' perspective. In addition, BRG participation in the Council ensures that breeders receive feedback on demanded quality attributes in the marketplace, an essential feature of a market-based classification system.

Although such representation creates favourable condition for feedback, the question is whether market signals for quality attributes in the form of market intelligence is adequately generated by parties with direct exchanges with end-users, such as the milling or baking sector, and whether this feedback is transmitted timely and effectively back to breeders. In other words, does the current system have the ability to gather intelligence regarding the desired functionality traits in various markets, regarding the end-user willingness to pay for these desired attributes, and to feed it back to breeders, so that these attributes are targeted accordingly in breeding programs? We return to this issue as we discuss the end-users' role in the WQMS and AEGIC as an organization increasingly playing a role in this space.

3.2.2 Production

In the production stage of SC (Fig 1), growers participate in the WQMS by choosing to cultivate varieties that provide the highest return for the area cultivated. In terms of

quality, the presence of significant, persistent and predictable premiums for higher quality wheats but presumably lower yield wheats, affects growers' decision on which wheat varieties to cultivate. More specifically, if a higher quality wheat will consistently receive a higher premium over a lower quality, then to compensate any potential reduction in yield, a grower has incentives to grow high quality wheat in order to maximize his/her returns. However, if the premium for higher quality wheats is insufficient to compensate for yield reduction, a grower could be better off by growing a higher yielding but lower quality wheat. We further expand on this issue in our discussion of emerging trends in Section 4.

Another way that growers participate in WQMS is their responsibility to accurately declare the variety delivered and the chemical regime used in production. Accurate variety declaration is important for End-Point Royalties (EPR) collection, which in turn ensures that breeders are properly rewarded for their varieties. If growers inaccurately declare as a variety with a lower EPR rate, this cost-saving practice can prove difficult to deter. Furthermore, misdeclaring varieties could result in deliveries being comingled with varieties belonging to classes with different quality attributes and could undesirably affect the functionality expected by the end-users.

If misdeclaring is widespread, such practice becomes potentially problematic for the quality. A few participants noted that although cases of inaccurate variety declaration have occurred, this is not a prevalent issue and it doesn't seem to be strategic. More specifically, cases of misreporting varieties had both lower and higher EPRs, and are primarily due to random errors such as, grower's inaccurate information about their seed mix or information errors by third parties responsible for transporting (trucking) the deliveries (Interview data).

Lastly, farmers also play a role in affecting the quality of the wheat stored in their farms. Since deregulation has increased the marketing opportunities for growers, in-farm storage capacity has expanded considerably. This expansion has a spatial consideration, where investments have primarily taken place in the Eastern seaboard; the high-quality storage capacity on steel silos has doubled in the period 2013-18 (White et al., 2018).

The on-farm storage can affect quality in various ways. Firstly, the physical condition in which the wheat is stored can directly affect the quality, and investments in better quality storage are important. Secondly, the capacity to store wheat mitigates, to some extent, for the volatility of production and price due to weather conditions and affects the stock availability of certain quality wheats, such as feed wheats or prime hard wheats. While this practice is beneficial for those farmers that partake, its effects in the aggregate level of stocks are less significant. Lastly, on-farm storage provides the infrastructure for some growers to blend wheats and capture additional value by lifting the grades of their deliveries, an issue discussed further in Section 4.3.

3.2.3 Storage, Handling and Transport

Currently the Australian supply chain is characterized by a high degree of vertical integration of grain storage/handling and marketing and an increase in foreign ownership (Stretch et al., 2014; White et al., 2018). This is the result of decade-long changes, such as the deregulation of domestic marketing in 1989, privatization of state handling authorities in early 1990s, consolidation of the grain handling and storage industry in early 2000s, deregulation of export marketing in 2008, and further consolidation through a number of takeovers and acquisitions from multinational grain companies in early 2010s.[7]

Grain companies play an important part in the WQMS (Fig 1). The main players in this space are the vertically integrated regional monopolies/duopolies with GrainCorp in the Eastern seaboard, Emerald Grain in Victoria, Cargill in Victoria and SA, Viterra, a subsidiary of Glencore in SA, the Co-operative Bulk Handling (CBH) and Bunge in WA (White et al., 2018). In addition, a number of domestic and international agribusinesses which operate in the export marketing space are not fully-fledged grain companies and as a result, must rely on "the system" or the infrastructure of the main grain regional monopolies to handle their grain (Interview data).

[7] See White et al., 2018, p. 31 for a chronological outline of all mergers, acquisitions and ownership changes, resulting in the current structure in that space.

As per the definition of quality, the environmental conditions during crop growth determine many aspects of quality. This environmentally determined aspect of quality is captured by the harvest grading, also known as the Industry Trading Wheat Standards, which are measured at receival sites when the wheat is first delivered, or when the grain is out-turned. Site and Zone composite testing are performed to measure physical characteristics of wheat such as protein content, moisture, screenings and test weight (WQA 2021a, GTA 2016). Along with variety declarations these are the basis for determining the wheat grade (receival standard) used in the segregation of comingled wheat, while the wheat is stored, handled or transported and in contract specifications for shipments.

Prior to deregulation, AWB published the Wheat Trading Standard that were administered in conjunction with bulk handlers. After deregulation this function was picked up by GTA, whose core mission is to facilitate grain trade. GTA membership is open to all companies within the grain industry.[8] Since the grain handling and storage companies had administered the standards at harvest delivery prior to deregulation, GTA publishing and administering the trading standards in the new marketing regime seemed a natural fit. Study participants stated that consensus developed quickly among GTA members and without any government directive, GTA took over this function when the Marketing Bill came into effect in July 1, 2008. GTA has been administering the trading standards since that time and the annual review of such standards has become part of GTA's core business (GTA, 2020). This is an important role that GTA plays within the WQMS.

Another contribution of GTA is the development of Industry Code of Practice which was funded by the Australian Government Department of Agriculture and Water Resources. The Code is a self-regulating mechanism that provides guidelines and expectations of managing

[8] GTA had officially changed its name in early 2009 from National Agricultural Commodities Marketing Association (NACMA). NACMA was created in 1991 and had gone through a number of changes in the period before deregulation of export wheat marketing, most notably the withdrawal from advocacy and lobbying activities, a move that quickly opened NACMA's membership to other companies within the grain industry. The name change to GTA, along with a sharper focus on trade functions, were taken in direct response to marketing deregulation (GTA study participants).

the grain and assuring the quality, as the grain moves along the commercial SC. The Code is mandatory for GTA members since 2014 and Australia is the only OECD country that has developed such a code (GTA 2016; 2020).

GTA also serves as the secretariat for The National Working Party for Grain Protection (NWPGP),[9] the body responsible for providing management in the area of grain storage, chemical use, market requirements and chemical regulation in Australia and other grain exporting countries (GTA, 2016; NWPGP, 2020). While the work of the NWPGP is independent and is funded by GRDC, GTA facilitates the distribution of relevant information produced by NWPGP and supports the NWPGP annual conference (NWPGP, 2020; GTA study participants).

In the Storage, Handling and Transport stage of the SC (Fig. 1), bulk handlers participate in the WQMS by administering the deliveries at the receival sites. First, they check the delivered wheat varieties against the VML (published by WQA and distributed by GTA) in order to accept the delivery for human consumption and to collect EPR when applicable. Next, they conduct site and zone composite testing for various quality parameters in order to determine the grade of delivered wheat based on GTA's receival Trading Standards (various participants from grain companies). The zone testing is typically conducted in Zone laboratories of large bulk handlers at different locations to assure that quality parameters are accurately measured at receival sites. This practice not only ensures that testing equipment at receival sites are recalibrated properly when a discrepancy occurs, but it also collects quality intelligence of available stocks at various locations (GrainCorp study participant).

In addition, at the receival sites, Chemical Residue status is determined as per industry guidelines published by NWPGP. Once the grades and chemical residue status is determined for compliance with Maximum Residue Limits (MRLs), the accepted deliveries

[9] See http://www.graintrade.org.au/nwpgp for more details regarding the work of NWPGP.

are segregated. The segregation by grade and MRLs is maintained during storage and transportation and quality tests are performed again at outturn.

3.2.4 Export Marketing and International Shipment

In the export marketing stage of the SC (Fig 1), marketers participate in the WQMS by assembling shipments as per their client contract specifications. GTA Trading Standard that serve as the basis for determining the harvest grade along with MLRs would guide the contract specifications. In the single-desk regime, AWB as the sole export marketer for wheat, had control of all grain stocks and was well-positioned to draw deliveries from a large number of storage locations and blend, in order to assemble shipments that met particular contract specifications. In a deregulated environment, the large vertically integrated marketers, which have sufficient storage infrastructure both inland and at port, are better positioned to blend wheat deliveries across grades and assemble shipments that meet contract requirements at a lower cost than non-integrated marketers (Various participants).

In the international shipment stage of the SC, there are a number of additional activities to ensure quality. First, wheat exporting is only undertaken by a Registered Export Establishment approved by the Department of Agriculture and Water Resources (DAWR). In addition, before shipment, inspections by government authorized officers are undertaken to ensure compliance with quarantine requirements. A final audit for MRLs compliance (both Australia's and importing country) is undertaken by the National Residue Survey, a DAWR agency (GTA 2016; Various participants).

Lastly, before shipment, a buyer or a seller, can conduct additional tests on the cargo through an independent service provider, to ensure that shipment is in full compliance with contract specifications. Such practice is more applicable for small sellers. Many participants expressed in different ways that the established grain handlers and export marketers have strong incentives to manage the quality and assemble shipments according to contract specifications, as maintaining a reputation of a reliable supplier is important for

their future trading.[10] In addition, the costs of not meeting contract specifications on any individual loaded vessel can be significant in terms of time and money. Since this self-enforcing system is sufficiently powerful, independent inspections of shipment to confirm contract requirements is atypical but nevertheless is available to parties.

3.2.5 End Users

Finally, in the final customer stage of SC (Fig 1), the end-users play an important role in the WQMS. Given many uses of the Australian wheat end-users category consist of a diverse body of international and domestic bakers and millers, and feedlot operators. Their satisfaction with the quality attributes of purchased wheat, particularly for milling and baking, is important for marketers in maintaining their competitive position and market share.

In the single-desk regime, AWB had developed stable access in certain markets and was well-positioned to preserve the good reputation of Australian wheat. This was further supported by the market conditions at the time, where state to state trading with a number of Middle Eastern countries was a major and stable market for Australian wheat. In the new marketing environment, whereas overseas buyers may change their Australian sellers or look into doing business with other international competitors, fostering long-term relations is critically important for maintaining market share. To that effect, large scale marketers such as the vertically integrated grain companies that are heavily invested in the system are incentivised and better positioned to undertake repetitive market exchanges, prove themselves as reliable suppliers, and develop and maintain the reputation of the Australian wheat as a quality product. Having said that, some of the international marketers may supply contracts on an optional origin basis, which allows them to fill the contract with wheat from multiple export sources as long as they meet contract specifications.

[10]As one participant said "… the established firms have made investments and they want to stay in this business for the long haul."

Another important aspect of end-users involvement in the WQMS is related to the feedback that sellers receive regarding the quality of the product. Such information provides important market signals to all SC players, from sellers to growers and further upstream to breeders. As previously outlined, producing such market intelligence has industry wide benefits. This is an instance of the complementarity nature of various industry goods (quality and market intelligence) that when provided jointly, enhance each-other's benefits.

In the single-desk regime, the end-users feedback regarding their satisfaction was carried by AWB with relative ease, particularly because the AWB deliveries typically met and often exceeded quality requirements of contract specifications, a statement universally expressed by study participants. While a number of participants also spoke favourably of the AWB ability to engage without much difficulty in market development and market intelligence in the international market, there were others who accurately pointed out that state to state trading with Middle Eastern countries, which did not require great efforts in market development, constituted a considerable share of the AWB business.

Our reading of competing claims in interviews is that at that time in 2016, such market intelligence was not provided in a systematic way at the industry level. A number of participants stated that large grain companies conducted their own market research for their own intended goals and as expected, such information was not shared with the industry. This market intelligence was more about maximizing the returns within the given crop year; it was more narrowly focused on pricing and annual production pending weather conditions and similar dynamics about international competitors, all considerations that vary greatly from year to year and tended to be short term.

Many participants spoke of the industry lacking adequate market intelligence with a longer-term view and identified AEGIC[11] as an organization, which at that time, was increasingly playing a role in that space to fill that need. A number of participants also

[11] AEGIC was founded in 2012 by the Department of Agriculture on WA and GRDC with the mission to increase value to the Australian grain exports industry. These continue to be its primary members.

indicated that AEGIC was also seen to potentially fill the gap in providing international millers/bakers with technical training about the use of Australian Wheat (Interview data).

AEGIC Annual Reports of the last 5 years clearly demonstrate AEGIC's vision to become a leading organization in providing the grain industry with "market insight, innovation and applied technology" (AEGIC, 2020a). Study participants from AEGIC interviewed in 2017 spoke how the organization was strongly positioning itself in servicing the industry by undertaking the medium to long term (5-10 year) market analysis, and providing strategic insights in developing new markets. In addition to export market intelligence, the technical training for end-users, an important industry function for which there was a considerable need after deregulation, has become an important part of AEGIC's core functions (AEGIC, 2020b).[12]

In the last few years, AEGIC has undertaken a number of studies with a strong focus in the competitiveness of the Australian grains industry. These include analysis on the cost of Australian Grains Supply Chain, as well as comprehensive market analysis for a number of international competitors such as Russia, Ukraine and Argentina. More recently, AEGIC has undertaken analysis of market dynamics for important buyers (for instance Indonesia and Vietnam) with particular focus shown on the types of wheats and relevant quality attributes that will be demanded in the future (AEGIC, 2020a).[13] Additionally, AEGIC had directly engaged with end-users such a flour millers, brewers, maltsters and processors, by surveying to understand their preferences and desired functionalities of grains in various Asian markets (AEGIC, 2019a).

Such activities facilitate the information feedback flows that are critical in a market driven classification system and AEGIC is playing a critically important role in the current WQMS. Overall, AEGIC's important work in servicing the export grains industry is viewed

[12] See https://www.aegic.org.au/australian-industry/ for the numerous events and market engagements, as well as training and education opportunities undertaken by AEGIC.
[13] See the AEGIC website at https://www.aegic.org.au/resources/reports/ for the numerous published reports on these important issues.

positively by the industry stakeholders (AEGIC, 2019a). However, its journey to reach the current maturity in scope of its functions and the high regard from other industry stakeholders has not been without challenges.[14]

In 2016 AEGIC changed its strategic direction focusing sharply in establishing itself as an organization that adds value to the industry and committed to a collaborate and meaningful engagement with various stakeholders (AEGIC, 2016). These changes have gradually and positively shifted the views of industry players regarding AEGIC's role and its important contribution to the industry as was mentioned above.

4. Emerging Trends in a Deregulated Environment

This section outlines a number of developments in the new marketing regime that have important implications for quality. While some of these are directly and closely related to deregulation, others are part of domestic and international market dynamics that are occurring irrespective of the new marketing regime. These are ongoing issues and, in our analysis, we raise a few speculative questions for the future.

4.1 Front loaded system provides fuzzy signals for quality wheats

The deregulation of marketing has altered the nature of market transactions on wheat trading. Few participants pointed out that a major trend observed in the deregulated environment is the high speed at which the market is cleared, where most of the crop is sold within the first and second quarter after harvest. A major contributing factor was the way port/shipping stems were allocated under Port Access Regulation.[15]

[14] Some study participants noted that AGEIC's early work, which explored issues of quality as experienced by end-users in the international markets in the newly deregulated environment, was received with suspicion by major marketers. Questions were raised regarding the report's proper context, methodology, and the way these stakeholders were engaged. At that time, this controversial issue adversely affected the AEGIC prospect of receiving recognition and credibility from major traders as an entity that could effectively provide market intelligence for the industry. Numerous external reviews, short term funding commitments and frequent changes in the executive leadership in the first few years, all raised some concerns about AEGIC role in the industry and its financial stability.

[15] Since removal of single-desk marketing, the regulation pertaining to port access has undergone a number of changes. The initial Port Access Undertakings was reviewed in 2015 and was followed by the Port Access

Under Port Access Undertakings until 2015, allocation of shipping stems took place well in advance of shipping, using primarily an auction system. Even with the long-term agreements which replaced the auction system under the Port Access Code, exporters made shipping stems commitments well in advance. With such early commitments, there was a high incentive to clear the crop as fast as possible, once it was harvested. As a result, the system has become very front-loaded, where stems were almost empty later in the crop year. As one participant stated "…when the (AW)Board was the single-desk institution, except in exceptional years, there was always crop carried through the storage system into the next season and now that is absolutely the exception."

One implication of such front-loaded system is that variable weather conditions will inevitably create volatility in the volumes transacted. This in turn creates price volatility, and inconsistent spreads on premiums for high quality wheats. For instance, in a moist year that results in high yields and hence a large crop, clearing the crop within the crop year will lower the price. Typically, in a moist year, the protein content of any variety is lower, so the high protein stock available is limited, resulting in a high premium for it. To the contrary, in a dry year with smaller crop the price is higher. There will also be more availability of high protein wheats, but due to limited overall supply, the price will be high even for low protein wheats, which in turn will shrink the premium for high protein. This situation could be further exacerbated if a grower, in a dry year, cultivated high protein wheat taking into consideration the high premium received in the past (the moist year) and hence, further supplying the market with high protein crop and further depressing its price and collapsing the premium.

The premium spread is unpredictable and inconsistent as it is primarily determined by acreage planted to high quality varieties and the weather conditions during growing and harvest. This problem become even more pronounced when periods of severe draughts and limited productions are followed by a high production year. Carter and Kingwell

Code administered by Australian Competition and Consumer Commission (ACCC). Some operators could be exempted from the Ports Access Code, which is still in place after the ACCC 2017 review (Productivity Commission, 2010; White et al., 2018).

(2019) argue that premium spreads are mostly affected by local conditions. They found that with the expectation of noodle varieties, spreads over ASW1 (Standard White) for other classes grown in West Australia were normally distributed, but the AH1 had the widest range, an indication that hard/higher quality wheats will not consistently pay a substantial premium.

While we have no data for premium spreads of prime hard varieties which are primarily grown in the Northern zone, it is reported that the production volatility in the last 20 years in Eastern seaboard (Queensland, NSW and Victoria) has been much higher than in WA (Kingwell, 2019a). One may expect that in such situations, the prime hard premium spreads may be even more inconsistent. Overall, the inconsistent and unpredictable premium spread provides a very fuzzy signal to growers whether it is worth growing high quality wheats. Therefore, farmers' decision on what variety to grow is mostly driven by the expected yields. Many participants indicated that choosing a high yielding variety of a mid-protein wheat, is the most common practice, as it optimizes the profitability per acreage.

A few participants mentioned the AWB's Golden Rewards Program that incentivized growers to cultivate high quality wheats by consistently paying a significant premium for higher protein content of deliveries within the same wheat class, something that is no longer available in the new marketing regime. In addition, AWB followed a multiyear approach by carrying-over stock in the next crop year and thus, reduced volatility in quantity and price for a certain wheat grade. If such approach is followed, it could result in consistently extracting more value from higher quality wheats and preventing their use for feed.[16] This requires however, a concerted effort from the major marketers that have the storage capacity to carry the crop forward, are exempt from the Port Access Code and hence, may be more incentivised to take such multi-season approach.

[16] One participant spoke of missed opportunities due to the one cycle approach. For instance, the rainy season in the East coast in 2011, resulted in a high production year and an exportable surplus of feed wheats. The domestic price reduced to $120 per ton from $300 in the previous season; the entire supply was cleared and sold at a discount, even competing with US corn in Vietnam.

Another closely related issue concerns the lack of information regarding stock availability along the SC during the trading cycle. Various participants indicated that such information, which would be very useful for trading decisions, is lacking in a deregulated regime. Despite concerns being raised primarily from growers, most parties involved are not inclined to disclose such information. By our own observation, although we sought data on quantities of wheat produced/exported by grades for purpose of this study, we were unable to find even historic data at publicly available government databases. In contrast, export volume information by grade type is publicly available for Canadian wheat on an ongoing basis (with some time delay) as part of Grain Statistics published by Canadian Grain Commission (CGC, 2019).

4.2 Delivery to specifications at the minimum requirements

Many participants stated that in the new marketing regime, there has been a shift in sellers increasingly delivering to contract specifications. It is important to note that grain, including wheat, can be traded several times at the same location and before it moves along the SC. Most parties, regardless of holding a GTA membership, use GTA trading contracts which are readily available at the GTA website.[17] Although parties may make some modifications or even have a more tailored contract, GTA contracts are widely used in Australia, which has considerably reduced transaction costs of trading grain. The contract specifications for quality are typically those determined by the trading standards such as protein content, moisture, screenings, etc.

Many participants indicated that contract specifications regarding "the grade" were met at the minimum specs. Participant who had milling and processing background further indicated that deliveries usually lacked variability in the parameters. For instance, the difference between H1 and H2 grades is the protein content.[18] For the H1 grade the

[17] See http://www.graintrade.org.au/contracts for various contracts

[18] Other quality parameters such max moisture 12.5%, min weight number 79, max screening 5, and falling number of 300 are the same for both H1 and H2 (GTA 2020). These factors are generally not constraining to meeting contract specifications so can be provided at low to no cost by marketers in most years.

minimum protein content is 13%, while in the H2 grade it is from 11.5% to 13% (GTA, 2020).

In a contract that specify a shipment of H2, the protein content would meet the 11.5% specification but be no higher than that. We understood from many participants that before deregulation, AWB would typically assemble shipments with sufficient variability within the specified range, consisting of parts at both minimum and maximum parameters. In this hypothetical case an AWB delivery would consist of batches at 11.5%, 12%, 12.5% and 13% and perhaps averaged at 12.4% or higher than 12.25 %, the average of the specified range [11.5-13.00%] in the contract. In contrast, a delivery in the post single-desk era would consist of a blended batch right at 11.5%. This behaviour by the AWB was more likely to take place in years where protein was not a constraining factor in meeting contract specifications.

For longstanding customers that have come to expect from AWB deliveries not only with sufficient variability, but also with satisfactorily high parameters, this shift contributed into a perception of a lower quality product. Since perceptions (whether or not founded) are critically important in maintaining the reputation of Australian wheat as a quality product, we take a closer look at the interview data which reveals some controversy surrounding this issue. Depending on who you discuss this issue with, a number of points were raised.

A number of participants stated that AWB was "over-delivering" on quality, meaning that consumers received incrementally higher quality at no cost to them. Such practice created expectations that when buying Australian wheat, one would normally expect a quality over and above of what they paid for. When the new marketers delivered shipments to minimum specifications, it is understandable why they fell short of their customers' expectations.

There were also claims that buyers' complaints for quality were likely used to negotiate more favourable prices. In such situation, adjustments either in the form of lowering buyers' future expectations for quality, or increasing buyers' willingness to pay more for a

higher quality wheat would eventually resolve any gaps in quality and expectations. In other words, the market would eventually take care of the problem through the pricing mechanism in a better specified contract.[19]

If AWB was indeed "over-delivering" in quality, were there any benefits (not measured in price) for doing so? One obvious explanation is related to accounting for transaction costs,[20] which are nonzero and take various forms such as searching, negotiating and enforcing a contract (Williamson, 1985). In the transaction cost literature it is shown that repetition and reputation are important mechanisms that lower transaction costs, and facilitate market transactions more efficiently. One could argue that fostering customer loyalty when dealing with repeating customers (millers and bakers), there are benefits in securing future business in the long run.

These mechanisms also mitigate for adverse selection, which arises when the buyer, unlike the seller, cannot fully observe the quality attributes of the product (Akerlof, 1970). Some participants with closer knowledge in the milling sector, revealed that meeting the contract requirements at the minimum specifications masked another problem, which may not be resolved with the pricing mechanism we described above, since there was still an incentive for sellers to increase revenues by blending different grades.

Suppose that in the previous hypothetical contract, the delivery for an H2 contract was at 11.5% protein, a legally acceptable level. This meant that the blend at 11.5% contained batches of higher than 11.5 % protein (within the H2 grade), but also batches of lower than 11.5%, or wheats truly belonging to the APW1 grade. These batches from a different class would underperform in terms of desired functionality attributes such as extensibility, water absorptions, dough strength etc., all of which are very important to end-users, but are not directly measured in grade parameters.

[19] A number of participants stated that if buyers would specify more clearly and more explicitly their desired quality requirements in contract terms, marketers would certainly deliver accordingly.
[20] Even in the case of a commodity like wheat the transaction cost (TC) are nonzero; for instance, measuring the physical attributes is considered a form of TC.

Instead, this is a matter of an incomplete contract. Wheat grades are determined based on a set of quality parameters (protein content, moisture, screenings, falling number, etc.), which are physically measured in an objective way. Nevertheless, these are not direct indicators of functionality (extensibility, water absorption, color, dough strength, etc.), but are proxies for certain desired functionalities that are difficult to measure or observe when wheat is traded. While the seller has more information on the composition of the blend, the end-users cannot observe the quality attributes that are relevant to them until it uses the product.

As long as these imperfect measures of functionality are kept within a given wheat class, using these proxies to specify contacts would not lead to an incomplete contract. The contract becomes incomplete, when the seller, motivated to get a higher price, blends wheats from other classes that underperform in terms of functionality, despite legally meeting the contract specifications.

To work effectively, even an explicit contract requires some implicit understanding between the parties (Mahoney and Thelen, 2009).[21] One could argue that before the deregulation there was an implied but shared understanding between the AWB and end-users that the contract specifications honored certain quality attributes implicitly linked to a certain functionality. In the new marketing regime, there is no reason to believe that the same shared understanding between end-users and new marketers would continue, particularly when sellers could earn higher revenues from a different practice.

Is it practically possible to design and implement a more "complete" contract to address the issue? Since the functionality attributes are difficult to measure, such contract could take the form of contracting for particular varieties, known to have certain functionality attributes. Obviously, contracting directly for functionality attributes would be almost impossible when trading large volumes of a commodity product. However, it could and has

[21] Although Mahoney and Thelen refer to Durkhem's notion of "the non-contractual basis of contracts" to make this argument in a broader institutional context, the same logic could apply to a specific contract.

already taken place in niche markets, which have established their own separate SC and are able to trace the product effectively to assure identity preservation. One participant shared the story of few mills in northern Queensland that would contract directly with farmers to grow certain varieties.

Additionally, there are consistent purchases of APH directly from growers through containers trades to China and Taiwan. For these costumers the functional trait of high extensibility and the colour of APH are most suitable for certain noodles of great cultural importance. Hence, they are willing to pay a premium since these functionalities cannot be easily obtained in high protein wheats grown in other countries.

Lack of substitutability is an important condition for developing profitable niche markets for high quality wheats. A few participants stated that these opportunities are more likely to be pursued by small scale players, rather than major grain companies that operate on a throughput business model. Unless these are large (voluminous) niches such as the Udon noodle market into Japan, it is less likely that large bulk handlers would be involved in these markets. However, White et al. (2018) report of the increased interest and the marketing shift of GrainCorp, the chief grain operator in the Eastern seaboard, to service highly specialized, high value, small volumes grain markets in the future.

4.3 Blending of grades at earlier stages in SC

With bulk handlers also assuming marketing, the desire to capture additional value within the SC is only natural. Given the large scale of wheat accumulation and the large capacity to store, these companies undertake blending of grades so that the lower and cheaper grades can be improved and assembled in shipments that fetch a higher price. The incentive to blend lower grades exists for all marketers and those that possess the infrastructure to blend will definitely partake in the practice.

Competition drives all players to engage in such practice and as a result, blending has become a widespread practice in the bulk-handling stage of the SC. Looking at the same

opportunity, growers are blending as well, as mentioned by various participants including framers. The increase in storage capacity at the farm level shown earlier, is partially driven by this incentive. Since a lot of blending is occurring upstream in the SC, the end-users have lost some of their own ability to blend.

The minimum specifications delivery and the lack of variability within it, has considerably reduced the ability of the millers/bakers to blend themselves to achieve a certain functionality in a way that is primarily guided by the science of baking. As long as blending is done upstream, better specified contracts or paying higher prices for higher protein would not necessarily address the millers' concern since marketers or growers do not necessarily command the intimate knowledge on blending for functionality.

Is there a way to affect the traders/growers incentives to reduce blending? One participant from the milling sector suggested that increasing the number of grades within a class and having smaller steps in scaling the grade's parameters (for instance in 0.8% rather than 1.5% increments in protein content) may weaken incentives to bring substantially lower quality wheats in the blend. While this may be a reasonable technical solution to the issue, it is a difficult proposition to contemplate. As noted, Trading Standards are managed by GTA, which most notable membership consists of major grain companies. Although there is a process for input, by which various industry players (including millers) could make submissions to the GTA Standards Review Committee, there is no indication that milling/baking industry representatives have formally pursued any suggestions of the nature discussed above. Even if that occurred in practice, can one expect that GTA would take actions that ultimately decrease revenues for its own trading members?

4.4 Increased container trade

Another emerging trend in a deregulated marketing environment is the use of containers. Australia, more specifically the Eastern seaboard, is a net importer of containers and their use in grain export has cost saving advantages relative to container shipping from other areas. The containerized volume of exports has increased considerably in the last decade,

with Victoria and Queensland exporting an average of more than 50% of their grains in containers during 2012-16 period (White et al., 2018). According to our interview data, the volume traded in containers was estimated at about 4 Mt of grains in 2016.

At the start of deregulation period, containerized shipments provided a suitable means of transport for small scale operations and hence, facilitated entry of small firms. Unfortunately, some of new entrants lacked experience and knowledge of the product, of the industry and markets. They traded low quality wheats that were rejected by large marketers and were diverted to "the hospital bin," a term used in the industry to describe poor quality deliveries. At that time, container trade was associated with poor quality product (Interview data).

Later, as benefits of container trade become more evident, more serious players (Quadra Commodities for instance) developed a number of packing facilities, enhancing the infrastructure to support the container trade on a regular basis. As a result, the volume of container trade has grown steadily, eventually overcoming the initial negative reputation. One participant with intimate knowledge in the containerized business spoke of various reasons as to why players choose containers. Some overseas buyers could avoid theft and product contamination enroute to inland end-users' milling sites, an important issue in countries with weak law and order. Additionally, small-scale operations that cannot partake on "take it or leave it" costly contracting with rail operators, can in contrast be financially viable working with containers. White et al. (2018) also note that this model has provided start-up smaller companies with a path to grow their businesses and eventually compete with bulk traders.

Most importantly, the use of containers can facilitate moving of differentiated products, where guaranteed segregation and identity preservation is critically important in ensuring a premium. Through container trade, niche markets can develop their separate SC and capture additional value. As a result, the container trade has a high potential to serve niche markets, such as high-quality wheats or particular varieties which are highly valued by customers.

4.5 Shifting dynamics in the domestic and international markets

Australia is a major producer and exporter of wheat. The annual production in the last 20 years averaged about 22Mt of wheat, with droughts greatly affecting its variability. As seen in Figure 2, the domestic and feed use have more than doubled during this period, reaching 8.96Mt and 8.42Mt respectively in 2018-2019 crop year (ABARES, 2020a). Such increases are driven by population growth and increasing demand for animal feed, primarily in the east coast, a trend that is expected to continue (Kingwell, 2019b). The steady increase for these uses means that surpluses for exports are directly affected by the variability in production, as it is clearly seen in Figure 2.

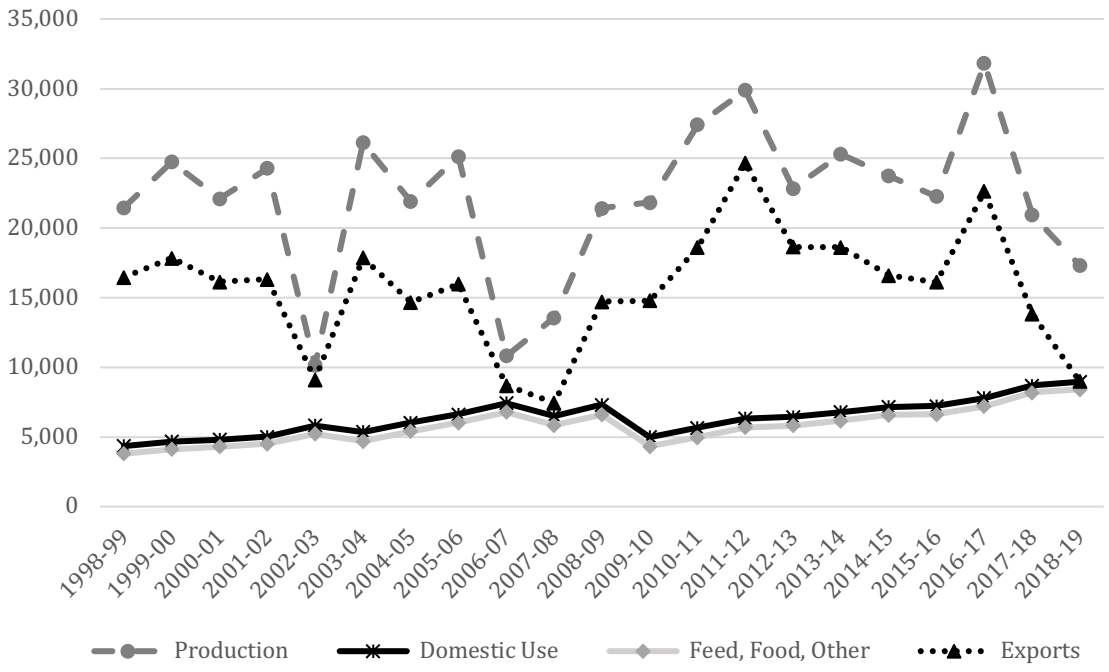

Figure 2. Austalia's Wheat Production, Domestic use, Feed use and Exports (Kt)
Source : ABARES 2020a

The spatial market dynamics are such that South Australia and West Australia, which account for 54 per cent of average production (see Figure 3), face relatively low domestic demand and continue to produce primarily for export markets (more than 85 per cent of production). The Eastern seaboard (Queensland, NSW and Victoria) produces on average 46 per cent of Australian wheat (ABARES, 2020b). This includes some of the best quality,

premium hard wheats that are only produced in the Northern zone (AEGIC, 2019b). In contrast with WA and SA, this production is primarily destined for the domestic market.

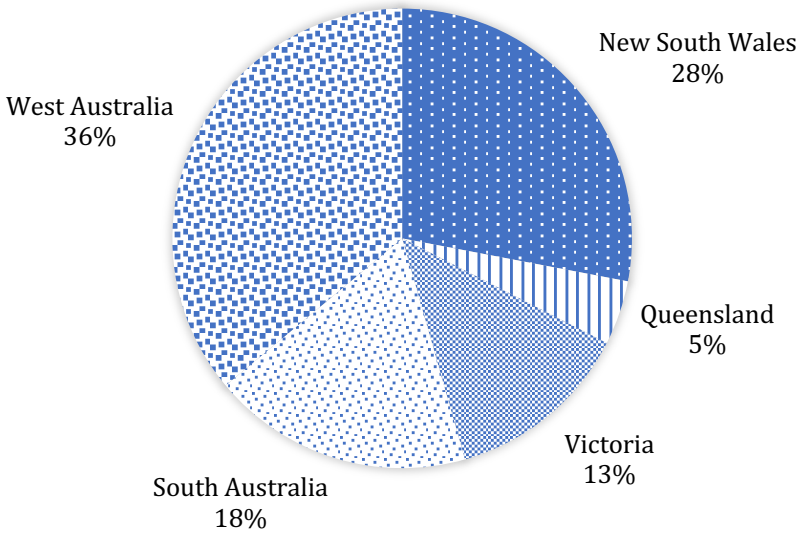

Figure 3. Wheat production by state (%), 2013-14 to 2017-18 average

Source: ABARES, 2020b

High human consumption in the more densely populated region of Eastern seaboard and the burgeoning livestock industry located in this region make up most of the domestic demand (Kingwell, 2019b). The feed demand is often met with the regional production of often high-quality hard wheats due to relatively high freight costs for imported feed grain. As a result, the Eastern Seaboard export share of wheat has decreased over time, even though the prime hard and hard wheats grown in this region are highly desirable in export markets (Various participants).

This dynamic in the domestic market begs some important questions related to quality, particularly for the feed class. With the demand for feed expected to rise in the future, should high quality hard wheats continue to partially meet this demand? Currently, feed wheats are basically stocks deemed unsuitable for human consumption. Is there a scope for breeding programs to develop high yielding, premium feed varieties with functional traits better suited to this end-use that could deliver better feeding outcomes such as metabolizable energy, fiber, protein etc.? Additionally, if breeders could successfully select

for and develop such varieties, would these be commercially viable? If the economics are favourable for such feed varieties, would growers, who have traditionally grown high quality wheats, be willing to switch their practices and adopt them?

Turning attention to the international market dynamics, Figure 4 shows that although Australia is a major wheat exporting country, its share in world exports displays a declining trend (USDA, 2019). As noted above, Australian exports are closely related to the production fluctuations. It is expected that export shares will drop during periods of drought, but increased competition from other international suppliers can also affect Australia's export standing, even when in years of high production and favourable weather. Black Sea countries like Russia and Ukraine are emerging as considerable low-cost players in the last decades. As Kingwell et al. (2016a) and (2016b) show, they pose a serious competitive threat in Australia's traditional export markets not only with their competitive pricing, but also because buyers value reliability. Once forced to substitute for Australian wheat and learn how to work with a blend that includes the relatively cheaper substitute, end-users would likely continue to engage with the newfound suppliers in the future (AEGIC, 2019c).

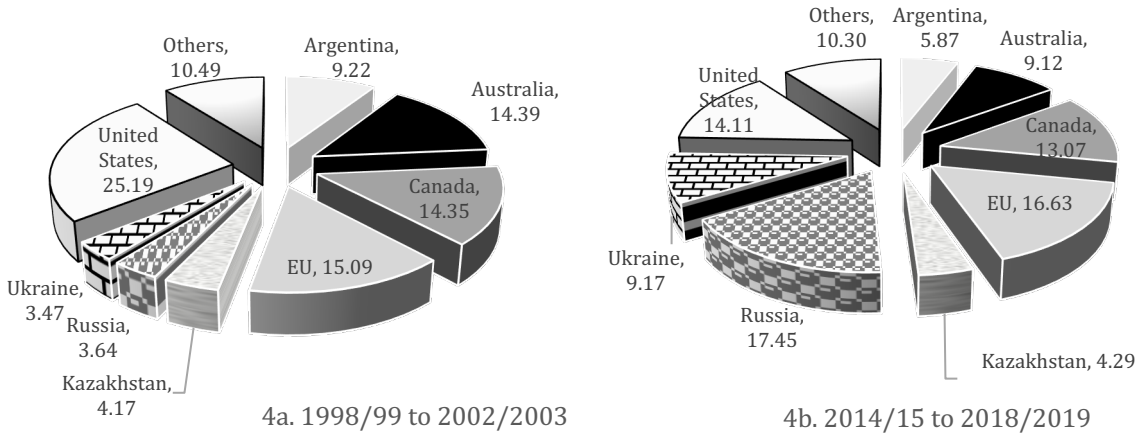

Figure 4. Market share of world exports (%)

Source: USDA 2019

The export destinations for Australian wheat have changed considerably in the last decade as seen in Figure 5. With the steady decline in Africa and Middle East,[22] Asia has overwhelmingly become the major destination, accounting for more than 75 per cent of Australian exports. This increase is due not only to the stability and increase of exports in traditional markets such as Indonesia, Japan, and South Korea, but also the considerable increase of exports in emerging economies of Vietnam and Philippines (ABARES, 2020c).

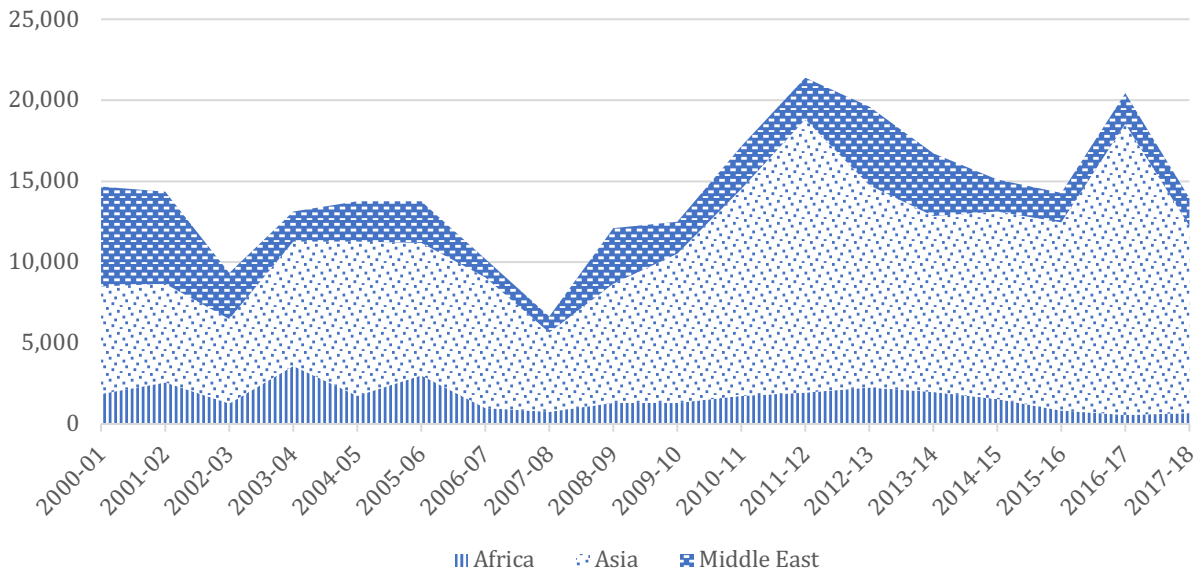

Figure 5. Australia's Wheat Exports by destination (Kt) (2000 - 2018)
Source: ABARES 2020c

What do these trends mean for the types and the quality of wheats grown in Australia? To serve these markets Australia will continue to cultivate wheats that are better suited for products in Asian markets, most notably different types of noodles and Asian steam breads, and perhaps cultivate less wheats suitable for flat breads that are popular in Middle East and North Africa. Australia has earned the reputation as the "noodle specialist" since Australian wheats have high functional performance in a wide range of noodles (Elliot et al., 2019). Delivering to these markets and preserving the reputation as a reliable supplier should continue to earn a premium. As White et al. (2018) conclude, faced with high

[22] While there has been a drastic decline of exports to Egypt, Nigeria has emerged in the last five years as the major importer in the African continent; although exports to Iraq, Iran and Saudi Arabia have diminished significantly, Yemen and Kuwait continue to be stable markets from Middle East.

competitive pressures on the cost of the supply chain, Australia would greatly benefit by focusing on nearby markets that pay a premium for wheats with functional characteristics that are difficult to replicate by competitors.

5. Concluding remarks about the Australian system

This study provides an account of the organizational and institutional evolution of wheat quality management system in Australia, after the 2008 marketing deregulation. We pay particular attention to new organizational arrangements that filled the void of providing industry goods pertaining to quality, such as the wheat classification, market intelligence, and technical training for use of Australian wheat, all of which facilitate a well-functioning quality management system.

We found that when consensus and common ground was found by industry players to provide industry goods, such as preserving the integrity of classification or the trading standards, new organizations and institutional arrangements were relatively fast to emerge. To that effect, Wheat Quality Australia was founded in 2012 as an independent corporation to administer the wheat classification system. Additionally, publication and administration of the Trading Standard was taken over by Grain Trade Australia without any governmental directive; these standards continue to serve as the basis for grading at harvest and contract specifications.

While the main classification functions were maintained throughout the transition, no major changes in wheat classes have occurred. The most notable exception pertains to the zone classification for the APH Class, which since 2018 expanded from the Northern zone and became a national class (WQA, 2021c). Changes have been incremental in nature, with most new varieties classified giving yield increases or better disease resistance within the already established classes. Is this a sign of stability or of a system still in transition which may lack the proper agility to effectively receive market signals?

Other industry goods such as market intelligence, generic promotion and technical training for using Australian wheat, complement the quality assurance and their adequate provision enhance the performance of the quality management system. However, being more prone to free riding, un-fragmented organizations for these services were much slower to emerge. Overcoming some initial challenges, AEGIC has established itself as the chief provider in this space in the last few years.

Market intelligence regarding the desired functionality attributes, the end-user willingness to pay for them in various markets is very important for breeding programs in a market-based classification system. Although market deregulation adversely affected the provision of market intelligence until more recently, it has not yet shown any adverse impact on the breeding programs.

The governance structure of new organizations permits relatively wide representations from various industry stakeholders. Along with the collaborative engagement of these representatives, these organizations have increased their credibility in servicing the industry well into the future. A major industry development took place in March 2020, when GRDC announced the founding of Grains Australia (GA) an independent company aimed to consolidate the provision of industry goods. Years in the making, through negotiation among major stakeholders such as Grain Growers, Grain Producers Australia, GTA and GRDC, the new business model aims to streamline the functions provided by various organizations.[23] With the founding GA Board of Directors in place only in August 2020, the scope of industry functions and the extent of transition of services from other organizations into the new model has yet to be determined and operationalized.

[23] The GRDC press release outlines the following as GA core functions: "To establish and maintain a grain variety classification system; To provide services that maintain and improve trade and market access; To develop long term market and consumer analysis and product awareness to support longer term demand and value creation; To ensure technical support and training is available for customers of, and participants in the Australian grains industry" (GRDC, 2020).

We found that during this transitionary period GRDC has played a central, albeit less direct role in leading the provision of industry goods primarily through funding. For instance, GRDC has financed the operation of WQA from its creation, eventually becoming its sole funder. In addition, GRDC has provided a significant portion of the AEGIC financing in partnership with West Australia Department of Agriculture. Understandably, given the diverse and often competing interest of industry stakeholders, new organizations face many challenges to credibly establish themselves. GRDC financing facilitated their operation amid many uncertainties, something that afforded them the time and opportunity to evolve, mature and establish themselves as organizations that add value for the industry. It is not surprizing to also see GRDC playing a critical role in the most recent industry development, the founding of GA. It is understood that GRDC not only was instrumental in negotiations among stakeholders, but it is also providing the entire funding for GA operations.

The few trends we identify point out that the deregulated marketing environment by its very transactional nature, does not necessarily and systematically provides incentives or rewards for farmers to grow high quality wheats. When it comes to managing the high-quality wheats and preserving the reputation for a quality product, there is a need for a long-term approach in managing the stocks across multiple cycles and in developing longstanding relationship with overseas customers. Opportunely, the large vertically integrated grain companies which have the capacity and infrastructure and the vested interest are well positioned to partake in such practices.

Additionally, with an increased delivery to (min) specifications and incentives to blending grades in early links of the SC, there is an impetus to better manage high-quality wheats by designing contracts with specifications that better reflect functionality. Along with the increase in containerized trade, these create favourable conditions for Australia to develop niche markets, which may consistently pay premiums for the quality. While the quality improvements in terms of yield gains, disease resistance and drought tolerance may likely dominate the expansion of mid-protein varieties in the commodity market, further

developments of niche markets that value high performance and functionality attributes of high-quality wheats will continue to bifurcate the wheat market.

After more than a decade of organizational and institutional changes in Australia, the industry has come full circle. The prevailing model has undeniably an element of centralization that was present in the single-desk era. The most recent consolidation of industry functions under Grains Australia, which is funded single-handed by GRDC, signifies the need for coordination and joint provision of complementary industry goods, which can be achieved more effectively in a centralized structure.

6. What insights does the Australian case offer for Canada?

The Canada Grain Act, which is currently under review, gives the Canadian Grain Commission (CGC) the authority and the resources that enable it to provide a number of industry goods related to grain quality. Recent funding surpluses of the CGC, combined with the general thrust towards deregulation within the industry, has resulted in grain marketing firms advocating for a smaller role for the CGC in quality assurance system.

The Australian experience would suggest that quality assurance entails many complementary functions that together enable the grain sector to develop, market and deliver quality grain to its customers. Having explored a number options to "do more with less" these functions have each been restored and eventually have been centralized as a means to coordinate these activities effectively. Notably the GRDC, has funded most of these initiatives, signifying the need to design funding mechanisms for these industry goods.

The developments in Australia beg three questions for policy makers engaged in the review of the Canada Grain Act. If the CGC activities are curtailed, will industry goods related to quality assurance still be delivered at an adequate level? If so, what organisations will perform these functions? Perhaps most importantly, who will fund these activities in a sustainable manner?

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