A Looming Crisis for Western Canadian Grain?

by
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Abstract

The proliferation of Genetically Modified Organisms (GMO's) and the public backlash concerning these foods may require separate supply chains to meet new anti-contamination guidelines. Coupled with changes in global markets and developments in food processing, this has led to a fragmentation of the traditional approach in providing homogeneous products in bulk quantities, to smaller quantities of identity preserved grains.

While the Canadian grain industry continues to tinker with the bulk system by rationalizing the network, other countries such as Australia and the United States are establishing Identity Preserved supply channels to take advantage of niche markets. The assumption of the Canadian grain industry that it can accommodate Identity Preserved Grain, particularly GMO's, within the confines of the bulk system is presumptuous in light of increasingly stringent consumer protection requirements.

The result may be that a looming crisis for Western Canadian grain logistics may become a reality unless separate channels for identity preserved grains are established.

1.0 Introduction

Bulk transport systems work best with homogeneous products in large volumes. Commodities such as coal, potash and sulfur are examples of industries that abide by this fundamental principle. Grain is no exception. During the past one hundred years of existence, barring several hiccups, the grain transport system has performed relatively well. However, developments within global agriculture sectors may require a wholly new approach to grain transportation rather than tinkering with the bulk system to extract incremental efficiencies. This paper will outline several of these developments and their impact on the bulk grain handling system. The primary focus will be on, 1) the proliferation of new varieties through

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biotechnology, 2) the unanticipated consumer backlash of Genetically Modified Organisms (GMO's), 3) the shift in food processing to Just In Time production techniques, 4) supply chain considerations in the context of de-commodified world markets and, 5) shift in market structure by the decommissioning of central buying agencies.

2.0 Biotechnology – Boon or Bust ?

Biotechnology is revolutionizing grain production, handling and consumption through the introduction of genetically modified organisms. The number of new varieties that are in production have necessitated logistics systems capable of preserving their identity.

Identity preserved grains (IPGs) are any grains that have added value from segregation. Users of these grains are willing to pay a premium for their procurement because of their superior attributes. Value added features of identity preserved grains are severely compromised in the bulk system, making segregation imperative. Fulfilling the requirements of niche markets, IPG systems currently function within traditional commodity systems – they do not replace them.

Increasingly, genetically modified organisms (GMOs) are joining the ranks of other IPGs. The benefits of GMOs however, are not easily measured. Premiums associated with IPGs are based on the novel traits of specific varieties and the economic value of these traits to producers, processors and end users. However, some GMO traits do not afford benefits to either consumers or processors. For example, GMO varieties with traits such as herbicide tolerance provide benefits only to the producers who grow them. The advantages of these varieties are that they simplify agronomic practices and lower perceived risk to the producer. The public's skepticism about the safety of GMOs has significantly contributed to the fragmentation of the grain market.

Figure 1: Protesters in London, England demanding a five-year freeze on the introduction of GMO's in Europe.

Concerned over the potentially dangerous trickle-down effects of biotechnology in agriculture, consumer groups and grain-purchasing entities are demanding that governments and the agriculture industry take steps to ensure the safety, quality and purity of the food being produced. Well-publicized cases of safety debacles such as the proliferation of Creutzfeld-Jakob Disease (more commonly known as

Mad Cow Disease) in the UK have weakened already fragile consumer confidence in the agriculture industry's willingness to make safety its top priority. Figure 1 demonstrates the public's mistrust of corporations involved in biotechnology is generating a consumer backlash, ranging from mild to militant, that has never before been seen in the agriculture industry. Due to the potential for contamination in bulk grain handling, these issues have had enormous implications for Canadian grain logistics.

Maintaining the value of particular segregations is the goal of an IP system. However, with respect to GMOs, a new justification for identity preservation has surfaced. Increased attention to IPG issues is expected in connection with GMOs for four reasons. First, the set of GMOs approved in different countries is not the same. The European Union, for example, has implemented a suspension of all GMO imports until new regulations are agreed upon. This moratorium has resulted in a significant reduction in market share for Canadian product.

Second, there is a need to develop consistent and informative GMO labeling requirements. Countries such as Australia, New Zealand and Japan have announced plans to introduce mandatory labeling for GMO foods in the near future. This raises the question of what the standard for determining adequate and universal tolerance levels should be. Tolerance levels must satisfy consumer uncertainty but be liberal enough to afford profit potential for producers, handlers and marketers. These tolerance levels are vital considerations to the nature and costs of the IPG system that is consequently developed.

Third, the demands of consumers that desire non-GMO food must be satisfied. Processors and distributors are obliged to provide this segment of consumers with GMO-free food. But the size of this market is growing rapidly. Canada's bulk grain logistics system is not equipped to handle this growth. The cost of supplying non-GMO food could be substantial, given the many opportunities for contamination and commingling that exist along the supply chain (Moschini, 1999).

Finally, GMOs have effectively doubled the number of segregations handled by primary elevators and the transport system. This will reduce the storage capacity of high-throughput elevators (HTEs) and their ability to quickly and efficiently handle large amounts of blended grain. The drive to increase HTE inventory turns to 15 per year (from the current 8) is unrealistic in light of the rapidly growing number of grain segregations in the handling system (Kosior, 1999).

The impact of GMOs and increased segregation on HTEs carries over to transportation. HTEs are built to capture economies of scale and can thus accommodate 75 to 100-car unit trains. The railways offer rate reductions to shippers who are able to fill a unit train, increasing margins for handlers. These benefits are frequently passed on to producers in the form of delivery incentives. Increasing the number of types of grain will make it more difficult for one elevator to

accumulate enough available non-GMO grain to load a unit train. This underscores the need to develop a suitable IP system. Potential efficiencies in the bulk system are lost when IPGs are pushed through a system designed for high throughput and homogeneity.

The major problem in exporting GMO grain will occur at export ports (Baumel, 1999). In Canada, grain is moved to export position by rail. At the ports, it is transferred to terminal elevators and stored where it awaits transfer into the holds of ocean-going vessels. The terminals have limited storage capacity and will have difficulty handling many segregations of grain at the same time. One way to avoid this problem is to load direct from railcar to vessel. However, this is more costly because it requires terminals to tightly schedule inbound loaded hopper cars and vessels. The high transit time variability will place extraordinary constraints on the ability of terminals to achieve this. Moreover, if importers strictly prohibit the import of GMO grains, how will the exporter know if all the grain is non-GMO grain and/or approved GMO grain? What does the exporter do if the wrong variety of grain has been loaded in the hold of a ship while it is still at the port or, even worse, in a ship that has already set sail? (Baumel, 1999)

This leads us to the question of how issues concerning documentation and testing will be addressed. As previously mentioned, the emergence of a larger number of segregations in the bulk handling system will greatly increase the risk of contamination and commingling. As a result, there must be a system in place to economically test the contents of each hopper car. Presently, Canada's grain industry relies on Kernel Visual Distinguishability (KVD) testing method. GMOs, however, cannot be distinguished from non-GMO varieties by simple visual means. How are we to detect GMOs from non-GMOs in a fast and efficient manner? The fact that the desired testing technology is still under development is a further obstacle faced by Canada's current grain logistics system.

Another important issue is where the testing should take place. At the farm? At the primary elevator? At the terminals? Ideally, testing should take place at every point of transfer along the entire supply chain, with documentation following each grain shipment. While this would improve accountability and reliability, such a system would become prohibitively expensive and time consuming.

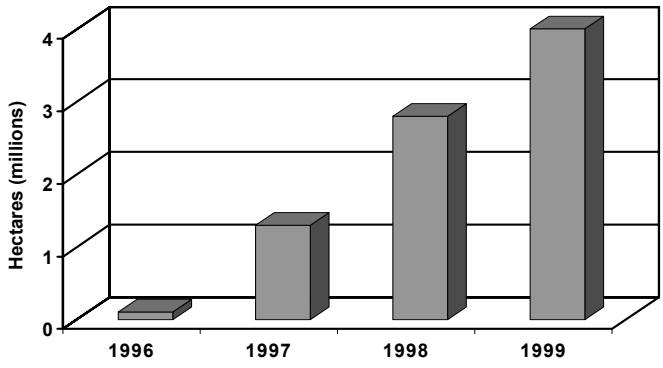

Figure 2: Growth in hectares of Canadian trans-genetic canola.

Genetically modified crops will become more significant as biotechnology continues to change the face of agriculture. Realizing benefits to be gained through their

use, producers are planting more GM crops. Figure 2 shows that in 1996, 5 percent of Canada's canola acreage was of GMO variety. By 1999, this number had jumped to 66 percent, an increase of 61 percent in four years. Substantial growth in GM varieties of other grains has also occurred. The impact of biotechnology on agriculture and the safety concerns it has created are key issues driving change in modern agriculture. As witnessed with Mad Cow Disease, many of these concerns are warranted. Biotechnology in agriculture, however, is not waning. These disparate forces will necessitate changes in Canada's approach to grain logistics.

3.0 The Evolving Sophistication of Consumer Demands

The growing sophistication of consumer demands and the impact these have had on the food processing industry has become an important market driver for identity preserved grains. Increasingly, consumers are demanding more varied food products from processors. Typically, these food products require more specialized inputs. As with the emergence of a greater number of grain segregations in the bulk handling system, an increased variety of food products requiring highly specialized inputs and processing techniques has necessitated changes in the food processing system. In their quest to meet minimum tolerance levels for contamination and to satisfy more discerning consumer tastes, processors have sought out greater varieties of IP grains in smaller quantities. Due to the superior homogeneity, purity and overall quality of identity preserved grains, processors benefit from improved process yields and greater product consistency (Clarkson, 1999). The sheer number of segregations in the handling system today, prevents the bulk system from effectively delivering these benefits.

With the added value provided by IP systems come certain cost considerations which must be taken into account. The fundamental point is that variety exacts its price. IP grains are processed in small batches requiring the production system to be chemically cleansed and sanitized between each production run. Strict quality control measures must be instituted to ensure that the quality and safety of the food is maintained throughout the production system. While the affluent North American, European and Japanese consumers who demand these IP products have been willing to pay premiums for them, the higher production costs they involve have also driven processors to seek greater operational efficiencies.

Processors utilizing a growing variety of specialized inputs in production must be concerned with contamination during on-site storage and problems related to storage capacity and input supply. The responsive, synchronized nature of Just-In-Time (JIT) food processing requires a fast, efficient and reliable supply chain. It is dubious whether a bulk system is capable of delivering small quantities of specialized IP grains at short notice or on an as-needed basis.

4.0 Supply Chains and the "De-Commoditization" of Agriculture

As discussed earlier, the advantages of bulk grain logistics systems lie in their ability to efficiently handle large quantities of relatively homogeneous grains. The principle factor responsible for the erosion of this efficiency in recent years has been the number of new grain segregations being handled in the system. This fragmentation or de-commoditization of the grain industry has negatively impacted elevator throughput, storage space utilization and handling and transportation efficiency in the bulk system. Further increases in the number of segregations moving through an already constrained handling and transportation system will increase the stress on the system's ability to preserve the identity of segregations (Demmans & Roth, 1998). The response of the Canadian grain industry is to tinker with the bulk system by rationalizing the network. All indications are, however, that the problem is getting worse. For wheat, in 1985 there was a total of 12 possible segregations, by 1995 there were 68 possible segregations of wheat. (Canadian Grain Commission, 1998). With the number of segregations expected to continue rising in the years to come, clearly, continuing to funnel identity-preserved grains through the bulk system is not tenable.

The obvious solution is to provide separate logistics channels for product streams (IPG, GMO, organics, etc.). However, the question is how should a mixed logistics network (Prentice, 1998) be configured to derive maximum efficiency? The goal of a mixed logistics strategy is to pull smaller segregated IPG shipments out of the high-throughput bulk system where they create congestion problems and redirect them through a specialized IP system. The return on investment will be determined not by an isolated cost/benefit analysis of the IP system alone, but through an assessment of the overall efficiency gains in the entire grain logistics system including the benefits accruing to the bulk system. Investment in IP facilities and equipment should only occur where supplies of identity-preserved grains and the subsequent congestion they cause warrant it.

Second, a viable IP logistics system will require facilities in areas of Canada where grain handling has been severely rationalized in recent years. In some areas, rationalization is scheduled to continue in the years to come. Rather than continuing to dismantle older elevators, designation of these facilities for dedicated IPG handling may enable the establishment of identity preserved infrastructure at minimal cost. Through greater specialization of handling activities, higher productivity and less congestion, a mixed HTE and IP system could generate overall efficiency gains.

Third, a specialized IP system will improve product flow and boost efficiency through the improved utilization of facilities currently operating below capacity. The potential for improvement in this area begins at the farm. Canada's commercial grain storage capacity is low

relative to its on-farm storage capacity. Taking full advantage of farm storage infrastructure will further reduce congestion in the handling system. Establishing dedicated IP handling facilities will ease some of the burden increased segregation has placed on the handling system, but additional action must be taken. More emphasis will have to be placed on farm storage as a means of optimizing storage efficiency. As with the exclusive dedication of non-utilized infrastructure such as rationalized grain elevators to IP activities, the goal is to achieve the greatest operational gains with the least capital expenditure.

Increased reliance on underutilized ports such as Prince Rupert and Churchill could also significantly benefit Canada's grain logistics system by providing shipping alternatives which take pressure off the Port of Vancouver and Thunder Bay during the peak shipping season. In light of the trend towards increased segregation from GMO's versus traditional crops, potential designation of Prince Rupert and Churchill as "GMO-Free" facilities may prove attractive to discriminating consumers.

The emergence of containerization (Prentice, 1980) as a viable option for transporting small shipments of grain provides further impetus and justification for the establishment of a dedicated IP system. Only recently has the economical movement of containers worldwide become a reality. During the past twenty years, the capacity of container ships has risen from 2,000 TEUs[4] to over 6,500 TEUs. Growth of the world's container slot capacity has out-paced demand and rates have fallen steadily. While producers of specialty crops have been taking advantage of containerization for some time, rates have now reached the point where significant potential exists for lower-value grains such as wheat. Due to increased segregation, the accumulation of large quantities of grain which was once easily obtained through blending are now more difficult to achieve. Current scenarios involving smaller quantities of segregated grain grown on a contract basis for overseas buyers present opportunities which are ideally suited to containerized IP systems. Further substantiating the need for a dedicated IP system is the fact that international grain purchasing is changing and customers are demanding smaller shipment sizes.

5.0 Rising Market Forces – The Decommissioning of Central Buying Agencies

The 1990s brought a shift in international grain importing functions from primarily large central buying entities to smaller, more numerous independent private buyers. Figure 3 shows that private buyers now represent over half of the market for high quality Canadian wheat.

[4] A TEU stands for Twenty-Foot Equivalent Unit, a forty-foot container is 2 TEU's.

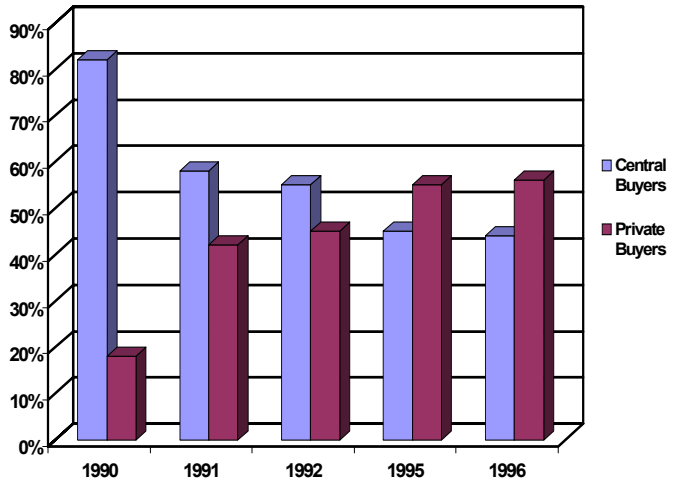

Figure 3: Percentage of Canadian export grain purchases by central versus private buyers, 1990 to 1996. Source: Mckinsey, 1998.

At the same time, globalization and the liberalization of trade has spurred market reform in many countries with the privatization of state-owned enterprises. Greater self-sufficiency in China and the dismantling of the Former Soviet Union are two key developments that have negatively impacted Canadian bulk grain exports in the past decade. The inability of the of the bulk system to efficiently handle greater numbers of customers purchasing smaller quantities of more specific grains is a recurring theme in an assessment of Canada's grain logistics system. With regard to international grain purchasers, the problems are similar to those of local food processors. Smaller grain purchasers cannot afford to tie their capital up in large inventories of bulk grain. Moreover, they require quick delivery of specific varieties of grain which, increasingly, can be more efficiently procured through a specialized bulk or containerized IP system.

Figure 4 shows Canadian wheat exports by shipment size for the 1994/95 to 1998/99 crop years, confirming the trend towards smaller consignments. However, this does not necessarily mean that large vessel loads of grain will wane. Rather, industry sources state this is on the rise. In the past, government controlled central buying agencies purchased and stored grain in bulk on behalf of national millers and processors, usually in 30,000 tonne consignments or more. Processors within the nation would purchase their requirements from the central agency. Today, many of these individual companies must fend for themselves on world markets. Individual companies are forming buying associations or utilizing the services of freight forwarders to

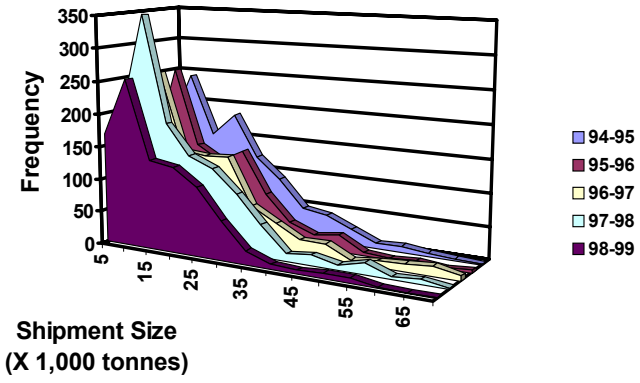

Figure 4: Frequency of Export Consignment Sizes by Tonnage Category for Canadian Wheat, 1994/95 to 1998/99 crop years.

consolidate and co-ordinate shipments to lower transport costs.

For example, a typical practice would be if four buyers chartered a 40,000 tonne bulk vessel to move four 10,000 tonne consignments. The first 10,000 tonnes would be placed in the hold with a plastic tarp over it and jute sacks stuffed on the periphery of the hold to prevent leakage between layers. The second layer of 10,000 tonnes is placed on top the first layer and so on. This practice is becoming more common in grain transport. However, several industry sources confirm that this method of "grocery boat" operation has a high material handling cost to prepare the vessel and reduce potential for contamination between layers. It is not well suited for transporting GMO's and traditional crops in the same hold. An entire shipload of grain could be rejected on the whim of one buyer.

6.0 Conclusion

Grain logistics has become much more complex over the last decade. Despite the rationalization of the Canadian bulk grain-handling network it cannot be assumed that the grain logistics system will be able to cope with the changes taking place in the global marketplace. Biotechnology has revolutionized the grain industry from both the producer's and consumer's perspective. While providing farmers with improved yields, biotechnology has also greatly increased the diversity of grains in the system. In addition to being concerned about the safety of genetically engineered food products, more consumers are now demanding more varied food products. As a result, they are much less willing to accept uniform grades of grain, particularly when they have been genetically modified or exposed to GMOs. The subsequent de-commoditization of the grain industry has had far-reaching effects in the supply chain. Due to concerns over contamination, new consideration must be given to the storage, handling and transportation of grain. Central buying agencies that once consistently purchased bulk shipments of grains from Canada, have been replaced by more numerous and discriminating private buyers soliciting smaller quantities.

When assessed simultaneously, these issues raise serious questions as to how well prepared Canada's grain logistics system is for the future. Countries such as Australia have already proven that a dedicated IPG system working alongside an established bulk grain logistics system can operate efficiently and profitably. By taking pressure off the bulk system and allowing the IP system to capitalize on expanding niche opportunities in the marketplace, overall efficiency gains are realized. Recognizing the necessity and potential of preserving the identity of grains, the United States has begun to establish dedicated IP systems of its own. Having delayed commitment to a mixed logistics strategy, Canada remains at the crossroads. If our agricultural products are to remain competitive with other world suppliers, our logistics system must avoid debilitating congestion. A dedicated IP system must be established in the near future. Failing to do so may result in a looming crisis in the Canadian grain industry becoming a reality.

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