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Supply Chain Coordination in Queensland's Agriculture Sector

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Abstract

Improving the economic efficiency of freight networks is key to unlocking productivity gains and improving the competitiveness of the freight industry. Supply chain coordination can play an integral role in unlocking the latent potential of Queensland's freight network.

This paper explores the challenges and opportunities facing Queensland's agriculture freight sector, particularly rail freight, and the potential economic benefits derived from supply chain coordination. The agricultural sector faces a number of key challenges in the efficient allocation of freight to rail services, these include: informational asymmetries among key stakeholders; suitability of the current agricultural rail network for freight services; seasonal nature of products; and comparative costs of rail and road freight.

In the absence of a central coordinating mechanism, the agricultural supply chain is inefficient, which presents an opportunity for a Supply Chain Coordinator (SCC).

A SCC plans, implements, and controls the efficient, effective flow and storage of goods, services and related information between the point of origin and point of consumption in order to meet customers' requirements. The presence of a SCC has the potential to increase the efficient use of existing and future infrastructure networks through: scheduling; planning; prioritisation; and maximising efficiency.

As detailed within the 2016 State Infrastructure Plan, improving the coordination and integration of freight across the rail network is a strategic priority for government. While the efficiency of the freight task has improved, investment in supply chain coordination may be the key to boosting industry and increasing economic output by unlocking the potential of critical supply chains across the state.

1. Introduction

Supply chain coordination can play an integral role in unlocking the latent potential of Queensland's agricultural freight network.

The interactions in Queensland's agriculture supply chain are leading to a suboptimal economic outcome. Individual supply chain members are acting in their own best interests, which is generating sub optimal supply chain efficiency, and even creating broader impacts outside of the supply chain (e.g. lowering liveability in regional communities). By adjusting individual behaviours in the supply chain at a small cost, through information sharing, an improved aggregate economic return could be realised for Queensland. Positioning the agriculture sector to benefit from the expected rise in demand for its products over the coming decades, rather than growing the dormant economic issues that exist in its supply chain.

This paper provides a review into the prominent issues faced within supply chains. These issues are explored in the context Queensland's agriculture supply chain to identify the challenges and opportunities faced by the sector. Particular consideration is provided for the use of freight in the supply chain, and the potential economic benefits derived from supply chain coordination.

Queensland's agricultural sector faces a number of key challenges in the efficient allocation of freight to rail services, these include:

- informational asymmetries among key stakeholders;
- suitability of the current agricultural rail network for freight services;
- seasonal nature of products; and
- comparative costs of rail and road freight.

1.1. Background

The mode of choice for the agriculture supply chain has trended towards the use of road. This shift from rail to road can be attributed to improving road freight efficiencies, and the falling competitiveness of agricultural products compared to raw mineral commodities. In the absence of significant infrastructure investment, the implications of the continued trend of road freight use will continue to impact on regional communities, hampering liveability and driving up congestion costs. This has resulted in the Queensland Government's attempt to shift the mode choice of agricultural freight back to rail, by providing subsidies to agricultural products delivered by rail (Transport, Housing and Local Government Commitee, 2014).

The emerging reaction to a subsidy has highlighted a number of issues in Queensland's agricultural supply chain. Specifically, the information asymmetry that exists between producers and rail operators; the challenges presented by the seasonality of agriculture and the impact this has on the availability of locomotives and rail paths.

The agricultural sector is subject to, at times, volatile market conditions. Given the sector's exposure to natural weather events, an entire season's produce can be lost in the global market. This has a number of impacts on the domestic agricultural sector. A loss of a supply in a global market directly influences the global prices which many Australian producers are facing. In these events, having a supply chain network to meet an increase in local output to reach the global market is paramount to achieving an optimal economic outcome. Inherent with these events is the unpredictable nature of such market conditions.

Queensland's freight network connects economic agents to domestic and global markets. Primarily, freight offers two distinct modes of transportation to producers within the economy. The road network, offers producers greater accessibility, availability, and faster transportation at a higher cost. The rail network, which offers producers greater capacity and lower costs, but has comparatively less availability and access.

Given its offering, rail freight operators often find their service is efficiently matched with the needs of the raw mineral commodity sector. Particularly in Queensland, where rail freight's major consumer is the coal sector, with 54 percent of freight revenues tied to the sector (Aurizon Holdings Limited, 2015). The steady output from the coal sector allows rail freight operators to efficiently manage their freight paths and locomotive availability to meet the predictable nature of the sector's output. In this context, to increase its relative attractiveness to rail freight operators, the agriculture sector has to improve its transparency.

2. Current State of Queensland's Agriculture Supply Chain

2.1. Queensland's Freight Network

Queensland's large dispersed economy is connected by its freight network. The network has a complex mix of users, infrastructure, regulation, services and network operators which must be effectively coordinated to ensure that freight is moved efficiently across and within the State. The network is a critical component of Queensland's economic infrastructure and includes railway lines, roads, as well as intermodal terminals. As the critical infrastructure that enables the movement of goods between geographic locations, modal choice for the growing freight task is contingent on the comparative advantage of each mode; each mode has attributes that render them more suitable for particular freight tasks (see Table 1). Key comparative features of Queensland's road and rail freight network are described below.

Table 1 Comparative advantages of mode type

	Accessibility	Availability	Volume Capacity	Speed	Cost Efficiency	Liveability Impact
Road Network	✓	✓	✗	✓	✗	✗
Rail Network	✗	✗	✓	✗	✓	✓

2.1.1. Road Freight

Queensland's road freight network carried approximately 37.4 percent of the total domestic freight task[1] in 2012/13 (CTEE, 2015). Most significantly, road freight offers flexible service, supporting variable freight volumes, timing and transit distances which can be adjusted to individual requirements. Specifically, the road freight network is well suited for fit-for-purpose supply chains and supports mobility between producers, distributors and consumers. As a result, the network is particularly suitable for transporting perishable and valuable goods (Allen Consulting Group, 2010). Improvements in road vehicle productivity and road infrastructure quality has markedly improved the cost effectiveness and efficiency of the Queensland road freight network, however road transport is still relatively more costly (by volume) than rail. The road freight task in Queensland is anticipated to grow by 50.4 percent to 2022/23. In light of ageing road assets and increasing route congestion, increasing road freight will have significant environmental and road safety implications (CTEE, 2015).

2.1.2. Rail Freight

In 2012/13, 259.22 million tonnes of freight was carried by the Queensland rail freight network (CTEE, 2015). Due to its ability to capitalise from scale-induced cost advantages, the Queensland rail freight network is best suited for carrying large volume freight and long-

[1] Total domestic freight task includes Pipeline, Sea, Air, Rail and Road Freight.

haul cargo. Relative to road freight, the rail freight network is better suited to providing capacity over long haul distances for products that are not time sensitive (non-perishable) and are produced in large volumes (e.g. commodities that can be stockpiled).

The Queensland rail freight network accounts for approximately 32.2 percent of the total domestic freight task in 2012/13 (CTEE, 2015). While rail has been losing market share, the comparative volume capacity and environmental and liveability advantages make it a more sustainable freight mode, which will be fundamental in maintaining the safety and efficiency of the freight network across Queensland.

2.2. Queensland Agriculture

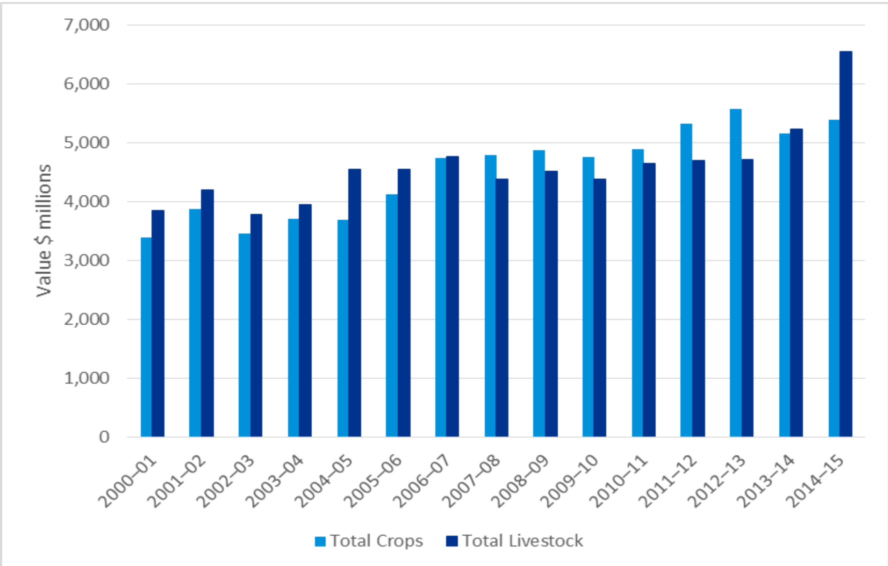
Agriculture forms the economic and social backbone of the majority of Queensland's regional communities. With Queensland having the highest proportion of land area dedicated to agricultural use in Australia and its geographic location, the sector is well placed to realise strong long-term growth as a major exporter of agricultural produce over the coming decades (Department of Agriculture and Fisheries, 2015). Improving the sector's supply chains can lower production costs, improve efficient output volumes, and safeguard the longevity of the agriculture sector. More broadly, it can enable the efficient allocation and planning of freight use throughout the Queensland economy.

2.2.1. Economic contribution

The agriculture sector is a significant contributor to the Queensland economy. The sector's direct economic contribution is forecast to reach $16.88 billion in 2015-16 (Department of Agriculture and Fisheries, 2015), with rural goods exports accounting for over $9 billion, as of April 2016 (Queensland Government Statistician's Office). The sector also indirectly supports the broader Queensland economy, through the processing and distribution of its products, and represents a significant portion of demand for heavy machinery, labour, technology, and other agricultural inputs (such as fertilizers, seeds, etc.).

Queensland's agriculture sector is growing. Recent production volumes have seen Queensland's crop and livestock products increase the headline value of the sectors output (see Figure 1). This can be attributed to changes in the global market and consumer preferences contributing to the rise in demand for Australian agriculture products, particularly in the Asia-Pacific region.

Figure 1 Queensland agriculture gross value production, 2000 to 2015



Source: *Gross value of production by commodity, Queensland, 2004–05 to 2014–15* (QGSO, 2016)

The expected rise in the middle class of Asian economies will further increase demand for the premium products of Queensland's agriculture sector. With current export levels of agriculture in Australia at 65 percent of the production, access to overseas markets is of vital importance to ensure the profitability of the sector (ABARES, 2015).

Demand for agrifood products is expected to increase by approximately 77 percent by 2050, with the expected global population to exceed 9 billion (Linehan, Thorpe, Andrews, Kim, & Beaini, 2012). To respond to the rise in demand Queensland's agricultural sector will require significant support to meet the global market. The opportunity to realise strong growth in the sector must be supported by innovative advances throughout the sector's supply chain. Chiefly, the objective should be to ensure the sector can produce larger output volumes at more efficient/competitive costs.

2.3. Supply chain

The Queensland agriculture supply chain is characterised by the large dispersed geography of the state. With many large producers in both agriculture and raw mineral commodity sectors, there is significant demand for capacity in the freight network. Inefficiencies in the supply chain, particularly for agriculture, are most prominent at the interfaces of the differing supply chains, agriculture, livestock and minerals (Transport, Housing and Local Government Commitee, 2014). To reach the forecast growth of the agriculture sector these inefficiences will need to be address by those with a stake in the supply chain. This has been acknowledged in the *Agriculutre Competitiveness White Paper* (Commonwealth Government of Australia, 2015), citing that "achieving stronger farmers and a stronger economy will require effort by all those with an interest in the sector, including all levels of government, farmers, the broader agriculture sector and industry organisations."

2.3.1. Queensland's agricultural supply chain characteristics

The key characteristics of Queensland's agricultural supply chain has been summarised in the following dot points:

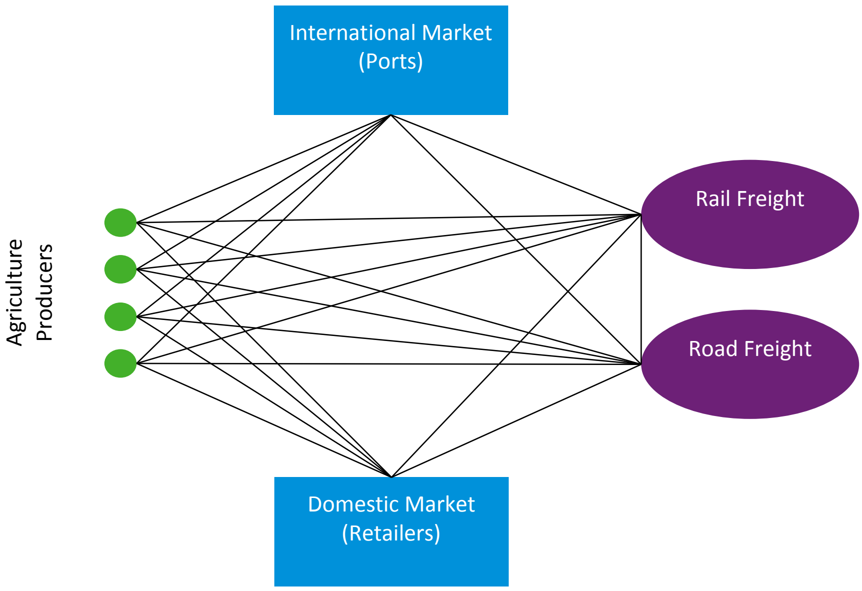
- Fit for purpose supply chains – producers have a fit for purpose approach to supply chain management that meet their independent needs.
- Network size - the network covers a large dispersed geographic area.
- Volatile market - agricultural products' seasonal nature and exposure to weather events creates uncertainty in the supply chain, impacting scheduling.
- Supply chain gaps - the supply chain has numerous stakeholders with competing interests, generating large informational asymmetries in bargaining.
- Commodity competition – agriculture competes with the higher value and steady outputs of raw mineral commodities for timely freight capacity.
- Deteriorating infrastructure - regional road and rail infrastructure are either outdated and/or aging, exposing regional users to comparatively lower quality infrastructure to that of other economic areas. Particularly, rail infrastructure has limited capacity and rail movements are relatively slow.
- Container availability – Queensland is a net exporter of food (20 ft. containers), and a net importer of white goods (40 ft. containers).
- Market access - large grain traders often act as an intermediary between smaller producers and markets.
- Regulatory inefficiencies - no one individual regulatory body is responsible for the Queensland agriculture supply chain. Responsibilities are shared, and often overlapping, among departments and industry bodies.

2.3.2. The impact of Queensland's agricultural supply chain characteristics

The fit for purpose nature of Queensland's agricultural supply chain has both up and downsides. On the upside, agricultural producers are able to arrange their supply chain in such a way that meets the demands of their particularly produce. This is important given the exposure of the sector to seasonal weather and weather events.

On the other side, the same characteristic generates the information asymmetry issue that occurs within the supply chain. When each individual producer in the sector arranges their own supply chain, the stakeholders within that supply chain are subject to a variety of differing demands and uncertainties. This reduces the comparative attractiveness of the sector to freight providers on rail, and agricultural producers more naturally aligned to freight by road. Figure 2 provides a simplified illustration of the communication channels occurring among supply chain members.

Figure 2 Current supply chain communication channels



As observed in Figure 1, there are numerous agricultural producers in the supply chain who interact and arrange commitments with other members of the supply chain. The agriculture producers have full view of their own supply chain and have all of the information regarding their own harvest (e.g. harvest volume, expected harvest time, market destination, preferred transport arrangements, etc.). The number of independent agriculture producers acting in the supply chain add to its complexity, significantly hampering informational asymmetry issues. Furthermore, the issue compounds when considering other supply chain members as it is often difficult to accurately gauge the demand requirements for the freight network, both in terms of freight operators and for regulators of the supply chain.

Freight operators, both rail and road, interact with numerous agriculture producers, each other and the market destination. They coordinate to arrange for intermodal transfers, and the timely passage of goods. Importantly, the freight operators have significant commitments outside of this simplified supply chain (e.g. to other sectors including: raw mineral commodities, white goods, manufacturing, etc.). Given their interactions in this supply chain, and the uncertainty of the goods in transit. They are often subject to an incomplete view of the supply chain.

The markets both dictate and take the price agriculture producers realise. In this sense, they will determine much of the "when" in regards to the timing of agriculture producers' need to get to market. The information flow between the market and producers is often more of a signal (market price) and then an interaction between the relevant producer and consumer.

3. Problem Identification

Queensland's agriculture supply chain is currently unable to operate at its efficient potential. This has seen a partnership form in southern Queensland among some of the region's largest chickpea producers. The partnership identified that through coordination they could arrange for more efficient storage and transport of their product, providing higher returns (Crothers, 2015). The partnership involved the sharing of capital to invest in out-loading infrastructure, but can still yield lower cost per tonne. This example highlights the opportunity to investigate supply chain inefficiencies in the context of agriculture, and how a central supply chain coordinator may address the gaps found.

Recent literature has identified that the modern supply chain is often complex with varying degrees of interdependencies for supply chain members, influencing the efficiency of a supply chain and increasing supply chain risk (Oke & Gopalakrishnan, 2009). In particular, members are often exposed to the issues of information asymmetry, which increases the risk and uncertainty of the supply chain. This phenomenon arises from the implications of bounded rationality. Williamson (1975) suggests that individuals are perceived to have limited information processing capability, bounded rationality, and will act opportunistically with self-interest. In the presence of information asymmetry, where information is distributed unevenly among interacting individuals, the gap in information can lead to individuals taking advantage of other parties and/or confusion occurring in the interactions (Kembro & Selviaridis, 2015).

Further issues of risk and uncertainty arise when considering the type of goods produced in a supply chain. In supply chains involving seasonal and perishable goods, there are often higher levels of uncertainty as such products often have longer production and delivery lead times than their selling season (Mantrala & Raman, 1991). Given the nature of agricultural products, it is one of the biggest challenges the supply chain is exposed to. Improving supply chain coordination in agricultural sectors can provide a number of efficiency benefits, including: a reduction in losses of harvest in storage; reduced environmental impacts; improved availability of food; ensure food security; and enhanced product development (Parwez, 2014).

Collective action game theory has shown that individuals' will act in the best interest of the collective, or societal, best outcome when their own individual benefits align with that of the collective (Dixit, Skeath, & Reiley, 2014, p. 443). This idea is eloquently described in the classical example by Rousseau (1984), where a hunting party sets out to capture a deer. The group can only track and capture the deer by interacting and cooperating as a group. However, an individual hunter may be better off setting out alone and capturing a hare. The challenge for the group is to ensure corporation by aligning their interests and sharing information to achieve the optimal outcome of the collective. This is not different to the interactions in the modern supply chain.

The intricacies of modern supply chain networks demand strong managerial ability to integrate and coordinate the business relations among supply chain members to achieve the best outcome for the network (Lambert & Cooper, 2000). It follows that, achieving an efficient supply chain requires cooperation (Kleindorfer & Saad, 2005). In particular information sharing can reduce uncertainty, aligning the interests of supply chain members, and contributing to reaching the collective best outcome of the supply chain (Bhatt, Bector, & Appadoo, 2014). Information sharing policies have resulted in inventory reductions and cost savings (Yu, Yan, & Cheng, 2001). A comparative simulation modelling study found that supply chain costs are reduced when full information sharing is present, compared to traditional information sharing (Cachon & Fisher, 2000).

4. Features of a Supply Chain Coordinator

Larsen (2000) describes supply chain coordination as collaborative working for joint planning, joint product development, mutual exchange information and integrated information systems, cross coordination on several levels in the companies on the network, long term cooperation and fair sharing of risks and benefits. The role of a SCC in this context is a central entity responsible for managing the coordinated joint best outcome of supply chain members.

A SCC plans, implements, and controls the efficient, effective flow and storage of goods, services and related information between the point of origin and point of consumption in order to meet customers' requirements. The presence of a SCC has the potential to increase the efficient use of existing and future infrastructure networks directly benefiting freight providers and agricultural producers, and more broadly the economy. An SCC could achieve this through:

- **scheduling** movements of products based on producer forecasts – through liaising with stakeholders (government departments and regulatory bodies, freight operators, rail infrastructure providers, producers, exporters & importers);
- **planning** for future infrastructure needs, which may include regional facilities, network improvements, changes to subsidy levels or policy and regulatory changes;
- **prioritisation** of products with respect to time sensitive supply chains; and
- **maximising the efficiency** of freight, to ensure lowest possible costs for stakeholders.

4.1. Scheduling

A central scheduling function would enable the supply chain to provide greater certainty to freight operators. This would be achieved through aggregating all available relevant information in the supply chain and evenly distributing it among supply chain members. This activity would reduce uncertainty in the supply chain, aligning the expectations of supply chain members. The centralised scheduling function would enable the efficient allocation of transport capacity, matching it with producers' outputs, resulting in a more efficient outcome in Queensland's economy.

4.2. Planning

A centralised view of the entire end to end supply chain can identify key areas for improvement. Thus, planning in the supply chain can be targeted to key areas where gaps are occurring. This can improve engagement with supply chain stakeholders, both directly involved with and external of, the supply chain interactions. The supply chain coordinator would have the ability to advocate the needs and opportunities presented by the supply chain to the broader economy. This could introduce and support growing sectors, and has the opportunity to plan for greater integration of technological gains occurring in the Queensland and the broader Australian economy.

4.3. Prioritisation

Providing prioritisation can reduce the risk involved with perishable products. As suggested by Xu and Beamon (2006), supply chain coordination can provide a strategic response to the challenges that arise in supply chains. In this context, through the use of integrated information systems, the life of perishable products can be identified and prioritised appropriately, to ensure that the right products at meeting markets in the most efficient manner to generate the highest return. This would require consideration for which products have the highest sensitivity to time value, and ensuring these products reach market faster than those that are less likely to perish soon or be have their value decrease. This could also involve the use of risk and benefit sharing in the supply chain.

4.4. Maximising efficiency

A supply chain coordinator can maximise efficiency through the collaborative through approach to production and benefit realisation. This is achieved through the efficient allocation of freight capacity. By ensuring that freight capacity is best matched to the characteristics of the product being transported in the supply chain, the network can efficient allocate resources to maximise the economic benefit of the sector. The supply chain coordinator body can provide risk and benefit sharing can ensure that the collective

5. Supply Chain Coordination in Australia

The use of central supply chain coordination has a history of improving the efficiency of freight, increasing total output and driving industry growth. This has been evident in the success of a variety of supply chain coordination initiatives around Australia. Table 2 includes a summary of the major outcomes observed from supply chain coordination in a variety of applications.

Table 2 Observed outcomes from supply chain coordination

	Cost Efficiency	Volume Output Capacity	Reliability	Flexibility	Mode Share	Network Transparency	Overall
HVCCC	✓	✓	✓	-	-	✓	-
NQRSC	-	-	-	-	-	-	-
Bulla Burra Operations	✓	✓	-	✓	-	-	-
NSW CMCC	✓	✓	✓	-	✓	✓	✓

Key

✓ = Benefit obtained

× = Benefit not obtained

– = Benefits unclear/net neutral

5.1. HVCCC

Hunter Valley Coal Chain Coordinator (HVCCC) is a representative body that coordinates coal freight along the Hunter Valley Supply Chain and is currently the largest coal export operation in the world (HVCCC, 2016). Planning & coordination for the industry prior to 2003 was restricted to a service provider level, which was recognised as source of inefficiencies in maintenance, planning and scheduling of coal throughputs for the supply chain.

A centralised coal chain planning function was introduced in 2003 in the form of the Hunter Valley Coal Chain Logistics Planning Group (HVCCLPG) and subsequently the Hunter Valley Coal Chain Logistics Team (HVCCLT). The HVCCC followed on from the HVCCLPG and the HVCCLT; both of which were identified as evidencing the increased benefit of coordinated planning from a central supply chain body.

A key outcome of HVCCC's role is the increased coordination and oversight of maintenance to key assets in the supply chain. This is a key consideration in supply chain coordination as maintenance downtime reduces the capability for an asset to deliver coal. The introduction of the HVCCC has allowed for clearer oversight as to when key assets such as rail sections and conveyer systems require maintenance. Prior planning for aligned maintenance unlocks latent capacity in two key ways:

1. Increasing awareness of upcoming maintenance to ensure the supply chain can appropriately plan outputs and ensure the fulfilment of customer orders; and

2. Increasing the efficiency in which maintenance can be delivered and planned to ensure higher throughput.

The HVCCC has been successful in improving the efficiency, coordination and capacity of the coal chain. In particular, it has been effective in addressing the historic issue of mismatched infrastructure that often resulted in bottlenecks.

The centralised collaboration from the HVCCC also allows for the measurement of performance against targets of the system. This provides oversight to identify areas of vulnerability and inefficiency. This is a key support mechanism for long-term capacity planning for both investment, capacity building and centralised advocacy on behalf of the producers and service providers. This has been supported by continued investment in supply chain management technology, including the introduction of the 'Slot Management' process in August 2013, which reduced loss rates from ten percent in 2013 to as low as four percent in 2014 (Regional Development Australia, 2014).

Subsequently, the HVCCC has been identified as a central support function helping to improve co-ordination and capacity, increase investment and further expansion of the Hunter Valley Coal Chain (HVCCC, 2016).

5.2. NQRSC

The North Queensland Resources Supply Chain (NQRSC) developed for the Mt Isa-Townsville Economic Zone (MITEZ) recognised the importance of coordination between corridor operators and participants in line with the need for oversight across the supply chain. The NQRSC was successful in securing funding from the Australian Government Regional Infrastructure Fund (RIF). The North Queensland Resources Supply Chain Steering Committee was formed to develop efficiency and productivity of the supply chain by improving coordination between key parties to the movement of freight through the corridor. A working group consisting of operators, users and the Government currently coordinate to implement the findings of the committee. As such, no material benefits have been observed.

5.3. Bulla Burra Operations Pty Ltd

As addressed in a 2012 Grain Business Magazine report, increased scale and capital investment can be difficult to achieve for smaller agricultural businesses. Collaborative farming structures provide an opportunity for farms to increase scale and access to capital while allowing farm owners to retain property ownership. Larger farming collaborations provide for economies of scale reducing operational costs and allow for higher utilisation of land and machinery.

A key example is the joint farming partnership operated by Bulla Burra Operations Pty Ltd in South Australia, which was initially formed in 2009. The venture benefits from additional skill sharing and capital raising, with the expansion of operations increasing significantly under the collaboration. The flexibility of the model allows farming operations of different sizes and skillset to remain specialised while enjoying the support structure of a larger operation and respond to changing conditions by a variety of income streams.

5.4. NSW CMCC

The NSW Cargo Movement Coordination Centre (CMCC) is focussed on the optimisation of supply chain interfaces and networks to improve the movement of cargo through Port Botany, Port Kembla and regional NSW. The CMCC assists in coordinating landside cargo operations by focussing on key supply chain interfaces across the cargo freight network including ports, road, rail and intermodal terminals (NSW Transport, 2016).

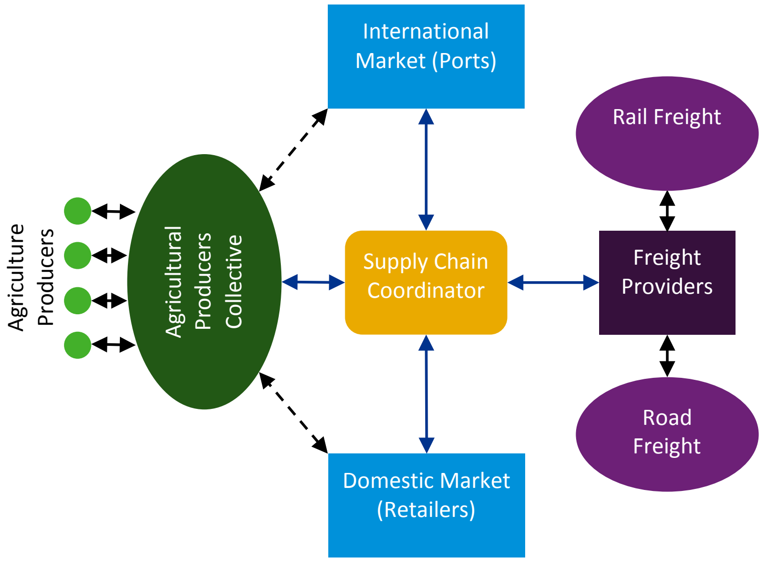
The CMCC provides key oversight to the supply chain utilising CCTV cameras, the CMCC's Operational Performance System and liaisons within industry to monitor congestion, movements and inefficiencies.

6. What a Supply Chain Coordinator can achieve in Queensland's Agriculture Supply Chain

If Queensland's agriculture supply chain members (producers, freight operators, infrastructure providers, regulators, consumers, communities, etc.) all act independently, the industry will continue along the same trajectory. In the long-run, this will hamper the state, and broadly, the national economy. Drawing on the research discussed and applying it to Queensland's agriculture sector, can potentially ensure the longevity of the industry, with the potential to prompt innovative technological change.

Adapting similar strategies to the freight industry across Queensland, while challenging, has the potential catalyse stronger economic growth for the state. The proposed supply chain arrangement reduces the overlap of communication streams. This is achieved by arranging producers and freight suppliers into collectives, and proposing that the central supply chain mechanism is equally represented by each supply chain member. The desired outcome is to reduce informational asymmetry through the sharing of information. Thus reducing uncertainty in the supply chain, and allowing for the efficient allocation of freight capacity within the supply chain, with consideration for external factors (see Figure 3).

Figure 3 Proposed supply chain arrangement



The benefits of this arrangement would reduce the excessive flow of information in the supply chain. Importantly, information would be aggregated and arranged by the central supply chain coordinator. The reduction in communication flows has a number of direct and indirect benefits.

Directly, the reduction in duplicated communication channels allows the supply chain to reach the outcomes described by the features of a SCC. Namely, it allows for efficient scheduling, planning, prioritisation and maximise the efficiency of the supply chain.

Indirectly, it allows for more efficient regulation of the supply chain. Through the arrangement of producers and freight providers into collective bodies and the introduction of a supply chain coordinator the communication channels could be reduced to four distinct interactions. This would allow for more transparent interactions in the supply chain, providing the opportunity for efficient regulation and enhanced information reporting and signalling to the broader economy.

7. Summary

This paper concludes that there is an opportunity to introduce supply chain coordination in Queensland's freight network, particularly in the agricultural sector. There are benefits to be realised in reducing the uncertainty throughout the supply chain through the benefits afforded by centralised supply chain coordination, particularly regarding information sharing. The paper should serve as a basis for a more rigorous analytical study, to find the quantitative benefits afforded through the coordinated effort. Particularly regarding cost efficiencies in the supply chain. Furthermore, the paper should inform future consultation with key supply chains stakeholders, to ensure that any supply chain coordination is achieved efficiently and equitably.

It is important to note that this paper does not suggest that a supply chain coordinator would be a single role, but rather a collective of stakeholders represented in a central body. This arrangement could ensure that opportunities, problems and risks are identified and planned for by those with direct stakes in the supply chains. The coordinated effort could reduce the uncertainty of the network, increase the efficiency of the network and allow for coordinated planning to ensure that the sector is well placed to realise the economic opportunities afforded by Australia's geographical position in the Asia-Pacific region.

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