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Pest control considerations in a least-cost supply chain

B.W. Bridgeman
Forsure Pty Ltd, 6 Clive Crescent, Withcott, Queensland 4352

Abstract. In an effort to maximise returns, increasing numbers of growers and end users prefer to utilise a least-cost supply chain. This option, while providing savings in logistical costs, has highlighted a host of issues that require resolution before it can be considered a satisfactory alternative to the centralised system.

The confidence that the central system provides the client comes at a price and by necessity sacrifices the economies that may have been realised by a more direct supply chain. To provide a viable alternative to the central system, the issues of critical mass, tonnage audit, ownership transfer, quality guarantees and insect control must be effectively resolved.

Guarantee of product quality and quality maintenance during the storage period continues to frustrate those attempting to utilise the least-cost path. The marketplace requirement for delivered commodity to be both insect-free and residue-free is of particular concern. This paper discusses the more common pitfalls in achieving this status and the various options available.

Introduction

The Australian grains industry has built up an enviable reputation for delivering quality produce to the marketplace. Much of this reputation is based to our ability to build confidence in our supply chain. This confidence comes from the level of control imposed on the quality of the product being sold and from describing the minimum quality to be shipped, particularly in regard to scheduled grains. The absence of detectable levels of insects at export is one of these scheduled descriptions with which the supply chain must comply. This system has worked well in the past with such controls in place. However, these controls may not be suitable if the supply chain becomes more direct.

The centralised grain industry has come under considerable criticism due to its high cost and perceived failure to value-add. In recent times, the focus on the 'least-cost supply chain' has highlighted the negatives of the centralised system and has endeavoured to move significant quantities of grain directly to market. While the logistical savings can be significant, the hidden value-adding processes inherent in the central system have been ignored or undervalued. When the costs of implementing the same value-addition to farm-stored products are added back into the equation, the cost of the direct or least-cost supply chain gives growers little savings to justify establishment of the required infrastructure to make the venture worthwhile.

Direct supply chain for domestic markets

Deregulation of the Australian grains industry has dramatically increased the marketing options available to growers and end users, including bypassing the traditional central bulk handling storage system and delivering grain directly to processors or end-use destinations throughout the year.

Growers with suitable on-farm storage have the flexibility to choose the best market for their grain and minimise delivery costs. In addition, by delivering directly to the user, higher freight charges at harvest and wasted time waiting in silo queues can be avoided. Harvest can be properly managed with minimal down-time for the harvesters.

This appears, to the uninitiated, to be a straightforward opportunity to maximise returns with minimal input. It also challenges the cost of the service provided by the central system. This has been the case with feed grains, which require much less quality testing at the point of sale than grains destined for the human-consumption market. In areas with high levels of domestic feed requirements, the central system has become almost insignificant. In fact, it is now a delivery point of last resort in times of oversupply.

Direct supply chain for export markets

The logical next step may appear to be the integration of the least-cost supply chain into the export-market supply chain. However, direct delivery to port has highlighted the

deficiencies in the direct supply chain approach. Most of these areas of concern reflect a somewhat unappreciated value-adding role that is inherent in the central system. The obvious advantages of critical mass accumulation and tonnage verification at a point of sale are well understood, however the guarantees on quality of product delivered are not. The quality assessment of produce entering the bulk handling system is finalised at delivery—at the same time as tonnage verification. The payments for produce can then be arranged as per the relevant parameters recorded. When this product is out-turned, it is generally true to description. In addition, the product is assessed for insect infestation and quality as it is out-turned. Product which does not comply with the export criteria is redirected to another market or otherwise treated to ensure that export criteria are met. The direct route to port cannot react in this way. There is then a serious consideration when utilising the least-cost, direct pathway. While the direct supply chain can supply commodity to the shipment within the quality parameters, another more subtle issue is looming as a fatal flaw in the enterprise. The situation becomes critical if insects are not detected at loading but appear *en masse* in the grain bulk on arrival at the designated market's port.

Pest control considerations in the central system

All grain should be considered to be infested, unless it is currently under fumigation. The population growth rate of most grain storage insect pests will develop from an invisible, single insect per tonne to over 100 per tonne (detectable levels) in about 60 days (dependent on relative humidity, temperature and species). The central handling system can coordinate its pest control efforts to minimise the effect of this population development time by timing fumigations to coincide with loading. Very few shipping times are in excess of 60 days, so it is more than likely that the grain would be unloaded and consumed before the population develops enough to be detected. This system has worked well, developing a high degree of confidence in the supply chain. The fumigations can be conducted up-country or at port. The control over the logistics ensures that product arriving at the port that may require fumigation can be fumigated before loading.

Pest control considerations in the least-cost, direct supply chain

Most current, on-farm storage facilities were not designed to hold grain long-term. Many were built as a harvest buffer and cannot maintain grain quality over long periods. In 1998, a survey of growers in Queensland and northern New South Wales on their farm storage systems concluded that most systems were unsuitable for long-term storage, but several were identified as possible models for on-farm use. Grain stored under the wrong conditions is often downgraded or rejected, usually due to insect infestation. To benefit from on-farm storage, correct grain management and investment in properly designed long-term storage facilities are needed. The ideal on-farm grain storage system is sealed and aerated, easy to clean and access, located where large trucks can be loaded easily, and allows out-turn of more than 100 t/h.

Insect infestation can cause grain spoilage, product downgrades and delivery rejection. Most buyers reject loads if insects are detected. Receival standards also limit the amount of insect-damaged grain that can be delivered. Unfortunately, absence of detectable levels of insect pests at intake or loading does not mean there are no insects present in the bulk. They are there, but their numbers are too few to be detected. This lag time is a critical consideration in the direct supply chain.

Aeration can also be used to increase the effective life of the grain protectant applied and reduce the build-up of insects. In some areas during some times of the year, growers can avoid insect infestation by aerating grain to lower its temperature. Still, this strategy does not provide a definitive answer. The insects are still present and as the grain warms out of aeration, the population growth rate will accelerate.

Sealing and aeration are essential to effectively store grain on-farm for the long term, but upgrading farm storage is difficult and expensive.

In addition to upgrading on-farm infrastructure, the technical know-how and quality issues for storing grain are important. Often simple errors can cause serious damage to valuable grain. The cost of providing suitable storage and expertise to ensure the direct path can provide the same level of confidence as the central system is significant. In many cases, the cost will be in excess of the savings achieved by utilising the least-cost pathway.

The solution

Storages need to be suitable for the task: sealed and aerated or fitted with an active fumigation system and use of professional fumigators or accredited growers who do their own pest control.

Quality assurance (QA) is a given. Documentation of the entire process is the only way the level of confidence required can be delivered. The systems developed for on-farm storage, including all pest control, need to be quality assured. As this is a food supply chain, the quality assurance system preferred by the market will be based on hazard analysis and critical control point (HACCP) principles.

Generally, growers have regarded the move to QA with scepticism. This is partly due to inconsistency in paying for quality-assured grain by buyers. History has shown that buyers, while insisting growers implement a QA program, will move to a lesser-cost option if it suits their cause. Such flexibility in standards has caused many growers to question the value of QA. This situation will change as

customers force markets to implement food safety guidelines, which will flow onto the way farmers store grain. The use of the direct supply chain will demand it.

Conclusion

The pest control considerations in the least-cost supply chain are significant issues. It is possible, however, that the direct supply chain can be made to perform as well as the central system and provide a series of benefits which provide a distinct advantage. When the QA and genetically modified organism aspects of the supply chain become issues with clients, the direct supply chain will be the storage system of choice.