

Grain Storage: Considerations

Introduction

Grain storage is essential to any grain operation in Alberta. Since the commercial grain handling system in western Canada cannot store the entire crop harvested each fall. Grain storage is used as part of the entire grain marketing strategy. The prices of grain tend to be the lowest at harvest. It makes sense for producers to store production until prices rise later in the year. Grain storage is also a tool for income tax purposes. Grain storage alternatives are abundant. Making the decision of what system to invest in begins with assessing the needs of the entire operation. Factors to consider are:

- Size of operation and storage needed
- Distance of land from storage area
- Type(s) of commodity being stored
- Land rented or owned
- Age of operator and succession plans
- Current cash flow and/or loan needs
- Labour availability during the year
- Equipment needs
- Options needed (aeration, handling system, monitors, sweeps, etc.)
- Length of storage
- New build or expansion
- Cost
- Lifespan
- Average yields for the operation
- Grain conditions while storing
- Ability to monitor storage bins
- Accessibility of the storage site
- Resale value
- Pest and wildlife issues

The decision to use either permanent or temporary storage is unique to each individual’s situation. Generally permanent storage is preferred to maintain grain quality and for the ease of use. That said, some temporary systems are becoming popular due to their flexibility.

Permanent Storage

Permanent storage includes any affixed structures not easily moveable such as bins (corrugated and smooth walled steel, sheds/Quonsets and Farmer owned elevators

Advantages	Disadvantages
Provides peace of mind that grain will be “safe” (aeration, limited contamination, moisture barrier and reduced pest and wildlife damage)	Costly to setup and takes time to build (proper foundations are needed)
Investment for future resale	Permanent and more costly for grain transportation if land is not close to the structures
Ease of handling	Maintenance is required
Facilities can be used for other uses (i.e. smooth walled bins for fertilizer storage, sheds for equipment)	Structures need to be cleaned before using

Steel Bins

There are two main types of steel bins, corrugated steel or smooth walled. Smooth walled bins have a higher upfront cost than corrugated, but can be used for both fertilizer and grain storage and have minimal assembly costs. Smooth walled bins come with hopper bottoms and are quick and easy to install. Corrugated bins are more economical and come in larger capacities than smooth walled. Either type of bin provides aeration, permanent handling solutions, hopper bottoms and resale value.

Brands, sizes and additional options can be purchased for either corrugated or smooth wall bins. Prices are dependent on the bin size and additional options. Larger bins normally have a lower investment per bushel, but lack longer term flexibility. Grain quality is more difficult to manage in a larger bin. With smaller bins one can reduce the risk of jeopardizing a large volume of crop if there is a storage issue.

Maintenance on grain bins is minimal, ensuring they are cleaned when emptied and inspected for insects, corrosion, loose bolts, foundation cracks and poor seals. Any mechanical equipment should have the dust cleaned off and ensure that electrical equipment is not damaged. In smooth walled bins if switching from fertilizer to grain, the bin should be pressure washed on the inside to remove any fertilizer dust. With proper maintenance, minimal wear and tear will occur and increase the lifespan and quality of the bin. Hopper bottom bins have good resale value as they are easier to move as opposed to flat bottom bins.

Grain operations would look at investing in steel bins if:

- They owned the majority of the land farmed
- Land was located close to the bin system(s)
- Existing bin and auger system that is easy to add onto
- They rely on aeration to maintain quality
- There is a need to closely monitor grain for quality
- The operation has plans to be in business for a long time
- Need long term grain storage (over 8-12 months)
- They store high quality crops (malt, milling wheat, durum, canola, human consumption pulses)
- They look at the bins as an investment
- They want peace of mind that grain is relatively safe from pests, wildlife, weather and theft
- The need for flexibility to store fertilizer or seed is important

Sheds

Sheds can also be used to store grain. Either steel or fabric buildings can be used. If the building has a concrete floor consider washing the floor and sidewalls before storing grain, especially if it was used for other purposes. If there is no concrete floor a moisture barrier should be laid down. Sheds hold less grain than expected as they can only withstand minimal weights on the sidewalls. Grain packages can be purchased for sheds that will reinforce or tie together the walls allowing for a higher load capacity. For fabric buildings, concrete sidewalls need to be poured to allow grain to pile against them. Aeration is difficult to achieve in a shed and roof vents are required to allow for ventilation. Fabric buildings are

more economical than steel sheds, but have a shorter lifespan. An operation would choose a shed to store grain if storage is infrequent and the shed can be used for other purposes.

Farmer Owned Elevators

In the 1990’s when grain companies were consolidating grain terminals and building large high throughput concrete facilities, small wooden grain elevators were being torn down or sold. In some cases a producer would purchase a wooden elevator for grain storage. This works well if the land being farmed is within close range of the elevator but very few farms have this luxury. Additionally grain elevators require a tremendous amount of maintenance and upkeep as many of the facilities are quite old. The opportunity to purchase an existing wood elevator is limited.

Temporary Storage - includes any system that holds grain on a temporary basis or has a limited life span. These include grain bags, plywood or steel bin rings with tarps, piles and bunkers.

Advantages	Disadvantages
Readily available in times of excess production	Reduced ability to provide moisture and heat management (aeration)
Usually have minimal investment	Creates waste – wasted grain and materials waste
Portable (can be placed in the location of choice)	Limited resale value
	Risk of pest, wildlife, moisture and contamination damage
	Challenging loading and unloading
	Short storage period (6-8 months)

Grain Bagging Systems

Grain bags are a recent grain storage option. These systems require a bagger, extractor and the bag. Bagging systems keep grain airtight from moisture and pests. Bags are good short-term storage option. If stored for too long damage to the bag can occur and spoilage can result. The system allows for grain to be stored right in the field, eliminating trucking during harvest. In some situations, high moisture grain can be stored in grain bags with minimal risk of heating. Grain bags are at a higher risk of having puncture holes from wildlife, mechanical damage (snowmobiles) or trees. Due to this risk bags should be monitored regularly for damage and repaired to reduce grain spoilage. Some options to reduce bag breakdown include using a thicker poly bag or installing reusable bag covers. Bags usually hold about 10,000 bushels so small volumes of grain do not work well for this system.

Bags should be located in a well-drained area away from trees or other potential sources of damage. The surface needs to be level and smooth with no stones or sharp objects. Picking an area that is accessible in the winter also needs to be considered.

Grain baggers and extractors require yearly and seasonal maintenance. The bagger and extractor have hydraulics, moving parts, augers and tires; regular inspection and greasing of all the parts is required. With wear and tear on baggers and extractors parts may break and will need to be replaced. Equipment in good working order will capture a good resale value but as the equipment ages and new technology comes on the market the equipment will become obsolete.

Disposing the plastic once the grain has been removed can create problems. Not all municipalities have recycling programs in place and if so, require that plastic to be clean and rolled. Some extractors have built in rollers but others do not. Rolling the plastic is time consuming and difficult to roll tightly. For municipalities that do not have recycling programs they may not accept plastic or charge a tipping fee. Burning plastic is not recommended as it is hazardous for human health and the environment.

Grain operations would look at using a bagging system if:

- The operation has a large amount of rented or leased land with no other storage options
- There is a need for short term storage
- The operator plans to exit the business in the near future (equipment is easier to sell than physical bins)
- Limited available trucking during harvest
- The operation has land located a long distance away from grain bin storage sites
- Storing low quality crops (feed wheat and barley, sample canola)
- Grain is dry and does not need to be dried or aerated or is willing to store high moisture grain
- Recycling options are available for the plastic
- Large volume storage is needed

Grain Ring and Tarp

Grain rings and tarps come with either wood rings or steel rings. This system is useful for temporary storage, but not recommended for longer periods of time. Pest, wildlife and moisture damage are the biggest concern when storing grain in this system. By keeping the grain contained in the rings and using a tarp, grain quality can be maintained much better than open piling. To keep the rings and tarps in good condition they need to be dismantled and stored when not in use. If using steel rings, the tarps need to be replaced well before the ring wears out. Wood rings are much more economical, but have a shorter lifespan than steel rings. Aeration holes and in-load out-load ports can be installed into the ring.

Bunkers

A bunker system can be designed with many different materials such as bales, wood, cement, steel and earth. These systems can store large amounts of grain and most bunkers can be tarped. This system has potential for pest, wildlife and moisture issues.

Open Piles

If grain needs to be stored for a short period of time, uncovered open piles are a low to no cost solution. This system is not recommended for longer-term storage as it has no protection from moisture, wildlife and pests. There is a greater chance for grain to spoil and to have contaminants such as animal feces and soil tag.

Costs and Features of Common Grain storage– the table below shows the most common permanent and temporary storage options with average costs, size ranges, lifespan, maintenance and options

	Grain ring & tarp		Corrugated hopper	Corrugated flat bottom	Smooth walled hopper	Grain Bagging System		
	Wood	Steel				Bagger	Extractor	Bag
Cost/bushel or machine \$ (approx.)	0.18 – 0.50	0.22 - 0.8	2.50 - 3.50	1.25 – 3.00	3.50 – 4.50	20,000 - 50,000	40,000 – 50,000	0.07
Set up costs	Labor	Labor	Gravel base 1.00 – 2.00	Concrete base 2.00 – 3.00	Gravel base 1.00 – 2.00	Minimal labor		
Common Size Range (bushels)	1,500 – 12,000	3,500 – 120,000	1,500 – 9,500	1,500 – 55,000	1,000 – 6,000	Bag holds approximately 10,000 bushels, number of bags are unlimited		
Lifespan (years)	5	20	40+	40+	40+	15-20		
Maintenance	High	High	Low	Low	Low	Medium	Medium	High
Resale value	Low	Low	High	Medium	High	Medium	Medium	
Options	Out-load and aeration ports		Aeration, handling systems, monitors, canola floors, bin sweeps			Bag covers, bag rollers, sealers		

Rental

When land is being rented or leased, adding permanent storage does not always make sense. Rental of bin space is an option. Bin space could be rented from, a neighbour, land owner or local retired farmer. Grain extractors can be rented for grain bagging systems as opposed to investing in the equipment.

Set up and Location

For a grain handling system to be effective, thought and attention should be given to the set-up and location. Some things to consider when designing a grain handling system are:

- Trucks ability to maneuver for loading and unloading
- Size of trucks and handling equipment
- Distance from field to storage
- Auger movement and positioning
- Drying and aeration needs
- Accessibility to storage all year round
- Potential damage risks (trees, wind etc.)
- Ease of monitoring
- Theft risk and security

Every growing season is different and it is hard to anticipate the exact storage needs the farm operation. Investing in grain handling and storage facilities require careful consideration of both current and future storage capacity needs. Looking at future plans for the entire farm will assist in your storage decision.

Other Resources:

Grain Storage Price Comparisons

[Management of Cereal Grain in Storage](#)

[Cereal Grain Drying and Storage](#)

[Storage of Canola](#)

[Grain Storage as a Marketing Strategy](#)

References:

Kansas State University. September, 2007. *The Economics of On-Farm Storage*.

<http://agmanager.info/marketing/publications/marketing/mf2474.pdf>

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<http://calculators.agstar.com/uploads/GrainStorageMethods0707.pdf>