

Comparison of 4 different Corn Feeding Strategies

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Comparison of 4 Feeding Strategies for Finishing Barn

Introduction

While working with many different farmers day-in and day-out, here at Dwyer Manufacturing, we help solve lots of different problems. Some are smaller questions like what type and size of concrete fastener to use. Others are bigger issues like design of a feeding or flooring system. A while ago a customer asked a very broad question before he started rebuilding his finishing barn, “What type of feeding strategy should I use: simple prepared feed program, feed my own dry corn or feed high moisture corn”? During this tail-gate conversation, we talked about the advantages of each but in the end the deciding factor should be cost of production.

From my experience feeding pigs, a high moisture corn feeding program in the finishing barn (or any other area) is easily the least cost feeding corn option of choice. In this document we shall let the numbers show us if that is correct.

Goal

The goal of this study is to demonstrate the difference in cost of feeding prepared complete feed and 3 different feeding strategies that utilize on-farm grown corn (dry and high moisture).

Application Frame Work

4 different ways of feeding a 2000 head finishing barn (25 – 125 kg):

- Feed mill prepared complete pelleted feed.



- Farm grown dry corn dried and feed prepared on-farm.
- Farm grown dry corn dried at local feed mill and feed prepared on-farm.

- Farm grown corn stored as high moisture corn (HMC) and feed prepared on-farm.

Basic Principle

The basic principle of this study is to compare only the costs that are not identical among each strategy.

Factors that are considered identical and thus not included are: labour for routine chores, feed ingredients (comparison made on preparation costs not the ingredients themselves), and other fixed & variable costs like: vet and meds, insurance, and taxes.

Factors that are included are: storage and feeding equipment, grain and feed grind/handling fees, feed room construction, feed equipment repair and maintenance, and on-farm energy costs to dry, handle and grind grain including feed preparation.

Some will argue that not including more factors in this economic study alters the results. It is my opinion that including minor factors will muddle the comparison and ultimately render the study unpractical to conduct at the least or even impossible.

Please take this as a broad-stroke study and fill in minor adjustments yourself as you see fit.

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4. High Moisture Corn

Conclusion & Summary

Economic Study Assumptions

- Base barn is a 2000 head finishing barn at 8 sq. ft. per hog. marketing 5831 hogs per year.
- Farm is a land based operation able to supply enough corn to feed the pigs each year.

- Farm has capital, staff, and management skills available to properly operate each of these feeding strategies.
- 1401 MT of corn or 1868 MT complete feed consumed annually.
- Standard feed mill Grind, Mix and Delivery charge for mash feed is \$35/ MT
- Dry feed feeders and liquid feed troughs costs are the same.
- Except for feeding equipment, the barn is identical in design and thus cost.
- Labour is the same to properly operate each system. Increased repair and maintenance is calculated for strategies with more mechanical equipment.
- It is acknowledged that many smaller variables/costs have not been factored in. This study is intended to be a comparison that shows the “big picture” difference between these feeding strategies.

Complete Feed



Principle consideration:

This system involves the least amount of capital investment and simplest day to day management.

Explanation:

Prepared feed is stored in two 20 MT feed bins and a simple flex auger system or one of 2 feed delivery systems.

- 2 feed bins needed @ \$14,000 each = \$28,000. Includes 30 ft flex auger to bring feed into barn and concrete base.
- Three feeding system options are considered so proper comparisons can be made to management ability of computerized liquid system used with high moisture corn.

- Simple: flex system, \$11,800
- Better: Daltec cable delivery system \$13,530
- Best: Daltec computer controlled delivery system, \$25,500. Able to measure feed going to each feeder.

Advantages:



- System is simple with least amount of management and potential maintenance problems.
- Least amount of capital is tied up.
- Easiest to find / train labour to run system.

- Managing pigs on a dry feeding system is well researched
- Many feed mills have access to lower cost dry ingredients which can be included in the ration

Disadvantages:

- Feed preparation costs paid to feed company adds up over longer period of time. (\$35 / MT)
- Options of feeding ingredients are limited to dry components
- Ability to calculate pig performance is more difficult when feed delivered to each pen is not measured
- U of Guelph studies shows feed waste up to 2% higher on a dry feeder than a trough used with a liquid feed system

Summary:

- Over a 15 year period, feeding system capital costs make up a small amount of total costs (4% – 5%).
- A computerized system can be a significant asset in measuring feed quantity to each pen thus providing the information needed to calculate F:G. A difference of \$13700 initially is only 1.3% of feed processing cost

over 15 years. If these management numbers are not required then a basic system is the best option.

- When making the decision to utilize the simplicity of prepared feed, be aware of preparation costs that will go towards the feed mill preparing your feed over the long term.

Prepared Feed, Pellets

9-May-18

2000 head all-in all-out finishing barn
 1868 MT of complete feed used annually
 283 kg per pig feed disappearance for 6000 pigs in, 5831 pig to market

Capital Costs

		<u>Basic System</u>	<u>Better System</u>	<u>Best System</u>
2 bins, 20 MT with flex auger	\$	28,000	\$ 28,000	\$ 28,000
Basic flex auger system =	\$	11,800		
Basic Daltec system =			\$ 13,530	
Computerized Daltec system =				\$ 25,500
Total Capital Costs =	\$	39,800	\$ 41,530	\$ 53,500

Operating Cost

Prepared Feed (Pellets)				
\$35 per MT grind, mix and delivery fee for Pellet feed			1868 MT =	\$65,380
Repair and maintenance		2.0%		\$ 830.60
			Annual Operating Cost =	\$ 66,211

Total Costs over	15 years. This includes annual operating cost and one time capital costs			
Basic flex auger system =	\$	1,032,959		
Basic Daltec system =			\$ 1,034,689	
Computerized Daltec system =				\$ 1,046,659

Dry Corn

On-Farm Drying and Storage

Principle consideration:



On-farm corn drying and storage avoids annual elevator drying, storage and transportation costs.

Explanations:

Three feeding system options are considered so proper comparisons can be made to management ability of computerized liquid system used with high moisture corn.

- Simple: flex system, \$11,800

- Better: Daltec cable delivery system, \$13,530
- Best: Daltec computer controlled delivery system, \$25,500

Advantages:

- When feeding your own corn, quality, good or bad, is a known variable.
- There are more options to find quality feeding programs for a dry feed program than for a liquid feeding system.
- Managing dry feeding system has been well researched with lots of information available.



- It's easier to find & train labour to run dry feeding system.

- Lower annual drying cost than having someone else dry and store your corn.
 - on-farm = \$4.75 / MT, (corn moisture 23.8% – 15.5%)
 - Elevator drying charges = \$17.03 / MT (natural gas at \$0.232/m³)
- Feeding system is simple with the least amount of management and potential maintenance problems.

Disadvantages:

- Drying cost will be higher if Propane is used
- Extra electricity is used to cool / warm stored corn during the year. \$500 / year. Spoilage is always a risk.
- Large capital outlay to build corn dryer and corn storage. \$320,000
 - includes: site prep, small dryer, wet bin, dry storage with aeration floor (2@30'x80'), and large PTO transport auger
- U of Guelph studies shows feed waste up to 2% higher on a dry feeder than a feeding trough used with a liquid feed system.
- Higher level of management needed to operate this complete system.

On-Farm Corn Drying and Storage			7-May-18
Capital costs			
Basic corn dryer system for 2000 MT/year			
site prep, electrical, dryer, wet bin, dry storage with aeration floor			
1 large transport auger to fill wet bin and dry corn bin.			
			\$320,000
Feed room equipment needed:			
Corn bin 28 MT			\$ 11,000
30 ft. 500 flex auger			\$ 2,900
Soybean bin, 10 MT			\$ 7,200
30 ft. flex augur			\$ 2,100
in-barn mineral hopper with flex auger			\$ 1,500
hammer mill with auger			\$ 50,000
Computerized Tumble Mixer			
Mixed feed receiving hopper			
Construction of Feed Room			\$ 10,000
			total
			\$404,700
Feeding System			
	Basic System	Better System	Best System
basic flex system	\$ 11,800		
basic Daltec system		\$ 13,530	
Computerized Daltec			\$ 25,500
Total Capital Cost	\$ 416,500	\$ 418,230	\$430,200
Operating costs			
Annual repair and maintenance	2%		\$ 8,365
Annual drying cost (NG & electricity)	\$ 4.75	per MT	\$ 9,500
Annual Labour cost to operate corn dryer			\$ 1,000
Additional energy cost (cooling and moving corn)			\$ 500
Electricity cost to grind and mix			\$ 4,000
			Total
Annual operating cost over			\$ 23,365
15 years =			\$ 350,469
Total Costs over 15 Years			
This includes annual operating costs and one time capital costs			
basic flex system	\$ 766,969		
basic Daltec system		\$ 768,699	
Computerized Daltec			\$ 780,669

Grinding corn takes energy which costs money. Here is our calculations for cost of grinding corn.

Electricity Cost Calculation to Grind Corn On-Farm			
Electricity cost to Grind		1401 MT / year	corn
		3087804 lb./year	2204 lb./MT
	mill grinds	50 lb./min	
	Grind time =	61756.08 minutes per year	
		1029 hours per year	
12.5 HP motor uses		48 amps at	240 volts
	=	11520 watts	
Working at	80%	9216 watts	
Annual watts used =	9485733.888	Watt hours	
	9485.733888	kWh	
Electricity cost =	\$ 0.2569	per kWh	
Total annual electricity	\$ 2,436.89		

Off Farm Corn Drying

returned to farm weekly throughout the year



Principle Consideration:

Most on-farm drying systems have a lower throughput capacity than the harvesting equipment used, thus slowing

down the harvesting process. A workable alternative is to deliver wet corn to a local elevator and return it to the farm throughout the year, on a weekly basis.

This system avoids the need for significant capital needed to construct a corn dryer system or high moisture corn silo.

Explanations:

This system utilizes on-farm corn but in a simpler way. Bins for dry corn, soybean meal and mineral hopper plus equipment for corn grinding and feed preparation are all that is required to prepare the pig feed.

Three feeding system options are considered so proper comparisons can be made to management ability of computerized liquid system used with high moisture corn.

- Simple: flex system, \$11,800
- Better: Daltec cable delivery system, \$13,530
- Best: Daltec computer controlled delivery system, \$25,500



Advantages

- Harvest is completed quickly with no dryer bottle necks.
- Reduced investment in drying and storage equipment

- Feeding system is simple with least amount of management and potential maintenance problems.
- Management of dry feeding system are well researched
- Easiest to find labour to run this type of feeding system.

Disadvantages

- Quality of corn received from local elevator can be variable.
- Full drying and elevation costs are incurred. $25\% - 15.5\% = \$18.74 / \text{MT}$
drying
- Storage costs incurred. $\$2.40 / \text{MT}$ per month totaling $\$18,493$ per year.
- Transportation cost incurred to return corn to farm. $\$10/\text{MT}$ totaling $\$14,010$ per year.

little spoilage. The best way to mix and deliver feed with high moisture corn is with a computerized liquid feeding system.

Explanations:

Total cost of a Sealed concrete silo is \$310,000 including site prep work, silo, unloader etc.

Due to the nature of handling HM corn, a higher repair and maintenance % is used.

Advantages:



- Harvest can happen earlier and quickly. 25% moisture target
 - With an earlier harvest time:

- There is more time for manure application and fall tillage.
 - less chance of molds to develop on corn.
 - Reduced chance of cobs dropping or stalks breaking down.
 - Longer day corn can be used to increase yield potential.
- No corn drying costs are incurred.
 - Feed costs and feed conversion can be calculated since feeding computer records amounts sent to each valve.
 - Feed intake and efficiency should improve when feed
 - Day-to-day feed intakes are easily monitored showing signs of illness quickly.
 - Medications are easier to add to feed on a short-term basis.
 - Significant reduction on dust in feed room and pig rooms.
 - More of the corn's phosphorus is available to swine in HM corn (166% increase) over dry corn. With additional soaking with some Phytase, almost

all the corn's phosphorus is available to the pigs. This not only eliminates cost of additional Phytase it also significantly reduces the amount of phosphorus in the manure. [CLICK HERE](#) or [HERE](#) for U. of Guelph Studies.

- Research has found less feed wasted from liquid feeding trough than a dry feeder resulting in an improved feed conversion. For studies demonstrating this click [HERE](#)



4.4% growth improvement with fermented corn. [CLICK HERE](#) for study details.

- Using lower cost wet co-products is a possibility with a liquid system. [Audemars Piguet Replica Watches](#)

Disadvantages:

- Significant initial cost to install sealed silo and computerized feeding system.
- Once corn is fermented, it can only be fed to livestock.
- Once exposed to air, HM corn begins to lose feed value so it needs to be used within 6 hours.
- Liquid feeding system has more maintenance issues that can disrupt pig feeding.
- Special skills required to operate and maintain computerized feeding system.
- Stainless equipment needed to handle acidic/fermented high moisture corn.
- Some loss of pen space due to feeding trough.
- If corn moisture is below 20% when loaded into the silo additives need to be used to assist in fermentation.
- Removal of corn from silo and handling / grinding is more difficult if corn moisture is above 30%.

<u>High Moisture Corn</u>			4-Oct-17
	<u>Capital Costs</u>		
Sealed Silo for 2000 MT, including fill system			\$ 310,000
Feed room Construction			\$ 10,000
	<u>Capital Costs</u>		
Soybean bin, 10 MT			\$ 7,200
30 ft. flex			\$ 2,100
in-barn mineral hopper with flex			\$ 1,500
SST hammer mill with fill and discharge auger			\$ 6,000
Computerized Liquid feeding system, complete			<u>\$ 50,000</u>
		Total Capital costs =	<u>\$ 386,800</u>
	<u>Operating Cost</u>		
Repair and Maintenance		2.5%	\$ 9,670
Electricity to Grind & Prep Feed			<u>\$ 4,000</u>
		total	<u>\$ 13,670</u>
Operating over		15 years=	\$ 205,050
	Total cost over	15 years	\$ 591,850

Comparison Summary

The simplicity of a feed mill prepared feed system and off-farm corn drying & storage will be the best option for certain situations, for a variety of reasons. When making this choice be aware of the higher cost of production it will incur.

Drying & storing your own corn or working with high moisture corn takes some skill and some risks are present, but a sizable reduction in production costs are available to those taking this route.



The calculations in the charts below show that:

- the prepared feed system incurs 4.8 times more costs than the high moisture and 2.8 times more cost than on-farm corn drying
- The 4 feeding strategy options have sorted themselves into 2 groups.
 - Using prepared feed and off-farm corn drying results in similar feed costs

- On-farm corn drying and High moisture corn are not as similar but they are comparable.
- If liquid feeding isn't an option, on-farm drying is the next best economical option
- Feeding on-farm high moisture corn with a liquid feed system is the most economical option by far. It's operating costs is about \$9.00 less per pig then prepared feed & off-farm corn drying options. Compared to its closest option, on-farm drying, it has a \$1.66 per pig advantage with a much simpler harvesting system, full use of the corn's natural phosphorus and the ability to calculate feed conversions and cost per kg gained.
- While it's tempting to design a barn with equipment purchase price as the leading factor, you will make more money in the long run, designing a system that reduces feed costs and maximizes growth.

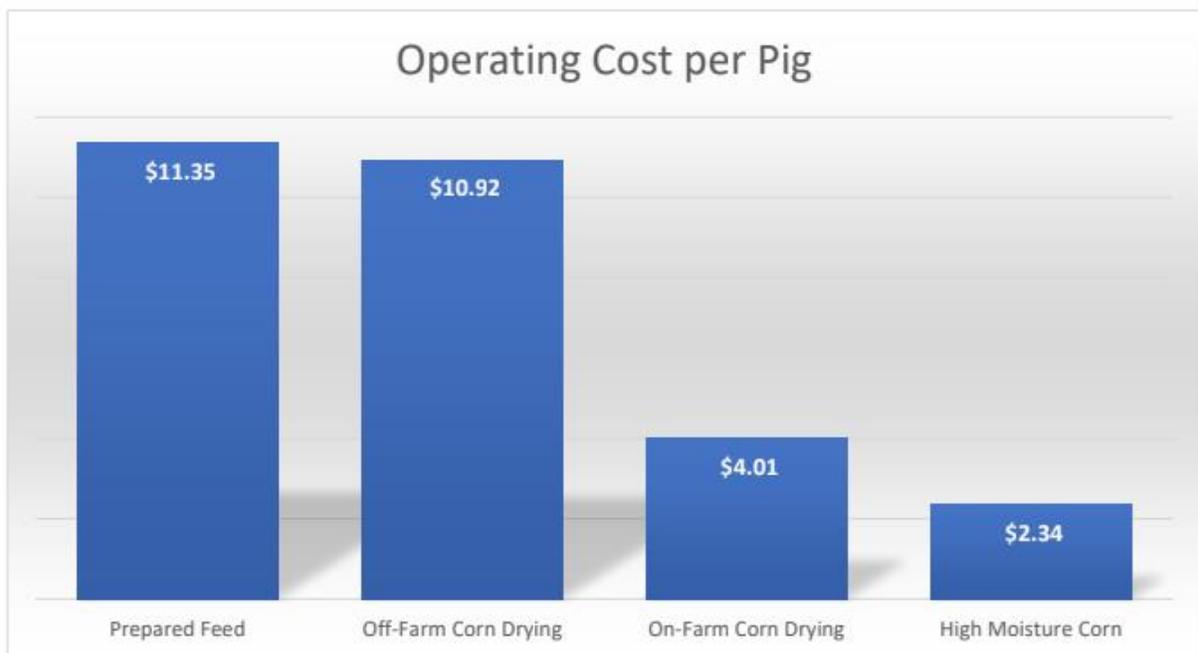
	<u>Initial Capital Cost</u>	<u>Annual Operating Cost</u>	<u>Costs Over 15 Years</u>
Prepared Feed	\$41,530	\$66,211	\$1,034,689
On-Farm Corn Drying	\$418,230	\$23,365	\$768,699
Off-Farm Corn Drying	\$98,230	\$63,686	\$1,053,517
High Moisture Corn	\$386,800	\$13,670	\$591,850

Conclusion

Computerized liquid feeding requires a particular skill set in operations and maintenance but those willing to do this can expect a significant reduction in feed costs.

Feeding system capital costs may seem significant at the moment of construction, but over the life span of the facility, it is a relatively small part of total operating costs.

While there is no feed strategy that will fit all business models, my hope is that this study helps you understand the costs over the long term of each system.



Thank you to those who's assistance was much appreciated.

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