

Using High Moisture Corn in Swine Rations

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Date

Using High Moisture Corn in Swine Diets

After a conversation with a customer regarding what type of feeding strategy he should apply in a new finishing barn facility I started thinking that instead of just guessing at an answer in general terms, it would be a good idea to put pencil to paper and discover the actual facts in figures to answer this question properly.

The purpose of this study is to discover the economic differences between 4 different feeding options to grower/finisher pigs, 25 – 105 kg so an educated decision can be made equipment purchases to maximize profitability over a 20 year period.

The 4 different feeding strategies are:

1. Feeding off-farm prepared complete mash or pelleted feed.
2. Feeding farm prepared dry corn ration where corn is dried on-farm
3. Feeding farm prepared dry corn ration where corn is dried at local elevator and returned to farm through out the year
4. Feeding farm prepared wet corn ration where corn is stored in oxygen limited silo

Contents:

- *Study Assumptions*

- *Advantages/disadvantages of each system*
- *Performance differences between each system*
- *Conclusion*

Assumptions:

- Farm is a land based operation with the ability to supply enough corn to feed the pigs each year.
 - 1401 MT of corn used annually
- Base barn is a 2000 head finishing barn at 8 sq. ft per hog. marketing 6509 hogs per year.
- Farm has staff and management skills available to properly operate each of these feeding strategies.
- Farm has capital to build facilities needed and ability to operate corn dryer or HMC corn storage facilities and needed feeding systems.
- Standard feed mill Grind, Mix and Delivery charge for mash and pelleted feed = \$35/ MT
 - 1868 MT complete feed used annually
- Except for feeding equipment the barn is identical. Roger Dubuis Replica Watches
 - Dry feed feeders and liquid feed troughs cost the same.
- Labour is the same to properly operate each system and receive the same amount of data.
 - Repair and Maintenance is considered on each strategy.

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Advantages

Prepared Feed, Mash or Pellets		19-Jan-17		
Feed system costs for 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				
2 bins, 20 MT with flex	\$	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 (Mash or Pellets)				
\$35 per MT grind, mix and delivery fee Mash fee			1868 MT =	\$65,380
Repair and maintenance		2.0%		\$ 830.60
			Annual Operating Cost =	\$ 66,211
Total Costs over 15 years				
Basic flex auger system =	\$	1,032,959	Mash	
Basic Daltec system =			\$ 1,034,689	Mash
Computerized Daltec system =				\$ 1,046,659 Mash

This system involves the least amount of capital investment with two 20 MT feed bins and a simple flex auger system or one of 2 cable feed delivery systems.

- 2 feed bins needed @ \$14,000 each = \$28,000 Includes 30 ft flex auger to bring feed into barn

- Three feeding system options so proper comparison 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:

System is simple with least amount of management and potential maintenance problems.

Least amount of capital is tied up.

Easiest to find labour to run system.

Managing dry feeding system well researched

Disadvantages:

Feed cost / MT highest among 3 options

Options of feeding ingredients are limited to dry components

Ability to measure pig performance is more difficult

U of Guelph studies shows feed waste up to 2% higher on a dry feeder than trough used with a liquid feed system.

On-Farm Drying and Storage

Option 2	Dry your own corn, store on-farm			19-Jan-17
	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 with flex auger			\$ 11,000
	30ft. 500 flex auger			\$ 2,900
	Soybean bin, 10 MT with flex auger			\$ 7,200
	30ft. flex auger			\$ 2,100
	in-barn mineral hopper with flex auger			\$ 1,500
	hammer mill with auger			
	Computerized Tumble Mixer			\$ 30,000
	Mixed feed receiving hopper			
			total	<u>\$374,700</u>
	Feeding System			
	basic flex system	\$ 11,800		
	basic Daltec system		\$ 13,530	
	Computerized Daltec		\$ 25,500	
	Total Capital Cost	\$ 386,500	\$ 388,230	\$400,200
	Operating costs			
	Annual repair and maintenance	2%		\$ 7,765
	Annual drying cost (NG & electricity)	\$ 4.75	per MT	\$ 9,500
	Additional electricity cost (cooling and moving corn)			\$ 500
	Electricity cost to grind and mix			\$ 4,000
			Total	\$ 21,765
	Annual operating cost over		15 years =	<u>\$ 326,469</u>
	Total Costs over		15 Years	
	basic flex system	\$ 712,969		
	basic Daltec system		\$ 714,699	
	Computerized Daltec		\$ 726,669	

To keep corn drying and storage on-farm to avoid annual elevator fees.

Three feeding system options so proper comparison 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

- Known corn quality.
- Options of feed company choice is bigger than liquid feed
- Managing dry feeding system well researched
- Easiest to find labour to run this feeding system.
- Lower annual drying cost than having someone else dry and store 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 least amount of management and potential maintenance problems.

Disadvantages

- U of Guelph studies shows feed waste up to 2% higher on a dry feeder than trough used with a liquid feed system. [orisonlinesale](#)
- Drying cost will be higher if Propane is used
- Extra electricity is used to cool / warm stored corn during the year. \$500 / year
- 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
- Higher level of management needed to operate this complete system.

Off Farm Corn Drying and returned to farm as needed during the year

	Dry corn				19-Jan-17	
Option 1	deliver wet corn to elevator and receive dry corn weekly as needed.					
	Capital Costs					
total corn used=	1401 MT	over	52 weeks =	26.94 MT bin	1061 BU bin	
	Feed room equipment needed:					
	Dry Corn bin, 28 MT, cone bottom			\$	11,000	
	30 ft. 500 flex auger			\$	2,900	
	Soybean bin, 10 MT			\$	7,200	
	30 ft. 350 flex			\$	2,100	
	in-barn mineral hopper with flex auger			\$	1,500	
	hammer mill including augers					
	Tumble mixer on scales, computer controlled			\$	30,000	
	Poly bin for prepared feed					
			Total=	\$	<u>54,700</u>	
	Feeding System					
	basic flex system	\$	11,800			
	basic Daltec system			\$	13,530	
	Computerized Daltec			\$	25,500	
	Total Capital Cost	\$	66,500	\$	68,230	
				\$	80,200	
	Operating Costs					
weekly delivery cost	\$	10.00	per MT		\$	14,010
drying costs (NG & Elect.)	\$	4.75	per MT		\$	6,655
Electricity cost to grind and mix					\$	4,000
storage cost	\$	2.40	per MT per Month		\$	18,493
Repair and Maintenance		2.0%			\$	1,365
			Annual Operating costs =	\$	44,523	
	Annual operating cost over		15 years =	\$	<u>667,838</u>	
	Total costs over 15 years					
	basic flex system	\$	734,338			
	basic Daltec system			\$	736,068	
	Computerized Daltec			\$	748,038	

With most on-farm drying systems having a lower capacity than the harvesting equipment used, a workable system is to deliver wet corn to a local elevator and replace it with dry corn stored on-farm.

Advantages

- Harvest is completed quickly with no dryer slowdowns.
- Reduced investment in drying and storage equipment
- Feeding system is simple with least amount of management and potential maintenance problems.
- Managing dry feeding system well researched
- Easiest to find labour to run this feeding system.

Disadvantages

- Quality of corn received from local elevator is unknown.
- Full drying and elevation costs are incurred.
 - $25\% - 15.5\% = \$18.74 / \text{MT}$ drying
 - Storage costs needed. $\$2.40 / \text{MT}$ per month
- Transportation cost incurred to return corn to farm.
- U of Guelph studies shows feed waste up to 2% higher on a dry feeder than trough used with a liquid feed system.

storage cost		\$ 2.40	per MT per month
total	1401	MT corn	
116.75	MT used weekly		
	total in	storage	
	storage	cost	
November	1284.25	\$ 3,082	
December	1167.5	\$ 2,802	
January	1050.75	\$ 2,522	
February	934	\$ 2,242	
March	817.25	\$ 1,961	
April	700.5	\$ 1,681	
May	583.75	\$ 1,401	
June	467	\$ 1,121	
July	350.25	\$ 841	
August	233.5	\$ 560	
September	116.75	\$ 280	
October	0	\$ -	
	total =	<u>\$ 18,493</u>	

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 =	9485733.89	Watt hours	
	9485.73389	kWh	
Electricity cost =	\$ 0.2569	per kWh	
Total annual electricity	\$ 2,436.89		

<u>High Moisture Corn</u>		19-Jan-17
<u>Capital Costs</u>		
Sealed Silo for 2000 MT		
MWI 519-656-2341 Calvin		
DeJong and Sons 519-348-0523, Peter		
Harvestor Silo sent email		\$ 310,000
<u>Feed room equipment needed:</u>		
Soybean bin, 10 MT		\$ 7,200
30 ft. flex		\$ 2,100
in-barn mineral hopper with flex		\$ 1,500
hammer mill with fill and discharge auger		\$ 6,000
Liquid feeding system, complete		\$ 23,500
	Total Capital costs =	<u>\$ 350,300</u>
<u>Operating Cost</u>		
Repair and Maintenance	2%	\$ 7,006
Electricity to Grind & Prep Feed		\$ 4,000
	total	<u>\$ 11,006</u>
Operating over	15 years=	\$ 165,090
Total cost over	15 years	\$ 515,390

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

Advantages

- Harvest can happen earlier and quickly. 25% target
 - There is more time to plow and spread manure.
 - With an earlier harvest time, less chance of molds to develop on corn.
 - Reduced chance of cobs dropping with earlier harvest.
 - Longer day corn can be used to increase yield potential.
- No corn drying costs are incurred.
- Significant reduction on dust in 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 trough than dry feeder.
- 4.4% growth improvement and with fermented corn. [ensen and Mikkelsen \[19\]](#) summarized the results of 9 *in vivo* trials comparing the performance of pigs fed dry feed and liquid feed and reported a 4.4% improvement in weight gain and a 6.9% improvement in feed efficiency with liquid feed. Although the improvements in performance obtained with growing-finishing pigs are not as great as those obtained with weaner pigs, there may be benefits in terms of carcass quality.
- Using lower cost co-products is a possibility with a liquid system.

Disadvantages

- Sealed silo is required to store high moisture corn properly.
- Once corn is fermented, it can only be fed to livestock.
- Stainless equipment needed to handle acidic/fermented high moisture corn.

- Once exposed to air, HM corn begins to lose feed value so it needs to be used within 6 hours.
- If corn moisture is below 20% additives should be used to assist in fermentation.
- Removal of corn from silo and handling / grinding is more difficult if corn moisture is above 30%.

Additional Comments:

Harvest. Much more important than the small variation between systems in harvesting cost per bushel are the implications for field losses in harvest because of timeliness. Dried corn systems permit a considerable range in the moisture content at which corn may be harvested, thus lengthening the harvest season. A disadvantage, however, is that the dryer often forms a bottleneck in the system, thus restricting harvesting speed. High-moisture systems eliminate that bottleneck but may shorten the season, since high-moisture corn for hogs makes the best feed at moisture contents of 22-28%.

Sealed Silo pH levels: Whether the HMC is ground into a silo, put into a glass lined silo whole or treated whole and put into a wood bin the key to it all is to get the pH level of the corn down to 4 to 4.2 pH so it will store well without rotting. The little costs associated with storing the HMC correctly into clean facilities, adding additives as needed and feeding fresh will help you be successful with feeding high moisture corn all year long. [CLICK HERE](#) to see whole Kenpal article.