centred on
swine

PRAIRIE SWINE CENTRE

Fall 2021 Volume 29, Number 1

How do we manage high feed prices?

Ken Engele
Prairie Swine Centre

2021 is one for the record books. The wide spread dryness seen throughout western Canada has not been seen on this level since 2002. In speaking with producers, the consensus is this year's crop will be 40-50 percent of average. As any livestock producer knows, feed costs are always the single biggest factor representing 60-70 percent of the total cost of production. Over the past year, grain prices have increased significantly with wheat and barley prices close to doubling the values seen in the fall of 2020, therefore finding strategies to minimize the impact of high feed prices will be important moving forward through to next spring.

It is not all bad news though. Hog prices have remained relatively strong over the past six months with cash prices exceeding $190/ckg since the early part of March. Even with feed cost increasing over this period, most producers would have seen

(How do we manage high feed prices?... cont'd on page 3)

Inside This Edition

Program funding provided by

Sask Pork · Manitoba Pork · Alberta Pork · Ontario Pork · Saskatchewan Ministry of Agriculture

Publication # 40010021

The Utilization of Corn DDGS in Swine Rations. Some "reminders"

Denise Beaulieu, PhD.
University of Saskatchewan

Corn distillers dried grains with solubles (DDGS) is an ingredient that has been successfully incorporated into swine diets for many years. The following is an update on some recent research with this ingredient, plus some "tips" or reminders when incorporating corn DDGS into swine rations.

Current estimates for a US corn crop that may be one of the largest on record (USDA Feed outlook, Sept 2021) plus a continuing demand for bioethanol ensures a continuing supply of corn DDGS. The nutrient content of corn DDGS can be variable, primarily dependent upon the corn used (especially if one of the new high protein varieties) and the residual oil content in the DDGS. It is estimated that the majority of bioethanol plants are utilizing some post-processing to extract the oil from the DDGS. The NRC (2012, swine) lists corn DDGS with either >10%, 6 to 9% or < 4% oil. The starch content increases from ~ 6 % to 10% as the oil decreases. The crude protein and total lysine content were similar, regardless of oil content and approximately 3 times that of corn. While these numbers are reasonable estimates, they are based upon the limited data available at that time and do not provide reliable information on nutrient (energy and amino acid) availability.

The energy content of corn DDGS is affected by the content of fat, fibre, starch and protein. Shurson and co-workers (2018) collected 15 samples of corn DDGS from the midwestern US and found that the ME content ranged from 3,280 to 3,700 kcal ME/kg. Surprisingly, the energy content was not well correlated with the oil or starch content. Recent estimates of the NE content of corn DDGS are about 2,200 kcal NE/kg (Shurson 2019) while others (Cemin et al. 2019) estimated that high protein corn DDGS had about 2680 kcal/kg "productive energy" (comparable to NE), or very close to the energy content of corn. Variability in the energy content of corn DDGS does make it difficult to accurately gauge its value and incorporate it into diets. It is recommended that producers work with their nutritionist and suppliers to obtain a consistent product and monitor performance carefully when introducing corn DDGS into the ration. If growth or feed conversion worsens, the energy content of the DDGS was overestimated, resulting in a diet that contained less energy than estimated.

> "Energy content of corn DDGS is affected by the content of fat, fibre, starch and protein."

Similar to other nutrients, the precent standardized ileal digestible amino acids is concentrated in corn DDGS approximately 3 times, relative to corn. It has been suggested that lysine should be at least 2.8 % of crude protein, as lower values indicate heat damage (Stein 2007). However, the quality of DDGS has improved greatly and recent work indicates that heat damage is less of an issue (Espinosa et al. 2019). Current evidence indicates that up to 30% corn DDGS can be included in the diet of growing pigs provided that diets are

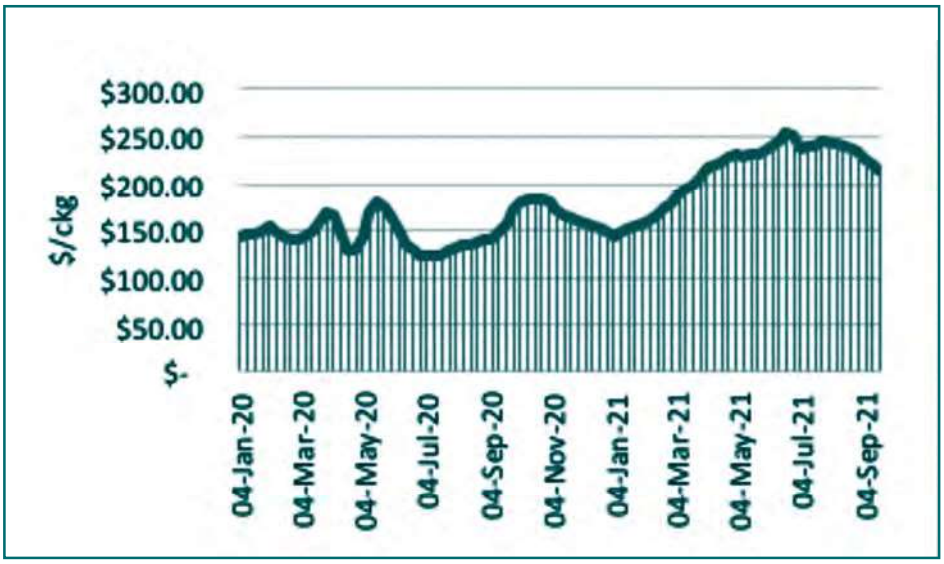
balanced using NE and SID amino acids. The THR:LYS ratio should be increased to 0.61 or greater. The high fibre content limits the inclusion of corn DDGS to newly weaned piglets; 5% is suggested as the maximum in stage 1 diets. This may increase to 10 or 15% in later stages in the nursery but growth and feed conversion should be monitored. In contrast, the high fibre contents makes this an ideal ingredient to be included in the diet of the gestating sow, up to 40% is suggested.

Some producers who haven't used corn DDGS for several years may remember the previous issues with pork fat quality, storage, and mycotoxins. The reduced oil DDGS has improved storage and handling characteristics, and has alleviated the pork fat quality issues. Mycotoxins can always be a problem, as they will be concentrated in DDGS, relative to what was observed in the corn. However, according to the recent US Corn Harvest Quality report, greater than 98% of samples tested from the 2020 crop year had very low levels of deoxynivalenol, aflatoxins and fumonisin.

In conclusion, corn DDGS can be a very attractive addition to our ingredient "toolbox". The energy content is variable. Producers can determine if energy content has been overestimated by monitoring feed conversion numbers.

(How do we manage high feed prices?. ... cont'd from page 1)

positive returns throughout the spring and summer. The challenge does become later this fall and early winter when hog prices make their seasonal trend downward that would pressure margins. Another piece of good news is the recently released (September) USDA Pigs and Hog Report that found numbers that will support of hog prices going forward. This may provide producers an opportunity to find additional coverage at prices near or slightly above break even.



Where do we go from here? The first should be, if you have not already, is to calculate your true cost of production. While feed costs grab all the headlines you should not lose focus on other things that can help improve your financial position. Even with near record feed prices, feed cost still only represents 70% of the cost of production. This means other variables have also increased at the same time, therefore adjusting feeders, drinkers, ventilation management, vaccination programs and regular barn maintenance are things done on a daily, weekly and seasonal basis that have a direct impact on cost, pig performance and overall herd health.

Taking a direct look at the increase in feed cost, there are different things producers can do to manage this high feed cost situation. This was a focus of a webinar held by Sask Pork, University of Saskatchewan and Prairie Swine Centre on September 23 with topics focusing on the following areas:

- Maximizing profit through feed processing – Rex Newkirk, U of S
- Strategies to reduce feed cost – Diet formulation and feed efficiency – Dan Columbus, PSC
- Finding your optimal marketing weight – Ken Engele, PSC
- Utilization of corn DDGS in swine diets – Denise Beaulieu, U of S.

If you are interesting in viewing the webinar, please follow the link below.
https://us02web.zoom.us/rec/share/gFrfVDd7j_qIavKlJE-bUzDIHPzpt0C4pmEc2TPVaj6WgJFsc9L4PvDPwtH0vezQ.WQSFIpzB9O6JDPU8

If you are looking for ways to manage your feed costs or your total cost of production there are numerous resources available at prairieswine.com, or feel free to reach out to the staff of PSC. We are always here to assist in any way we can.

Strategies to Reduce Feed Costs, Feed Formulation, Feed Efficiency, and Economics of Feeding Programs

Dan Columbus, PhD,
Prairie Swine Centre

Feed economics

With feed costs making up 70% of total costs of production on average, it is not surprising that ways to reduce the cost of feed is foremost in producer's minds, especially during times of reduced availability of common feed ingredients and rising costs for others. While it may be tempting to simply pick the cheapest feeding program available, the question that should be asked is do you know what your feed is actually costing you?

The overall cost of your feeding program is inherently tied to feed efficiency, as greater feed efficiency allows for more growth with less feed and, subsequently, lower cost, however, this is only part of the equation. As changes in dietary ingredients and nutrient content often result in changes in pig performance, tying the cost of your feed to the performance of your pigs is critical to feeding program evaluation.

The most basic calculation to consider is feed cost per kilogram of gain ($/kg gain), which is feed efficiency (kg feed/kg gain) × feed cost ($/kg feed). While this will give you a general idea of the cost of your feeding program, it is strictly related to feed cost and animal performance and fails to take into account revenue or operating costs. Therefore, determination of either the margin over feed cost or margin over feed and operating costs (see insert) will provide a more accurate picture of economic value of your nutrition program. You will notice that a common feature of determining the economic value of your feeding program is knowing how much your pigs are eating and how fast your pigs are growing, with more accurate measures of feed intake and growth performance resulting in more accurate measures of economic value.

Margin over feed cost ($/pig) = revenue ($/pig) – feed cost ($/pig)

Margin over feed and operating cost ($/pig) = revenue ($/pig) – (feed cost + operating cost [$/pig])

Feed cost ($/pig) = feed intake (kg/pig) × feed cost ($/kg)

Feed formulation

When formulating diets to maximize feed efficiency, the critical detail is meeting the pig's requirements for growth. Like with determining economics, the more information you know about WHO you are feeding and WHAT you are feeding will allow you to make adjust feed formulation to more accurately meet requirements. Errors in feed formulation due to inaccurate measures of feed intake or formulating for the wrong pig weight are inefficient and increase cost. At the most basic level, knowing the actual weight of your pigs at the start and end of each phase, instead of relying on assumed weight ranges, will allow for more accurate feed formulation. At a more advanced level, information on the lean gain potential of your animals, either through carcass evaluation of lean yield or provided to you from your pig supplier, instead of assumed potential will allow for even more targeted formulation. This is because nutrient requirements of a growing pig are largely determined by its potential for lean gain. Providing nutrients below the requirement or unbalanced nutrients will result in slower growth, whereas providing nutrients above the requirements will end up with more fat gain.

At the most fundamental level, diet formulation is all about meeting the pig's requirements, with dietary content of energy and lysine largely dictating the inclusion of all other nutrients. Therefore, two key values to consider first when formulation are the dietary energy content (metabolizable energy or net energy) and the lysine:energy ratio. While net energy is currently considered the gold standard for understanding energy content of the diet and supply to the pig, it is more important in high-fibre diets where the difference between metabolizable and net energy is larger due the impact of fibre fermentation.

Whichever energy value you determine for your feed, the next step is meeting the lysine:energy ratio. As feed intake changes with energy content, formulating dietary lysine as an energy to ratio ensures that the daily lysine intake will be sufficient to meet requirements for lean gain. After, all other essential amino acids are formulated according to their required ratio to lysine.

The other half of the feed formulation equation is knowing what you are feeding. This is more than just the basic ingredients being used and includes accurate measures of the nutrient content of the ingredients. Assays of ingredients should be done routinely for nutrient levels and digestibility values to make sure that the feed you have formulated will meet the requirements you have identified. This has become fairly easy to achieve with the widespread availability of NIR technology. Determination of nutrient content should be determined on each individual batch of ingredient used, with less frequent evaluation necessary, and more consistency achieved, when ingredients are purchased from a single source.
Regardless of the specifics of formulation and requirements, the expected goals of any feeding program should be weighed against the actual performance and costs achieved.

Considerations to improve feed efficiency and reduce feed costs

Now that you know how to determine the economic value of your feeding program and you understand the importance of knowing who and what you are feeding, there are a few feed formulation and management strategies to consider that may improve your feed costs.

- Protein source and crystalline amino acids – In general, meeting amino acid requirements through inclusion of standard protein ingredients (e.g., soybean meal) is costly and wasteful. The availability of crystalline amino acids, such as lysine, methionine, threonine, and tryptophan, have increased and the cost of these products has decreased to the point that replacement of a portion of protein-yielding ingredients can reduce feed costs. The use of crystalline amino acids also allows for more accurately matching dietary nutrient levels with nutrient requirements. Another consideration is the inclusion of animal-based protein ingredients, as these tend to be the most costly and pigs often can performance quite well with their removal from the diet and replacement with plant-based sources.

- Phase-feeding – Phase-feeding allows for more tailored diets to be fed at multiple stages of production. Providing more dietary phases results in a reduction in the over- and under-supply of nutrients that would result from the feeding of a single diet and can result in significant savings, although the savings achieved are less significant as the number of phases increases. It is important to note that while feed efficiency and feed costs may be improved with more diet phases, a difference in growth may not be evident.

> "Understanding who and what you are feeding will help you adjust feed formulations to meet your goals."

- Split-sex feeding – As nutrient requirements differ across growth stages, the nutrient requirements of barrows and gilts differ. Barrows tend to gain weight faster and tend to be less efficient than gilts. This can be accounted for through formulating diets for barrows that contains less lysine and energy content. As with phase-feeding, the goal here is to more accurately meet the nutrient requirements of the pig.

- Least-cost formulation – Every diet should be formulated with consideration given to least-cost as well as the potential performance of the pig, and reformulation should occur often to account for price changes. It is also important to understand that the lowest cost diet may not result in the best margin over feed cost and vice versa, and the economic analysis of the diet as well as the performance analysis of the animal are both critical parts of the equation. Know your break-even cost.

- Re-evaluate safety margins – Many nutritionists will include safety margins in nutrient levels to account for variation in ingredient nutrient composition, feed mixing, and pig requirements. However, large safety margins can result in significantly higher feed costs with little return and, therefore, reducing safety margins can save you money. This is especially the case if you are able to more accurately identify your pig's nutrient requirements and consistently evaluate ingredient nutrient content, reducing reliance on larger safety margins.

While there are many key considerations to take into account when developing and evaluation feeding programs, the general concept is to know who and what you are feeding to really understanding what your feed is costing you.

Now is the Time to Look at Market Weight

Ken Engele
Prairie Swine Centre

With feed prices at or near all-time highs now is the time to look at how heavy you should market your pigs. A small survey, conducted as part of the feed cost webinar, indicated two-thirds of producers have not looked at adjusting their market weight and strategy.

Figure 1 shows the change in feed cost, on a monthly basis, year over year. For the first half of the year feed costs were up between 20-30 percent compared 2020. The challenge really hits home in late summer, as the reality of this year's small crop takes hold, with feed cost increasing by slightly more than 60 percent.

Calculating your optimal market weight is a relatively straightforward exercise, once you have all the required information. Once set up, it is something that should do on a monthly or quarterly basis that will help simplify the marketing process.

Information you need

- **Carcass Information**
  - **Carcass data (weight, fat, lean)**
  - **Premiums (Weight, Loin, Freight, Proximity …)**
  - **Feed conversion**
  - **Required for different weight classes**
- **Finisher diet cost**
- **Market hog price**

The first step to collect all the information that you will need. This includes carcass data for length of time, the more data you have the better. Ideally, if you had a rolling average for a 3-month period works the best. Ensure you have carcass breakdown that includes weight, fat and lean for individual carcass used in the analysis. You will also need some additional information including your grading grid, premiums (weight, loin, freight, proximity and others), feed conversion rates, diets costs and average hog prices. It is important to note you will need this information for different weights ranges throughout finishing. While feed cost and market prices would remain the same, weights, bonuses, and feed conversions all change corresponding to your market weight. All of this information is readily available through multiple sources. Carcass data is available through producer settlement summaries or your packer can provide electronic data. Feed conversion and feed cost data is available from your feed budgets, or provided to you the nutritionist or feed company that you deal with.

Summarize the data

Once you have all the required information, the next step is to summarize the data. In order to make this step easier I have built a spreadsheet that will calculate the averages for each weight class. You can see the results of a sample analysis in Table 1. At a quick glance, we can see that index and premiums are consistent across weight classes six to eight, with slight declines in weight class five and nine, and a significant drop off with weight class 10. Looking at feed, feed conversion increases at pigs get bigger resulting in more total feed consumed which is nothing new. Now, how to we put everything together?

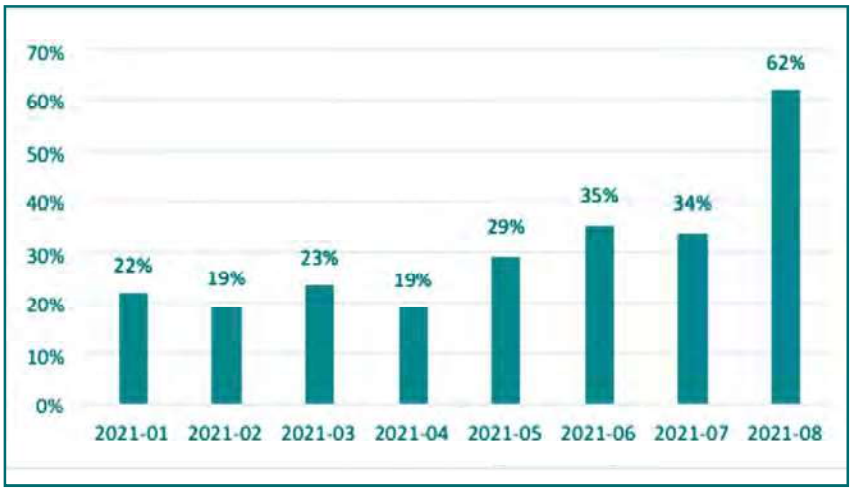


Figure 1. Monthly year-over-year changes in feed costs.

Table 1. Average carcass data by weight class.

Weight Class	5	6	7	8	9	10
Min Wt (kg)	95	100	105	110	115	120
Max Wt (kg)	99.99	104.99	109.99	114.99	119.99	124.99
Premiums	$19.97	$20.12	$20.19	$20.16	$20.03	$19.98
Index	108.6	111.0	110.9	110.9	108.8	103.5
Dressed Wt.	97.2	102.3	107.4	112.3	117.2	122.0
Live Wt.	123.0	129.4	136.0	142.2	148.4	154.5
Feed Conversion	3.2	3.25	3.3	3.35	3.4	3.45
Feed Cons.	309.7	330.5	352.1	372.8	394.0	415.0

Calculating your optimal weight

The next step in the process is to calculate your margin over feed cost (MOFC). Why is this important? Weight classes that have the highest MOFC will be the weight classes you should be targeting to market your pigs. MOFC considers everything including market price, feed cost and grading results and show the net benefit across different weight classes. Taking a closer look at Table 2 we can see the impact of different finished costs with an average market price of $210/ckg.

The hog value seen in Table 2 uses a price of $210/ckg with the rest of the results pulled from Table 1. For instance, if we use weight class eight as example is we see ($2.10/kg x (110.9/100) x 112.3kgs) + $20.16 = $281.73/hog.

We will follow the same process in calculating feed cost. Still looking at weight class eight and assuming a finished feed price of $450/mt each pigs would consume (372.8 kgs x ($450/1000) = $167.76 worth of feed. In this case, I am also using an additional $22.70/pig in feed cost attributed to the maintenance of the sow herd for a total feed cost of $190.46/pig. We calculate MOFC by subtracting feed cost from hog value ($281.73 - $190.46) for a total of $91.27 (Note the numbers vary due to rounding differences used in the spreadsheet).

MOFC is the amount we have to cover all additional costs in your operation, including labour, utilities, maintenance, etc. Further analysis suggests if all other costs were $72/pig, even with $450/mt this producer would still be making a profit with a market price of $210/ckg

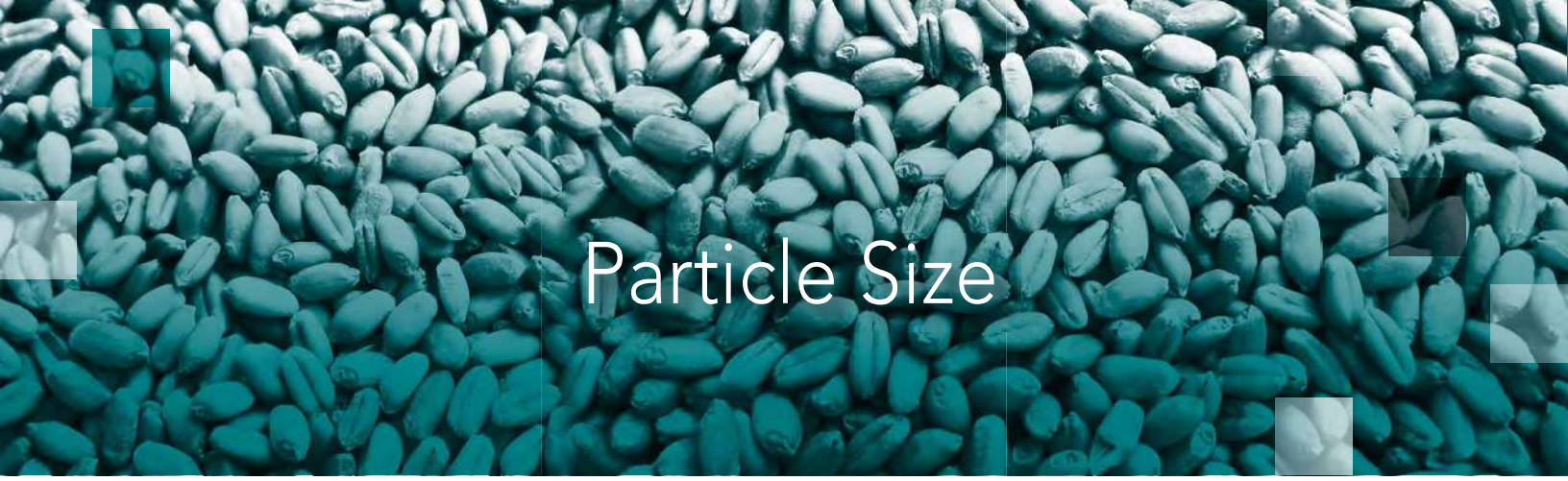
The results in Table 2 also show you where this producer should be marketing their pigs. Assuming $450/mt weight classes seven to nine generate the highest MOFC, therefore this is we should target when shipping pigs. If we increase feed cost to $500/mt we can see we require a change in shipping strategy by reducing market, as weight class six to eight generate the highest MOFC.

Conclusion

Calculating MOFC is an important part of your marketing strategy. The greater volatility and fluctuations we see in hog and grain prices the more important MOFC becomes as your optimal market weight will change more frequently. It is easy to focus on individual pieces of the puzzle such like feed/hog price, index ore premiums, but it is not until we look at them as a whole that we have the complete answer. By focusing on MOFC we can calculate our optimal marketing weight and maximize returns to your operation.

Table 2. Margin over feed cost calculations for different weight classes.

	Weight Class					
	5	6	7	8	9	10
Min Live Wt.	120.3	126.6	132.9	139.2	145.6	151.9
Max Live Wt.	126.6	132.9	139.2	145.6	151.9	158.2
	Hog Value					
Hog Price $210 ckg	$241.59	$258.54	$270.48	$281.73	$287.99	$285.25
Feed Cost (mt)	Margin Over Feed Cost					
$300	$126.02	$136.73	$142.17	$147.22	$147.11	$138.09
$350	$110.54	$120.21	$124.56	$128.59	$127.41	$117.34
$400	$95.05	$103.69	$106.96	$109.95	$107.71	$96.59
$450	$79.57	$87.16	$89.35	$91.31	$88.01	$75.84
$500	$64.09	$70.64	$71.74	$72.67	$68.31	$55.09



Particle Size

Rex Newkirk, Ph.D.
University of
Saskatchewan

What can I do to reduce my feed bill?

This is the inevitable question of 2021. Unfortunately, due to the drought in western Canada and supply chain issues, including shipping challenges, the cost of ingredients locally is likely to remain high for a while. One option, however, is to maximize feed utilization through processing. Grinding (particle size reduction) is an integral part of feed processing. It serves several functions, but one of the most important is it increases the digestibility of nutrients. If the pigs do not effectively digest the feed, you produce some very expensive manure, especially when ingredient prices are so high. Grinding damages seed coats, hulls, and other structures increasing the digestibility of the nutrients within the grain.

How fine should you grind your grain?

The smaller the particles, the more significant the improvement in digestion and therefore feed conversion. However, there are practical limits. If you grind too fine, it takes a great deal more energy to grind, and it reduces how quickly you can process the grains. The other risks are if the feed is too fine, it can cause bridging and may not flow properly through your feeders, risking feed outages in your barn. Very fine particles can promote gastric ulcers, reducing performance or even resulting in mortalities in extreme cases. Most people agree that the ideal particle size should be, on average, between 650 to 750 um. When you grind any grain, you will get some fine material and some course, but on average, you should target 700 um.

How can I measure the particle size of my feed?

You have a few options to analyze the size of your feed. At the Canadian Feed Research Centre, we use a system with ten sieves and a rotary shaker. We place 100 g of spread in the top sieve, the finest grind, let the unit shake the material for 10 minutes, and then weigh each sieve and plug the weights into a spreadsheet that gives us a bunch of data on particle size. You have the option of sending samples to us or another lab and getting them analyzed. It is a good idea to check particle size when you change grains or conduct routine grinder testing. Therefore I think it would be an excellent investment to buy a few sieves and a small scale so you can test it for yourself. You don't need a complete set of sieves and a fancy shaker like we have to get a good indication of particle size. Benz and Goodband from Kansas State University have described and validated a system that only uses three sieves, and you can shake them by hand with the aid of a few balls and some caruncles. You will need a small scale as well. They also provide a spreadsheet to enter the weights of material on each sieve, and it calculates particle size for you. You can access the information at https://www.asi.k-state.edu/research-and-extension/swine/particle-size-information.html

> "The single most crucial factor affecting particle size is your grinder."

What can affect particle size?

The single most crucial factor affecting particle size is your grinder. If you're using a hammer mill, what condition is your screen? How are the hammers? Is it time to turn or replace them? Worn parts can increase your energy usage, reduce production rate and affect particle size. The best option is to maintain your system routinely. The ingredients themselves affect particle size. For example, soft wheat not only grinds easier but also produces finer particle size. Fibre resists grinding, so if you are grinding high fibre grains, this can impact particle size. Your best option is to test your particle size, check the condition of your hammer mill or grinder and adjust if you need to.

For more information, feel free to contact me, Rex Newkirk Ph.D. P.Ag. Associate Professor, Feed Processing Research Chair at the Canadian Feed Research Centre and the University of Saskatchewan at rex.newkirk@usask.ca or 306-966-4279.

WATER INTAKE

Recommended Flow Rate and Height of Nipple Drinkers

Phase	Weight (kgs)	Intake (L/day)	Nipple Drinkers		
			Flow (L/min)	Height (cm, 45°)	Height (cm, 90°)
Gestation		Variable	0.5 to 1.0	90cm / 35"	75 cm / 30"
Lactation		12-20	1.0 to 2.0	90cm / 35"	75cm / 30"
Piglets		Variable	0.5 to 0.7	15cm / 6"	10cm / 4"
Nursery	5	1.0 - 2.0	0.5 to 1.0	30 cm / 12"	25cm / 10"
	7	1.5 - 2.5	0.5 to 1.0	35cm / 14"	30cm / 12"
	15	2.5 - 3.5	0.5 to 1.0	45cm / 18"	35cm / 14"
	20	3.0 - 4.0	0.5 to 1.0	50cm / 20"	40cm / 16"
Finishing	25	3.0 - 4.0	0.5 to 1.0	55cm / 22"	45cm / 18"
	50	5.0 - 7.0	0.5 to 1.0	65cm / 26"	55cm / 22"
	75	5.0 - 7.0	0.5 to 1.0	75cm / 30"	65cm / 26"
	>100	5.0 - 7.0	0.5 to 1.0	80 cm / 32"	70 cm / 28"

TIPS FOR SAVING WATER

- Nipple drinkers mounted at 90°, nipples should be set at **SHOULDER HEIGHT** based on the height of the smallest pig in the pen.
- Nipple drinkers mounted downwards at 45°, nipples should be set at 5cm or 2 inches **ABOVE** the back of the pig, based on the height of the smallest pig in the pen.
- Check flow rates. Flow rates determine the time spent at the nipple, water intake and water wastage.
- Repair or replace leaky drinkers and water lines.
- Individual water wastage was increases with nipple flow rate.
- Water wastage of finisher pigs from a nipple drinker ranges between 25 - 40%.
- Recent audit results of water flow rates indicate approximately 65% of nipple drinkers provide water flow rates higher than required.
- Drinking speed (actual intakes) of pigs was increased with nipple flow rate

Making the Most of Your Water

Ken Engele
Prairie Swine Centre

Among nutrients, water is required in the greatest amount but quite often receives the least attention. Water intake of finisher pigs has been reported to range up to three times feed intake, depending on body weight and feed intake. However, most 'water intake' reported is in the form of water disappearance from drinkers, including water wastage, rather than water actually consumed by pigs. Previous work has shown finishing pigs can waste 25% of water from well-managed nipple drinkers, therefore opportunities exist to reduce wastage when flow rates are adjusted on a regular basis1. Actual on-farm water flow rates and nipple drinker heights were measured on 24 farms across Canada, representing each phase of production from gestation to finishing. Note that not all farms had nipple drinkers installed in each phase of production, for example, some producers solely relied on wet/dry feeders without an additional water source.

Table 1 outlines water flow parameters showing ranges measured for low, target, high, and very high values. Recommended flow rates should range between 1.0 to 2.0 L/min and 0.5 to 1.0 L/min for farrowing and all other phases of production respectively, while the target range used in the analysis was expanded from 0.5 to 1.5 L/min for all areas other than farrowing.

Overall water management within audited farms varies across phase of production (Table 2). Generally producers do a better job in managing flow rates within Gestation (pens) and Nursery, where approximately 60% of the nipple drinkers measured met the target flow rate. The challenge is in Finishing, where approximately two-thirds of nipple drinkers provide flow rates in excess of pig's requirement, with 11% of nipple drinkers being rated very high (>2.5 L/min).

> "Managing water wastage is an important component in economic and environmental stainability."

Economics

Table 3 represents a hypothetical situation of a 6,000-head finishing barn. In this case, if 100% of the nipple drinkers were adjusted to recommended flow rates (1L/min) water

Table 1. Water Flow Rate Recommendations

	Low (L/min)	Target (L/min)	High (L/min)	Very High (L/min)
Gilt Pen	5.1%	33.3%	56.4%	5.1%
Gestation	0.0%	59.4%	21.9%	18.8%
Farrowing	15.3%	38.9%	29.3%	16.6%
Nursery	15.2%	56.8%	19.0%	8.9%
Finishing	5.4%	29.3%	54.3%	10.9%

Prairie Swine Centre. 2000. Pork Production Reference Guide.[2]

Table 2. Measured Water Flow Rates – 24 audited farms

	Low (<0.5L/min)	Target (0.5 – 1.5 L/min)	High (1.5 – 2.5 L/min)	Very High (>2.5L/min)
Gilt Pen	5.1%	33.3%	56.4%	5.1%
Gestation	0.0%	59.4%	21.9%	18.8%
Farrowing	15.3%	38.9%	29.3%	16.6%
Nursery	15.2%	56.8%	19.0%	8.9%
Finishing	5.4%	29.3%	54.3%	10.9%

disappearance would be 42,000 L/day for the facility. However, as shown in the example in Table 3, only 29.3% of nipple drinkers would have been optimally adjusted. For this scenario, we can assume that any water disappearance above the rate of 7 L/day could be avoided. Therefore, the daily water disappearance would increase by 70% (or 30,800 L) to reach a total disappearance of 72,800 L/day. The direct cost of water wastage (30,800 L) associated with manure disposal would translate into approximately $119/day or $41,500 per year if the previous assumptions were met.

Table 3. Hypothetical water disappearance measurements

Measured Values**	5.4%	29.3%	54.3%	10.9%
Water Flow Rate (L/min)	0.5	1.0	2.0	2.75
Number of Pigs	324	1,760	3,260	655
Daily Water Disappearance /Pig (L/pig)	7	7	14	19.25
Total Daily Water Disappearance/Day (L)	2,268	12,323	45,646	12,613
Daily Water Wastage (L/pig)	0	0	7	12.25
Total Daily Water Wastage (L)	0	0	22,823	8,026

** Refers to the percentage of nipple drinkers that were measured in each respective category. A total of 24 farms were measured across Canada.

Assumptions

The previous example provides potential savings for a hypothetical site; every producer should take the opportunity to assess potential savings related to manure disposal, water use, and pumping costs on a regular basis for their operation.

Properly mounting nipple drinkers can help reduce water wastage.3,4,5 Nipple drinkers mounted at 900 should be set to shoulder height, while nipple drinkers mounted at 450 should be set to 5cm (2 inches) above the back of the smallest pig in the pen. It is important to note that mounting nipple drinkers lower than required will increase water wastage.

Conclusion

Finishing pigs can maintain adequate water intake from a variety of drinker types, however water waste from drinkers can be very different depending on drinker type and management. Research has shown well-managed nipple drinkers can help reduce water waste to the same level as bowl drinkers..1 3 Finally, ensure you regularly check water flow rates, as this will determine time spent at the nipple, water intake and water wastage. Too little is just as costly as too much when it comes to flow rates.

6,000 head finishing barn
Average daily water consumption per pig - 7L/day
Duration of finishing period – 350 days/year (18 weeks/batch)
Manure application cost - $0.0175/gallon or $0.00385/litre

Category	L/Day
Calculated Water Disappearance	72,849
Target Water Disappearance	42,000
Water Wastage	30,849
Additional Manure Disposal Cost/Day	$119

For Further Reading

1. Water Usage and Wastage from Nipple Drinkers (English) http://www.prairieswine.com/water-usage-and-wastage-from-nipple-drinkers/

2. Pork Production Reference Guide (English) http://www.prairieswine.com/wp-content/uploads/2010/07/2000_Prairie_Swine_Reference_Guide.pdf

3. Effects of nipple drinker height and flow rate on water wastage in grower and finisher pigs (English) http://www.prairieswine.com/reducing-water-wastage-from-nipple-drinkers-by-grower-finisher-pigs/

4. Recommended Flow Rate & Height of Nipple Drinkers (English) http://www.prairieswine.com/recommended-flow-rate-height-of-nipple-drinkers/

5. A Checklist for Water Use (English) http://www.prairieswine.com/a-checklist-for-water-use/

Personal Profile

Karen Mancera

Karen is originally from Mexico City and completed a bachelor's degree in Biology at the National Autonomous University of Mexico (UNAM), specialized in neurobiology and animal behavior. Afterwards, she completed a master's in science in Production Sciences and Animal Health at the Faculty of Veterinary Medicine in UNAM, where she studied how different percentages of tree coverage affect the welfare and behavior of cattle in the Mexican tropics. Karen continued her postgraduate studies at the University in Queensland, Australia, evaluating the effect of mining machinery noise on the welfare, physiology and behavior of wildlife, using wild mice and blue-tongued lizards as animal models. Back in Mexico, Karen joined UNAM as a postdoctoral researcher, studying how animal welfare can be used as an indicator of sustainability in silvopastoral systems and teaching animal welfare to undergraduate students. Likewise, she worked as an animal welfare inspector for Certified Humane, where she collaborated in the certification of lying hen operations in Latin America.

Karen has also participated in projects related to the personality of cattle, the integration of sustainability indicators into the evaluation of livestock systems and has volunteered in projects with elephants, sea turtles and cats and dogs in shelters. Karen has joined the PSC as a Postdoctoral Fellow to investigate the effects of sow grouping practices on reproductive performance and piglet development. She is interested in expanding her research into the assessment of positive welfare, the development of alternative livestock systems with improved sustainability and the exploration of poorly studied stressors such as noise and vibration in production and wild animals.

Coming Events

Banff Pork Seminar
January 11-13, 2022
Banff, Alberta

Additional events for winter and spring are currently being scheduled. Check prairieswine.com at a later date for more information. Dates will be posted when they become available.

PRAIRIE SWINE CENTRE

Centred on Swine is a semi-annual newsletter produced by Prairie Swine Centre Inc. (PSCI).

Prairie Swine Centre Inc.
P.O. Box 21057, 2105 - 8th St. E.
Saskatoon, SK S7H 5N9 Canada

Tel:(306) 373-9922
Fax:(306) 955-2510
www.prairieswine.com

Prairie Swine Centre is an affiliate of UNIVERSITY OF SASKATCHEWAN