Swine Profitability Conference

Sponsored by
Department of Animal Sciences and Industry
K-State Research and Extension
Kansas State University, Manhattan

SWINE PROFITABILITY CONFERENCE

Sponsored by

Department of Animal Sciences and Industry and
K-State Research and Extension Service of
KANSAS STATE UNIVERSITY

Co-sponsored by

Kansas Pork Association
College of Veterinary Medicine, KSU
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Tuesday, February 5, 2013
Forum Hall, K-State Union

SWINE PROFITABILITY CONFERENCE

KSU Forum Hall
K-State Union
Tuesday, February 5, 2013

Program Agenda

Morning Program

9:15 a.m.	Registration
9:30 a.m.	Jack and Pat Anderson Lecture in Swine Health Management: **Five Key Changes to Modern Management Practices Necessary to Improve Profitability** *Dr. Jeff DeMint, Bern-Sabetha Veterinary Clinic*
10:30 a.m.	**Keeping a Swine Business Going for the Long Haul – What Our Family has Done to Insure Success** *Roy Henry, Longford, KS* *JoAnn Alumbaugh, Linden, IA*
11:15 a.m.	**Future Plans to Deal with Production Expectations of the Retail Pork Sector** *Chris Novak, CEO, National Pork Board*
Noon	**Lunch**

Afternoon Program

1:15 p.m.	**The Changing Landscape of the U.S. Swine Industry** *Dr. Ron Plain, University of Missouri*
2:00 p.m.	**What We Need to Know About Animal Activist Groups – Past, Present and Future** *Trent Loos, Loos Tales*
3:00 p.m.	**Adjourn**

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SWINE PROFITABILITY CONFERENCE

February 5, 2013

Jack and Pat Anderson Lecture in Swine Health Management:

"Five Key Changes to Modern Management Practices Necessary to Improve Profitability"

by

Dr. Jeff DeMint
Bern-Sabetha Veterinary Clinic

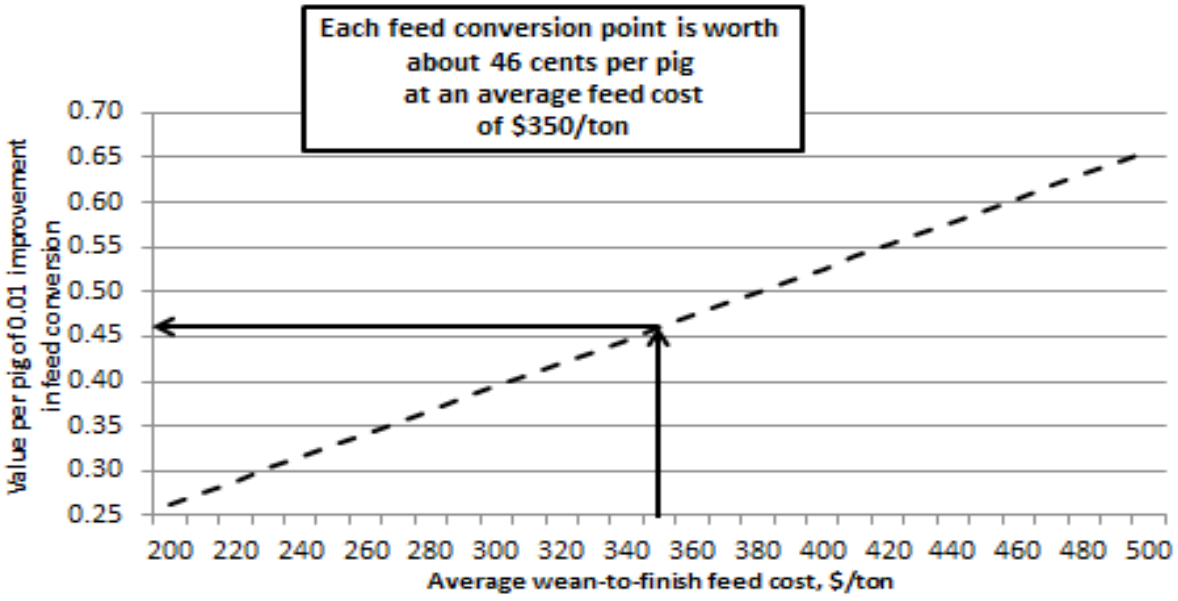
Jack and Pat Anderson Lecture in Swine Health Management:
"Five Key Changes to Modern Management Practices Necessary to Improve Profitability"

Dr. Jeff DeMint
Bern-Sabetha Veterinary Clinic

During these times of high feed costs and negative profitability it is difficult to find management practices to propel a swine farm to profitability. However, it is possible to implement many different practices and get a positive return. I remember from physics class that acceleration can be expressed as a positive number (profit) or as a negative number (deceleration/loss), so sometimes implementing new technologies will only slow your deceleration (less negative profit). The following five sections have the potential to increase profit with the possibility to cross into positive income territory.

Nutrition

Typically feed cost on a swine farm account for more than 60% of the farms expenses, but with the increase in feed cost the last year it is approaching 70%. Most swine producers are very well educated in feeding swine, but because of the relative expense of feed it also has the greatest opportunity to return the largest savings with the smallest percent change in costs. I am probably the last person to be here at Kansas State University to speak about nutrition, but with the importance I thought I would touch on a few key points. The following graph illustrates the potential savings by increasing feed efficiency.



Value of feed efficency, John F. Patience, Iowa State University, IPIC 25a 2012

There are many resources to aid in diet formulations. In the past, dried distiller grains have been a cost saving ingredient to substitute for high cost grain, and "A guide to Distiller's Dried Grains with Solubles (DDGS)", from the U.S. Grains Council, is a great resource for their usage. However, DDSG relative cost has risen greatly over the past seven years as presented in this table:

	Energy Content	2005 Cost		2012 Cost	
Ingredient	Mcal NE/lb	$/ton	¢/Mcal NE	$/ton	¢/Mcal NE
Corn	1.21	65	2.7	270	11.2
SBM, 46%	0.95	200	10.5	550	28.9
Corn DDGS	1.06	50	2.4	280	13.2
Wheat midds	0.96	60	3.1	260	13.5
Fat source: AV blend	3.28	300	4.6	850	13.0

The changing cost of energy. Reproduced from: John F. Patience, Iowa State University, IPIC 25a 2012

The Animal Science and Industry at KSU has many tools and recommendations at the website: http://www.asi.k-state.edu/p.aspx?tabid=235, to serve the do-it-yourselfer. I would recommend the instruction and guidance of a trained nutritionist. Here at Kansas State University we are lucky to have a world-class group of swine nutritionist and education system to produce many nutritionists for private industry.

Improvest

What would the savings per pig be if a sow farm did not have to take the time to castrate the boar pigs? The savings potentially could be much more than a labor savings. Additional savings could be realized by lower pig mortality, lower castration complications (infections and hernias), and increased feed efficiencies. Improvest *(*Gonadotropin Releasing Factor Analog-Diphtheria Toxoid Conjugate, 0.2 mg/mL, *Pfizer Animal Health)* is an injection that eliminates the necessity to castrate boar pigs. By retaining the functionality of the testicles for more growing time, it allows the pigs to grow with benefits of a boar pig until the second injection of Improvest. Literature from *Pfizer Animal Health* suggests the benefits of the Improvest regime can be: 6-10% increase in feed efficiency, 4.2% increase in average daily gain, up to 2.5% increase in cutout yield, and a decrease of 1.6% in mortality.

Improvest is a FDA-approved, veterinary prescription that has a flexible but strict procedure. The boar pigs are injected, subcutaneously, after nine weeks of age, usually around 120 days of age with today's market weights, with a primary dose. This dose by itself has little to no effect on the pig's behavior or growth. The second injection is given at least four weeks (150 days of age) after the primary dose and within 3-10 weeks of marketing. Within 7 days after the second injection the pigs tend to behave, temporarily, like barrows instead of boars. Two weeks after the second

injection is given, the pigs need to have a quality assurance exam to identify any pigs that still look or act like a boar to ensure the pigs at market time will not have an off odor (boar taint) caused by the chemicals: androstenone and skatole.

With new technology there is a learning curve with the correct timing of injections, feeding requirements (increased lysine), stocking of buildings, packer and consumer acceptance. Kansas State University has done feeding trials with Improvest pigs for the correct lysine feeding levels, some of which were in the 2012 Swine Day proceedings. A food taste test of pork from Improvest treated pigs has been similar to conventionally produced pork products. Meat packers have been slow in accepting Improvest injected pigs, so the number of pig injected in this area of the country has been low. Additionally, there is a human health concern if either a male or female would accidentally inject themselves with Improvest. The effect of physiological problems is large enough that once a person has been injected with Improvest, then that person is not allowed to use or handle the product again.

In an article (Agri-view, Nov 3, 2011), Dr. Steve Dritz said, "the income over feed costs ends up being about $5 more per pig than comparative barrows and low lysine Improvest hogs … can save about another $0.75 per hog if you feed a combination of medium and low lysine throughout the feeding program". With the increase of feed costs, I would expect this benefit to be closer to $7-7.50 per pig today.

Bio-security

Bio-security to a swine operation is the protection of your pigs from harmful biological agents (bacteria, virus, etc.). Most of the bio-security threat comes from the agents that are in other pigs: breeding stock additions, neighboring pig sites and pigs that are transported by or near you swine facility. Some diseases can be carried on people or equipment and others, like influenza can be directly transmitted from people to pigs. The major bio-security threat that swine producers face is Porcine Reproductive and Respiratory Syndrome (PPRS). It has been estimated that PRRS has an annual cost to the US swine industry of $664 million or about $6 per pig marketed. By practicing correct bio-security procedures for PRRS we can do a good job at bio-security to prevent the introduction or spread of other diseases in the swine herds. The best source of PRRS bio-security for me is: **Biosecurity protocols for the prevention of spread of porcine reproductive and respiratory syndrome virus, (** Andrea Pitkin, BS MS, et al, Swine Disease Eradication Center University of Minnesota College of Veterinary Medicine) found at: http://www.aasv.org/aasv/PRRSV_BiosecurityManual.pdf . I have an "O" bio-security chart that helps to decide how much of a concern a disease is to a swine operation. The chart is based on the first reaction the veterinarian or swine producer has to the notification of disease outbreak on a farm.

Vaccination and Management Protocol Review

A significant amount of money is used to raise pigs in a healthy and appropriate manner. These fixed input costs are usually listed in a standard operating procedure known as a vaccination and management protocol. I believe that many swine operations continue to add procedures and vaccinations that may not be necessary at this time, but continue to be done "because that's the way we have always done it". I would recommend at least an annual review of your protocols or every time a significant health challenge occurs in your herd. It seems that on some farms I work

with we change protocols every few months. The changes include the addition/removal or timing of vaccinations and medications as health changes occur or availability of items fluctuate.

I have seen figures that state that 97% of the pigs in the US are vaccinated with a circovirus vaccine. If there are 120 million pigs produced annually, then there are still about 3.6 million pigs that are not vaccinated. One item that I do not recommend dropping to save money is circovirus vaccine for pigs. I make this statement now because some of my clients and clients that I have started working with, have not been vaccinating, because of the cost of the vaccine and the perceived lack of benefit received. With the disease associated with porcine circovirus, type 2, the majority of pigs do not show clinical signs of the disease. It is reported that only 5% of pigs in a group are clinical (signs of disease) while the other 95% appear normal, but infected. The cost of vaccinating is a significant cost ($1.50-$2.00/pig), but is a cost that returns much more than that. From the beginning of circovirus vaccine usage, it has been shown to be financially sound. Dr. Steve Henry told us in the November 15, 2008 issue of National Hog Farmer, "return-on-investment for circovirus vaccine has never been lower than 2:1 and often reaches 4:1 to 7:1 In infected herds, we have not had a trial where there wasn't a good response". The research has continued to support the vaccine usage in a paper by Malachy G. Young, PhD, et al in the May and June 2011 issue of the *Journal of Swine Health and Production* which reached the conclusion "vaccinated pigs delivered a return on investment of $5.90 per pig over the unvaccinated pigs". A question that continues to be asked is; will I see an advantage in vaccinating pigs that do not show any signs of disease associated with circovirus? The answer to this is yes, there is a clear return on investment from the circovirus vaccine and was answered by Dr. John Waddell at the World Pork Expo, 2009 where he found a 5:1 return in sub-clinical pigs. Using circovirus vaccine is a standard protocol for raising pigs in the US for the foreseeable future.

Gilt Pool Management

How profitable a swine farm is, is greatly dependant on how well the gilt pool is managed. An active gilt pool of animals between 200-300 pounds of body weight will make up 12-15% of the target herd size. A well managed gilt pool will allow about 25% of the breeding group's target to be met with bred gilts. Dr. Foxcroft, et al, showed in paper (Advances in Pork Production, 2001) that the relative importance of factors influencing the number of pigs wean per week was greatest for numbers of females served (60%) with farrowing rate (30%) and born alive and pre-weaning mortality accounting for only 5% each. Keeping the farrowing crates full (on farrowing targets) is probably the most important factor in a sow farms profitability.

In order to achieve a well managed gilt pool, many things must be accomplished before the thought of breeding can occur:

- Choosing the correct genetic supplier with adequate supply of gilts and good health
- Isolation (quarantine): to prevent new gilts from passing diseases to existing breeding herd, monitor for disease outbreaks
- Acclimation: time to get the replacement animal's immune system familiarized with existing breeding herd, by exposure or vaccination

Now that your replacements are placed, healthy, and vaccinated, you need to bred them and get them into the herd in a steady, predictable, and profitable way. This period of time employs many different techniques to manipulate and stimulate the estrus cycle of the gilt. These techniques will include herdsmanship, environment, nutrition, boar exposure, and exogenous hormone manipulation.

Every breeding manager has to decide when it is "time" to breed a group of animals. So are the animals chosen by size, age or need? If the gilt pool is running ideally, then the need should be more of the exception than the rule. So this leaves us with the selecting of animals by size or age, and both are right. Generally data indicates that breeding on the basis of weight and recorded heat-no-serve (2nd or 3rd estrus) is the most cost-effective strategy. Dr. Levis showed that a group of gilts can show their first estrus over a long time span, 135-276 days of age with an average of 180 days. Gilts initially bred >10 months of age were less efficient, produced fewer pigs born alive per sow lifetime, were culled sooner, and showed a negative economic return over their economic lifetime (Culbertson and Mabry,1995).

If weight at first estrus was equal for all these gilts, then we would know that the faster maturing animal also had the higher growth rate. This selection of the early maturing gilts would allow gilts to be bred on the second or third estrus without adding non-productive days to the breeding herd, while enhancing performance. It has been reported that having breeding gilts on second or third heat can increase pigs born alive in the first litter.

As you read the literature you can find many different and conflicting results and recommendations. Every sow farm is different and has its own unique bottlenecks, but with that in mind these are my current recommendations for breeding gilts:

- Start boar exposure when gilts are 135-150 days of age, 20 minutes of direct contact 1-2 times a day with morning exposure having the most influence
- Get vaccinations or disease exposure done early in the growing phase, prior to boar exposure
- Give gilts 12-15 sq ft of pen space, with 3-50 animals per group
- Keep temperatures between 45-70 degrees Fahrenheit, reproductive heat stress starts above 80 degrees
- At least 10 hours of light, type of light not that important
- Breed at 300 pounds and 7.5 to 9 months of age, with at least one skipped heat

There are currently two hormone products on the market that are widely used in the swine industry, PG 600 and Matrix (Merck). PG 600 is used to stimulate estrus in gilts that have not cycled. Matrix is progesterone product used orally in gilts to synchronize heat cycles. Another lesser used product (Ovugel, Pennatek) is beginning to show promise in synchronizing the ovulation of gilts, and thus reducing the number of inseminations. Ovugel has had positive results, when given to cycling gilts on the final day of Matrix feeding, by allowing all to be inseminated at the same time 80-96 hours later and the use of only one insemination/gilt. The research of Ovugel's correct dosage and timing is still needed, but is tool that needs to be watched to see how it can affectively be added to a gilt management protocol.

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"Keeping a Swine Business Going for the Long Haul – What our Family has done to Insure Success"

by

Roy Henry, Longford, KS
JoAnn Alumbaugh, Linden, IA

Keeping a Swine Business Going for the Long Haul – What Our Family has done to Insure Success

Roy Henry
Henrys Ltd
Longford KS

The art of passing a business asset from one generation with minimum business interruption creates its challenges, but can be very beneficial and rewarding to all parties involved if properly done. Because of the vast amount of capital required in agriculture today, it is becoming increasingly difficult to transfer assets with minimal tax consequences. There are many different resources to help with this process. It is important to identify the ones that are best suited to help our families make and implement the decisions that will allow our businesses to carry on, if that is the goal.

One of the most important aspects of having a successful outcome is the active involvement of trusted non-partial third parties to help with the decisions. Sometimes it is very hard to follow the advice that you get because, at that moment in time, things seem to be going along just fine and "the future" is a long way off. Almost to the day when Linda and I became sole owners of our business, we started the transfer to the next generation, learned from the experience and teaching of our parents. I would have liked to have smelled the flowers a bit longer, but it really wasn`t possible. Looking back, my parents started the transfer before they really had very much.

Today I will try to explain what our parents did, having one child involved in the business, one kind of involved, one not so much involved and one not involved. What you will hear is about the process that worked in this one specific situation. Were all siblings treated fairly? I hope so. If there was a financial winner, it was me. I will always be there for my brother and sisters if needed. My parents would have wanted that.

Ten things to do to assure the next generation will appreciate your efforts. Really!!!???

1. Keep total control of all money decisions until the next generation is eligible for social security.
2. Share your desire for them to learn the hard way, like you did.
3. Keep all estate planning to yourself. No one else needs to know.
4. Do research on your own about the best way to pass assets to a successor. Consultants, financial planners and lawyers are too expensive and they'll leave you a lot less to pass on.
5. Be tactful, but be sure the sons-in-law/daughters-in-law know that you love them, but the money is only going to your kids and grandkids.
6. Don`t get any long term care insurance. You don`t need it because that is what your assets are for and your family can just take care of you, right?
7. Be critical of others that are philanthropic. What are they trying to prove anyway?
8. Live like a pauper. You never know what the weather is going to do and we won`t have any money.

9. Go to a lot of meetings, especially at busy times. Tell the family they'll appreciate you when you trust them to take care of things for a day or two while you're gone. Call often.

10. Keep reminding them of the guy that lost his farm because his worthless kids didn`t know how to run a farm. They got it given to them and they still lost it.

I can see myself in some of the above, but I can`t see our parents in any of the above. That is why I am one of the lucky ones. Steve, Mary and Ruth all seem agreeable with the final outcome. If they actually feel differently, they have never even suggested that they wish it had been otherwise.

I will explain a bit of what our parents did and why it worked for them and hopefully all of their four children. Everyone has a different set of circumstances, but there are choices that must be made even though the future is uncertain. The responsibility to set the course of transition is one that must start early and be reviewed often and can only be done by those who ARE the owners. It does not come from 'someone outside'. If we do no estate planning, the government and attorneys will decide where an estate to goes. Then usually others, not family, are the happy benefactors of all your efforts.

My parents were happy when I came home to the farm. We felt the same gratification with Marc coming home, but adding generations to the business doesn`t necessarily make it easy. It changes what once could have an easy estate and succession division into something a bit more complicated. Some of our non-agriculture friends have the fourth generation taking over management of the business right now with most of the family members involved. How can they can they possibly keep everyone happy? They are doing some things correctly and share lessons learned that can benefit some of us also. Look to others in your communities that have been successful in the transition of a business and ask for some suggestions. They are a very valuable resource, if they are willing.

Let me now explain what my parents did and why it worked. Mom and Dad moved to the farm from Belleville in 1951 and began farming and, a few years later, dairying. That was the life we kids knew; always home, had to milk and scraping by from milk check to milk check. Even as small kids we learned the checks came every two weeks. K-State Extension played a big role in the evolution of our farm thanks to Wendell Moyer who said *"Jim, you need to think about pigs….done properly sows can be a lot more productive than dairy cows….."* And so, in the late 50's, we started producing feeder pigs. Only to be slapped with a rhinitis quarantine when the first set of pigs went to the Sale Barn. (Yes, there was once a quarantine on rhinitis!! And, yes, almost all pigs then went through a Sale Barn!) And that led to the first of what has now become the first of multiple depop/repop events in our production life. We came back as an SPF herd in the days that was in vogue. By now, the mid 60's, kids start to leave for college. Dad is a crop and pig farmer with his labor source idling away at Manhattan. Mary and Ruth are still in high school. Pork production is now farrow-finish, crops are milo and wheat.

Back to business and finances, it was at this time that Mom and Dad incorporated the business, again as a result of K-State Extension education. The structure was as a family agricultural C corporation, formed long before limitations were placed on corporations in agriculture. Mom, the meticulous bookkeeper and stickler for detail, made sure all minutes, reports and notifications passed all requirements. This is the business as it stood when I returned to the farm in 1972.

Fast forward to the 90's. The farm had been successful and Mom and Dad began the process of asset transfer to their children and their spouses as well. How they reached the decision that "it's time" we still don't know as it was several more years before they finally 'retired' and moved to Lindsborg.

Our parents annually gifted shares of the C-corp stock to each of the kids and their spouses. When I look back I still am in awe that they felt they had the assets they needed to start that process. After a few years of that madness they decided that maybe that only the kids should own stock. In my experience, when parents choose to give cash, I believe it is extremely important that children and spouses get equal amounts. Stock is a different issue as deaths, divorce and just personalities may have consequences on the core business that are unanticipated and can be very costly to deal with. Stock IS the business; cash is not.

My sister Ruth sold her stock early on when she needed the money and I was young enough to think that, since I was on the farm and working, I had already earned it once and now I had to pay for it again! When you are part of up-valuing the stock it is a shock to realize that the passive investor has to be paid! (Probably not real smart to articulate that thought to your parents.) I would recommend not having an opinion in that case. I had failed to appreciate the fact that I was being well compensated for my labor and my stock value had risen also. I started to realize that I had very little equity at risk at that point in my life. Dad's comments about how things weren`t set in stone and they could be changed helped me grow up a bit.

My sister Mary and brother Steve hung around longer and got more expensive with time, as shares became more valuable due to the success of the farm. Mary helped with the books for 5 years because Mom had macular degeneration so she needed help. Since I am not the bookkeeping type, I was happy Mary was willing to drive 120 miles two to three days a week to help. By doing this it allowed our mother to still feel valuable and engaged in the business a lot longer than it would have been possible otherwise.

When both my parents were gone, Mary, Steve and I were the sole owners of Henrys Ltd with me having majority ownership. Marc, our son, had decided to come home so we had another family member and the new generation wondering where he would fit in. After Marc had been home for about a year it was time for us to meet with a tax and business attorney that my parents had worked with. It was a normal event that we would have every three years or so.

The "normal" left shortly after we got there because Steve told our tax attorney that it was time for her to figure out how to get him and Mary out of the corporation since the next generation was now home. Mary was blindsided and so was I. My only thought was *'wow, I thought life was going to get simpler and now I've got to try to buy them out'* and it looked like a big number. Here is where really skilled and experienced advisors became invaluable. The firm, and Cindy McClannahan, knew all of us and our business. Because of the long term relationship my parents had with the firm, they knew the drill and how to go forward and in a short time the process was done. The transition to another generation had begun.

What I just explained is something for which I will always be indebted to Steve and Cindy. When this transition occurred we had just started boar multiplication so our business had taken on a new level responsibility and excitement. That is not the time that most owners would chose to exit a business. If Steve doesn`t start the process, how would it occur and who would have started it? Because of what Steve does with many of his clients, this is just a normal thought process and action to suggest. This is a perfect example of the value a third party brings to the table. It just

happened to be my brother in this case. Legal council is important, but the right third party is paramount.

Hopefully Linda and I can get our assets transferred to our children as successfully as my parents did. If we don`t die broke, it just means we miscalculated.

Ten years later, Linda and I still are reevaluating our plan that started when Steve and Mary left the business. We are in no position to tell you that what we are doing today is right or wrong. I am sure we will make many changes as the government changes its mind. Since we don`t believe the government is the best steward of our resources, we will continue to look for charitable causes to support as well as the transfer of assets to children.

Finding the capacity and will to give to others is perhaps the most important first step in a transition, strange as that thought may seem. But it resonates because transition is truly giving something that is “mine” to someone else. Once this commitment is made all else becomes much easier. Find something you like and support it. If you don`t have anything that you would like, support something that you dislike the least. This will help in ways far beyond the tax deduction.

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Family Conversations on Succession: The Good, The Bad, and The Ugly

JoAnn Alumbaugh, Alumbaugh Communications, Linden, IA

Farm families risk losing their farms when estate and farm succession planning is nonexistent or stalled. Everyone has a plan, whether "default" or "intentional." The default plan is designed by the state law where the farm family lives and the property is located. The intentional plan is one designed by farm families to carry out their wishes.

Often families avoid planning in order to avoid conflict or facing mortality. It is widely recognized, however, that serious problems can arise for both generations if transfer and succession processes never begin or are never finalized. Proper ownership and management can allow for growth and profitability. That's why communication between and among farm family members is so important. Identifying issues, developing a plan that is both fair and equitable, and employing the right team of professionals early on in the process can help families realize their goals.

There are "good" communication skills and principles that can be employed to help families resolve conflict and reach workable solutions. And there are "bad" communication pitfalls and ugly examples of situations individuals and families fall into that keep them from reaching resolution.

Communication, although essential, is rarely easy, and sometimes those closest to us are the most difficult with which to have meaningful conversations. Individual differences in personality, style, skill and varying expectations will impact discussions with family members directly or indirectly. And when property and other assets come into the picture, a whole new set of dynamics can affect farm family issues and outcomes.

Sometimes you'll find it is best to let issues rest before trying to communicate. Other times, however, issues can't be allowed to rest, because lack of communication can interfere with daily living. After all, every family is a team, and this is particularly true of families with farms. They must communicate effectively in order to manage their farms effectively.

Just as every person communicates and negotiates with co-workers, employees, and other people with whom we come in contact, so do we communicate with family members. Members of farm families, whether involved in the day-to-day activities of the farm or not, are directly or indirectly affected by farm-family issues and decisions. Successful families operate systematically, much as do successful farms.

Each family member plays different roles in the family and in the management of the family farm. Each of these roles carries with it different responsibilities and expectations. But sometimes one person sees his or her roles and responsibilities in one way, while others see them very differently. Different perceptions and expectations can lead to a great deal of confusion and frustration.

Communication allows for discussion and clarification of roles, responsibilities, and expectations that can lead to more effective, collaborative, and supportive relationships within the family. And, when the farm family functions effectively, the farm business functions effectively.

Effective Communication

So, what is effective communication? More than anything else, it involves the utilization of active listening skills. Active listening encourages others to continue interacting. As an active listener, you demonstrate your interest in what is being said using both verbal and nonverbal communication techniques and you open the door for others to begin using the same techniques. The goal is to *Guide* the family from *Positions* to *Solutions* – a directional GPS, so to speak. Let's consider 10 key elements of "good" or effective communication through active listening:

1. **The Conversation Booster** – Encourage families to set the tone with a question or comment that has an important purpose with no hidden agenda. Examples: "So, where should we begin?" "What else?" "Tell me more." The goal is to focus on what's really important to someone else and why by encouraging people to elaborate, add additional details and express emotions.

2. **Acknowledging and Showing Appreciation** – When someone is angry or worried or unhappy with a situation, reflect back on what you heard and acknowledge the emotion. Expressing appreciation for someone's participation in a difficult conversation can help build trust and sets a tone of respect.

3. **Asking Clarifying Questions, Carefully** – Getting a person to elaborate with details often helps uncover more information and emotions.

4. **Frequent Summarization** – When conversations get bogged down, everyone feels "stuck." By summarizing what you've heard, you give everyone a chance to hear their own statements so they know they're understood. It provides for validation and clarification, and it opens the floor to new ideas.

5. **Reframing** – Things can get intense in family discussions – accusations, blame, perceived motives and insults can take over the conversation. A reframe focuses on interests and turns down the heat by removing judgments and inflammatory statements. It requires you to look for the underlying concerns and values that may be driving someone to make a challenging or upsetting statement.

6. **Using Technology Wisely** – Technology can be a double-edged sword. While it can make communication more efficient, it also can make it more complicated. Since you don't have the additional help of voice intonation or visual perception, messages are often misinterpreted. And people use it in different ways – some people check messages daily, others weekly, some not at all. It's important that family members discuss this and determine a workable and reliable system for communicating.

7. **Introducing Optimism to Move the Conversation Forward** – When families are in conflict, they may begin to lose hope – they may have even given up on the possibility of ever resolving a dispute. Help them think about things they've done well together in the past – what shared struggles or successes have they experienced together? And bring them back to their common interests, which might include fairness, Mom and Dad's financial security, or parents' health concerns. Common interests can be a source of encouragement when the discussion gets bogged down.

8. **Using Transparency to Build Trust** – Openness and sincerity shows your willingness to express difficult thoughts and feelings. It opens the door for others to do the same. As hard as it might be, transparency opens the door to thoughtful, meaningful conversation.

9. **Use "And" Instead of "But"** – "But" negates any positive comment that might have preceded it. Think about, "I love you but…" "I think you've done a great job, but…" We've all done it, and we've all heard it, and all we can think about is what came after the "but," not what was said before it. Using "and" in a reframed sentence still makes your point but doesn't negate the acknowledgement.

10. **Avoiding Toxic Questions and Comments** – Help families think about the *way* they say things. People who use words like "always" or "never" make it difficult to move forward. You will need to help them rephrase and clarify to reach a more specific statement that deals directly with the issue at hand, without passing judgment or assigning blame. Avoid focusing on the negative and help families refrain from fueling animosities.

Other key factors in effective communication include:

Interpersonal Skills

Interpersonal skills enable us to interact with others. Effective interpersonal communication involves putting people at ease, respecting others' opinions and capabilities, and encouraging the sharing of feelings and perceptions.

Rapport

To develop rapport with others is to develop a connection, a relationship, or an understanding with them. To do this, individuals learn to "signal" that they are open to the thoughts and opinions of others. They express an interest in what others have to say in a friendly and open manner.

Tone of Voice

Your tone of voice can determine the effect of your message. For example, if you try to communicate your anger or unhappiness, but do so in a light and jovial manner, your listener will miss your point. Your tone of voice should match the message you're trying to convey. Varying the pitch to demonstrate excitement or disappointment can help your listener to hear the intent of the message. And sincerity is important at all times.

Nonverbal Cues

Just as what you say and how you say it are important to effective communication, nonverbal cues can add or detract from a message. For example, leaning toward the speaker, nodding, and smiling all convey interest in and understanding of what is being said. In contrast, looking away, shuffling your feet, looking at a watch or clock or cell phone, or turning away when someone is speaking can be perceived as lack of interest or uneasiness with the person or message.

Beyond Effective Communication

At times, even effective communication fails to achieve a desirable outcome. In those cases, outside help, guidance, or support is necessary. Families may seek support through church, a community agency, or close friend. However, factors such as individual personality, upbringing and culture can influence how comfortable families feel sharing private concerns with others. For families conditioned to believe that personal problems should remain private, seeking outside help may seem virtually impossible.

Sometimes, it can help to think about reaching out as strength. Consider how you would feel if someone reached out to you in need. Reaching out to others can be a real comfort and help when times are tough. Many families find it helpful to ask one of the advisors we mentioned to serve as a meeting facilitator. Although it may seem like all of the answers should emanate from within the family, unbiased and objective viewpoints provide much-needed perspective and help to neutralize conflict. In fact, of all the people I've talked with in preparation for this presentation, everyone who had a good succession plan in place had used the services of an outside advisor. Non-partial objectivity is an important component in developing a fair, equitable succession plan. Be the catalyst that opens up people's feelings and thoughts about their parents and their family.

One of the most important steps is getting the right group of interested parties around the table. Start by defining "family." Does it include blood relatives only? In-laws? Consider what role step-children, grandchildren, nieces, nephews, cousins and others currently have, may have, or want to have in the future. Then identify which family members actually want to be successors, with hands-on responsibility for the business. Not every family member will be equally interested or qualified, and family farms usually don't provide opportunities that fit everyone's strengths and interests.

The Bad

Ron Hanson, an agribusiness professor at the University of Nebraska-Lincoln, is an expert on succession from one generation to the next. He tells of sitting around a kitchen table with siblings who won't talk to each other. He relates how a family of five brothers and sisters were joined at the table by seven lawyers. You can imagine how that meeting turned out.

Hanson says he would never have become a college ag economics professor and an expert in succession management if there hadn't been such discourse between his parents and his grandparents. He would have been farming the Illinois land on which two generations before him couldn't peacefully coexist.

Sometimes rather simple misunderstandings as well as the stress of daily life on a farm can quite easily damage the personal and working relationships between family members farming together. Too often the inability to openly share personal feelings and the failure to discuss expectations can ruin any family relationship. This is most often caused by an actual breakdown in communications between family members, especially during periods of stress (i.e. whether financial, work, or even personal) when individuals withdraw or hide emotions from each other.

The three most common communication complaints Hansen hears from family members farming together are: (1) "He/she won't discuss his/her feelings with me." (2) "He/she tunes me out most of the time." and (3) "He/she has time to talk with everyone but me."

He recommends farm families work to:

- Develop good listening skills to overcome breakdowns in communications
- Find or make time to talk
- Block out surrounding distractions
- Be sensitive to the feelings of others
- Clearly understand the situation or circumstances involved
- Maintain a level of respect for the opinions of others

Especially farmers, who are independent by nature, have the attitude that “I have to find a way to work this out by myself. I can’t let anyone know I have a problem or I am having trouble dealing with stress.” Some individuals will even withdraw and actually hide their feelings from others. Even when someone asks "what’s wrong, you seem troubled" the common reply is "nothing for you to worry about." This sense of isolation in a family or a marriage solves nothing. And not allowing others to help or share those feelings only makes matters worse, and can even result is a state of mental depression. The inability to cope with stress effectively and keep problems in a proper perspective is a common mistake in many family farming situations.

The Ugly

“My grandfather passed away a few years ago. He didn’t have a life insurance policy and there wasn't a good farm succession plan. Because of this, there has been fighting between the siblings. Three of them agree with what to do and one does not. I have lost an aunt, an uncle and many cousins due to the feud.”

“My father has a good succession plan in place, but I still worry about what will happen after he’s gone. One of my four sisters has already said she wants her money right away – if any of the others do, there’s no way I can keep my part of the farm. There are times when I think it would be better if we were left with nothing.”

“Our dad is getting older, but I can’t get him to talk about what he wants to see happen to the farm after he’s gone. My sister and I have tried to talk with our brother about it, but he doesn’t want to address the situation either. Something is going to happen someday and the state will decide what happens to the farm.”

“A woman moved into our dad’s farmhouse to help take care of him. At first, we thought this was a good thing – she did light housework and was a companion. Well, the relationship went to a new level, at least in her mind. After a few years, we started to get suspicious of some of the advice she was giving our dad – like buying a house that she could live in – we found out she had been married six times previously and the family of the last man she lived with had to pay her $20,000 to get her out of the house. We didn’t want our dad to be taken advantage of, but we didn’t want to hurt his feelings either. He moved in with my brother so she had to find another place to live, but we still feel badly – what if she really did care for him?”

These Common Barriers Can Lead to Ugly Situations:

- Lack of trust
- Different perceptions of fairness
- Multiple issues
- Poor communication
- Geographic dispersions
- Entrenched patterns
- Current family relationships
- Wealth disparities
- Styles of dealing with conflict
- Personality changes
- Complicated role reversals
- Passivity
- Relying on faulty assumptions
- Historical Impasses
- Emotional triggers and their responses

These obstacles must be overcome for families to develop relationships that allow them to move forward.

In summary, it's important for farm families to begin communicating early – before a crisis occurs; communicate effectively with active listening skills, and communicate often, to avoid misunderstanding.

But let's be honest – even the best situations are going to have issues. Some kids care more than others. Some care more about the farm and some care more about mom and dad, while other kids just see the money. Family dynamics, birth order and life experiences all play key roles in how family members communicate with each other.

Everyone needs to have realistic expectations of the issues that may arise when family members are encouraged and expected to speak freely, openly and respectfully. If disputes over the future of the farm are allowed to simmer, family unity and the long-term success of the farm deteriorate. The importance of focusing on a positive attitude and keeping "family" as the top priority in any farming situation cannot ever be overstated. Farms can be replaced, and there is a life after farming. But when you lose a family relationship between brothers and sisters, or fathers and sons, or destroy a marriage between a husband and wife who once loved each other and shared a dream together, you do not always get a second chance.

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…..Notes…..Notes…..Notes…..Notes

SWINE PROFITABILITY CONFERENCE

February 5, 2013

"The Changing Landscape of the U.S. Swine Industry"

by

Dr. Ron Plain
University of Missouri

The Changing Landscape of the U.S. Swine Industry

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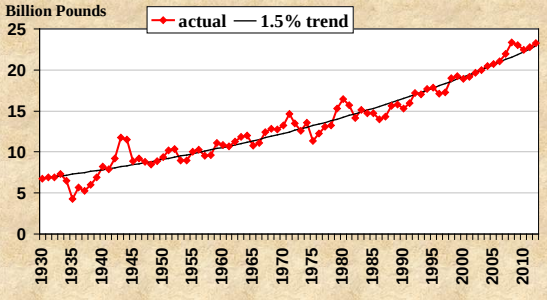
Changing Landscape of the U.S. Swine Industry

Ron Plain
D. Howard Doane Professor of Agricultural Economics
University of Missouri-Columbia
http://web.missouri.edu/~plainr/

Major trends

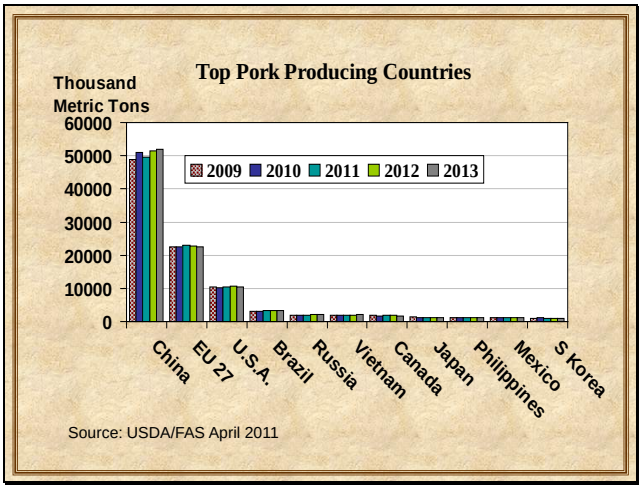
1. Pork is a growth industry

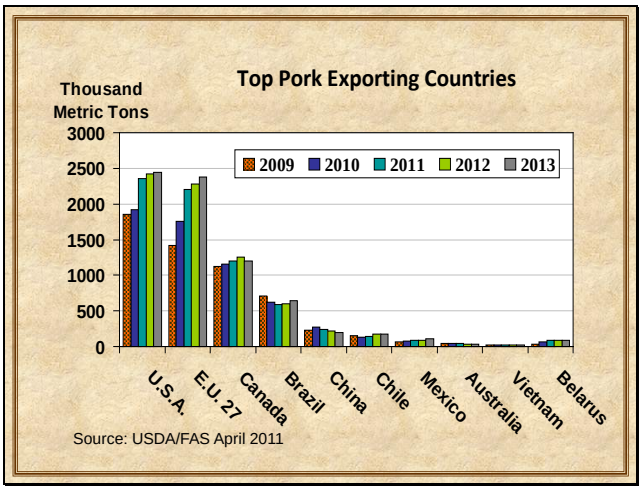
Annual U.S. Pork Production, 1930-2012



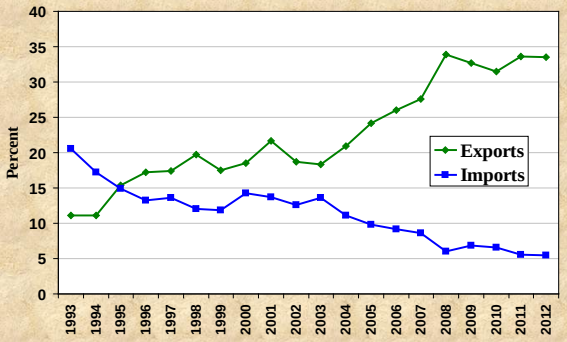
Major trends

1. Pork is a growth industry
2. U.S. pork is increasingly competitive





U.S. Share of World Pork Trade

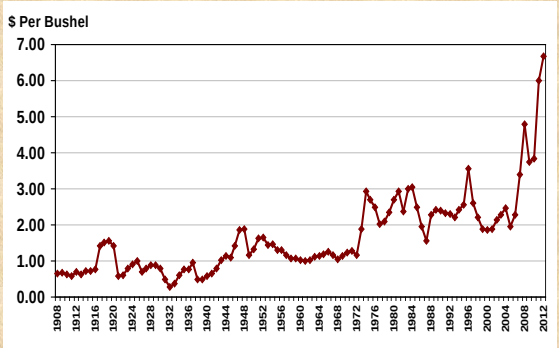


Source: USDA-NASS

Major trends

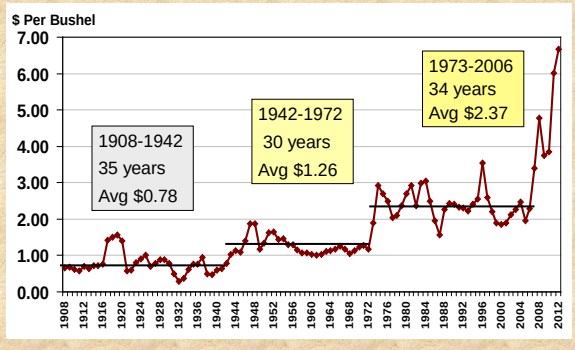
1. Pork is a growth industry
2. U.S. pork is increasingly competitive
3. Hogs are moving back to corn
   - manure management
   - DDGS are price competitive
   - cheaper to raise corn than to buy it

U.S. Average Corn Price, 1908-2012



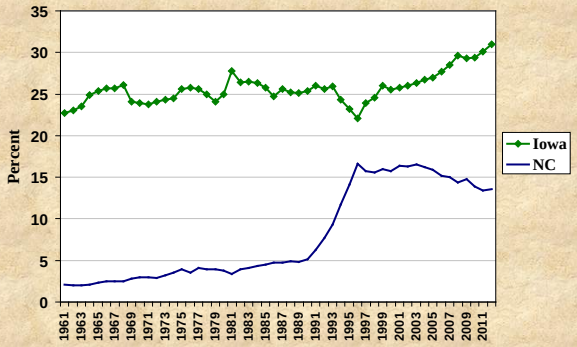
Source: USDA/NASS

U.S. Average Corn Price, 1908-2012



Source: USDA/NASS

Share of U.S. Swine Herd



Source: USDA-NASS

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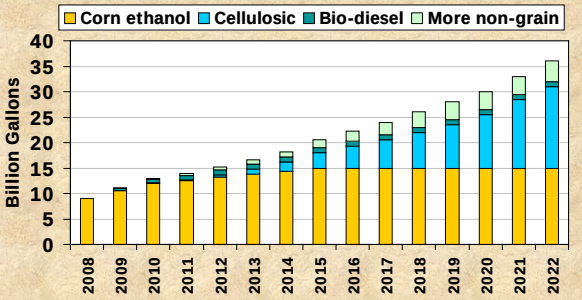
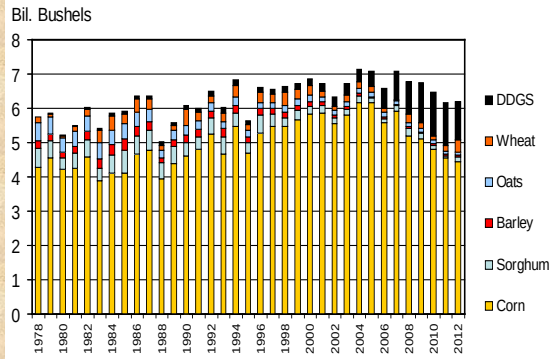
   - cheaper to raise corn than to buy it
4. Ethanol production is peaking

2007 Renewable Fuels Mandate

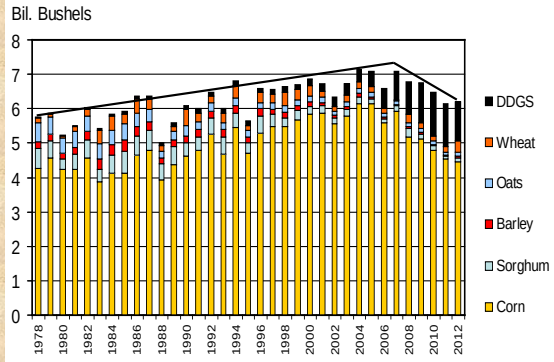


Grains: Feed and Residual



Source: USDA/NASS

Grains: Feed and Residual



Source: USDA/NASS

Major trends

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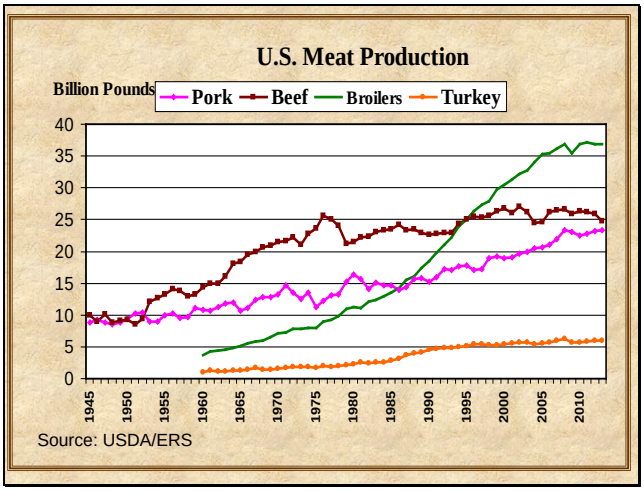
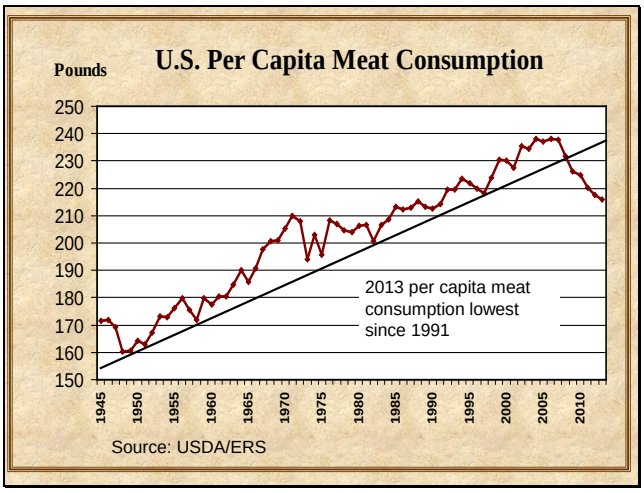
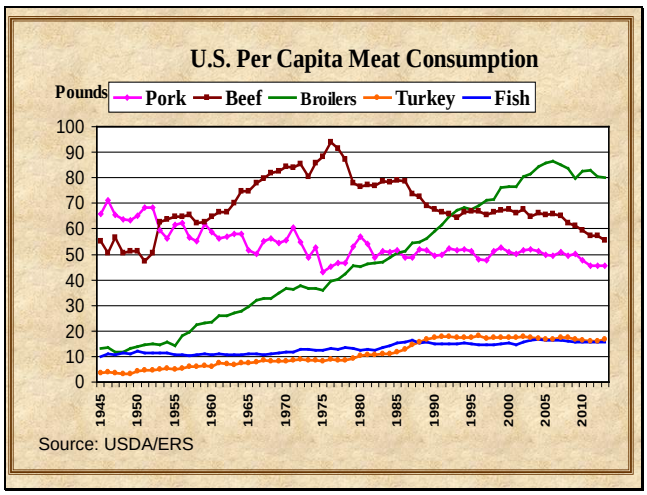
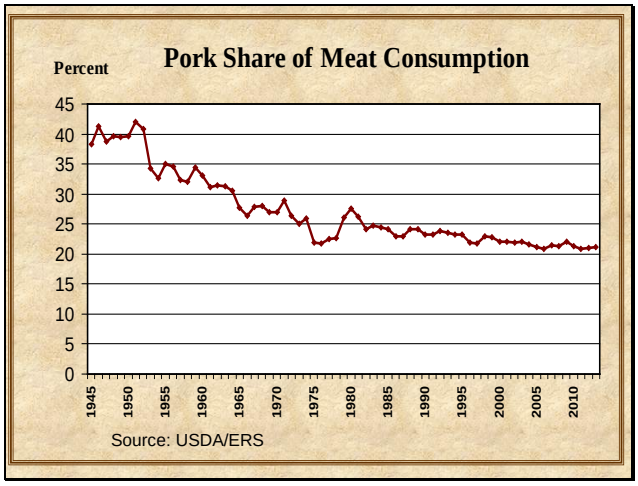
   - cheaper to raise corn than to buy it
4. Ethanol production is peaking
5. U.S. meat production





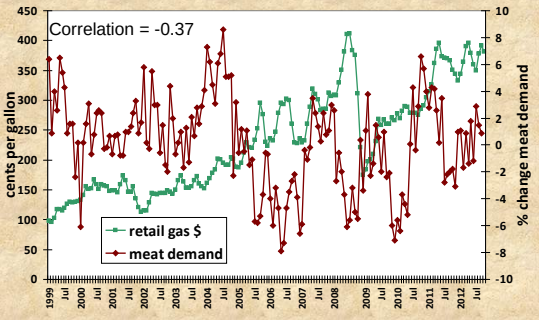

U.S. Per Capita Meat Consumption
Pounds
Pork
Beef
Broilers
Turkey
Fish
100
90
80
70
60
50
40
30
20
10
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Source: USDA/ERS


Pork Share of Meat Consumption
Percent
45
40
35
30
25
20
15
10
5
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Source: USDA/ERS

Meat Demand

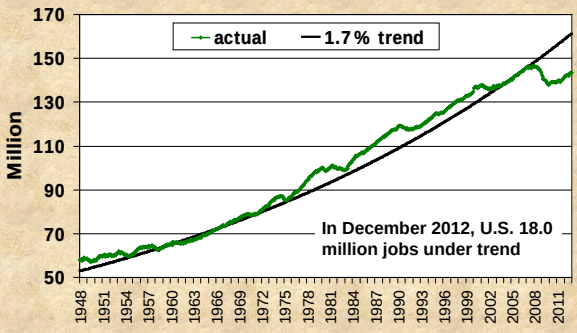
Gasoline Prices & Meat Demand,

1999-2012



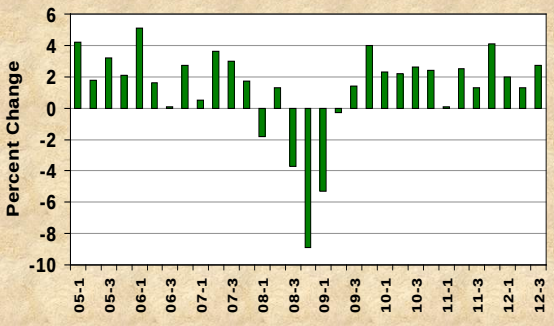
Source: U.S. Energy Information Administration

U.S. Civilian Employment, 1948-2012



Source: Bureau of Labor Statistics, household survey, seasonally adjusted & MU, 1.00143/month

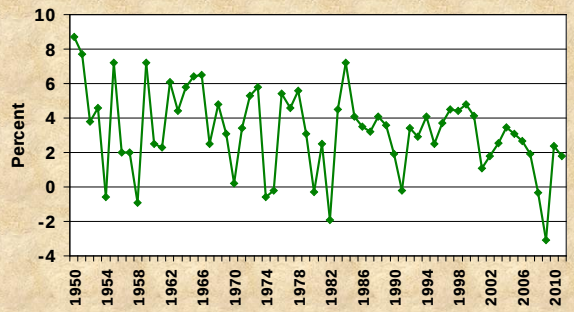
Growth in Real GDP



Source: U.S. Commerce Department

Change in Real GDP from Previous Year

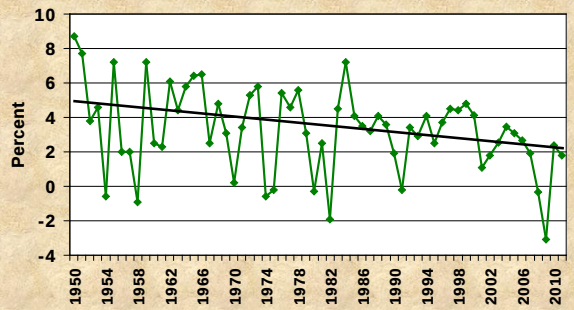
Seasonally Adjusted, Annual Rate, 1950-2011



Source: U.S. Department of Commerce, Bureau of Economic Analysis

Change in Real GDP from Previous Year

Seasonally Adjusted, Annual Rate, 1950-2011

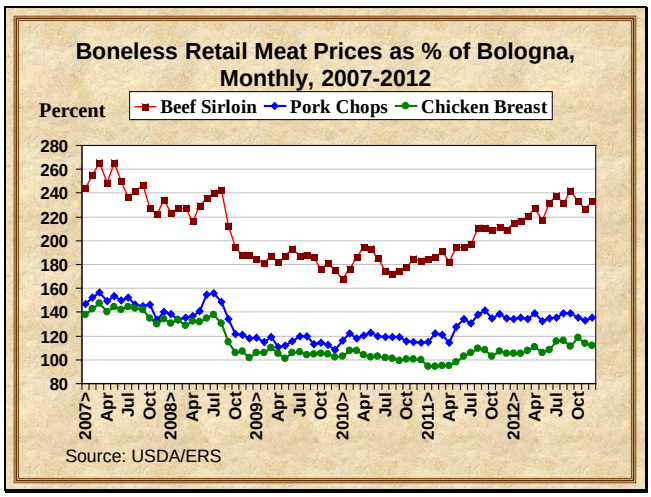


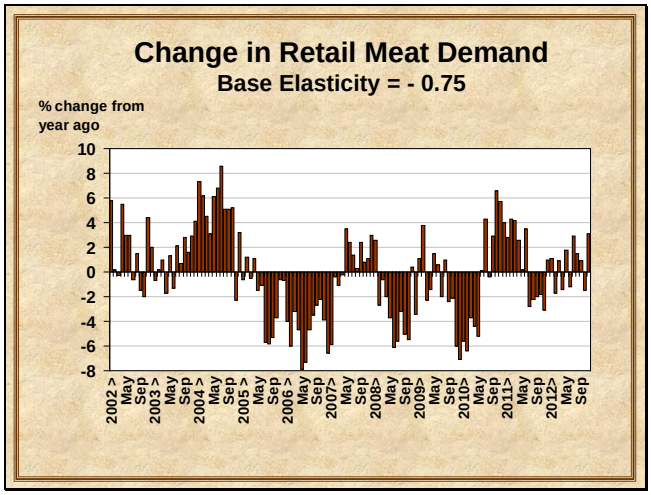
Source: U.S. Department of Commerce, Bureau of Economic Analysis

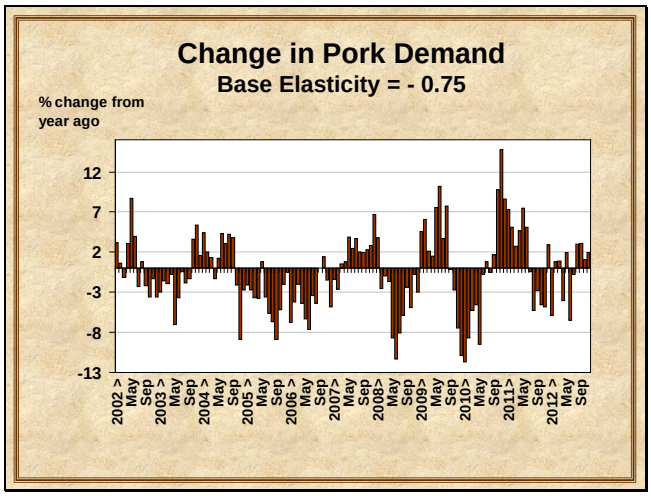
Change in Real GDP from Previous Year

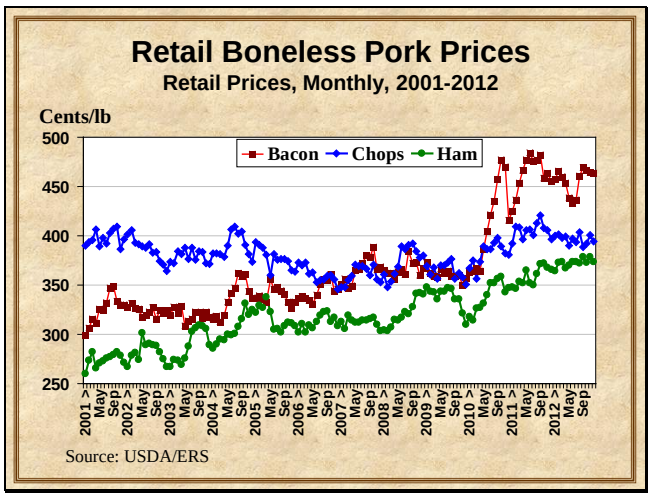
Seasonally Adjusted, Annual Rate, 1950-2011

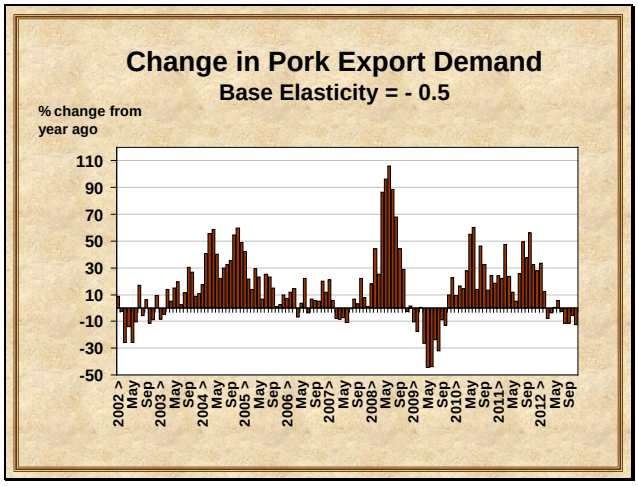
Source: U.S. Department of Commerce, Bureau of Economic Analysis

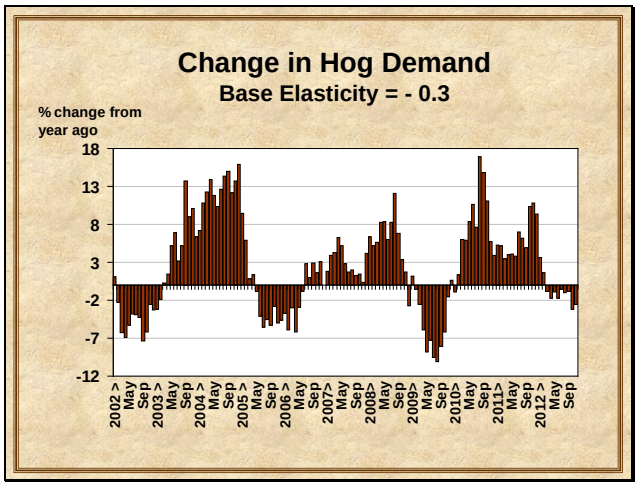

Boneless Retail Meat Prices as % of Bologna, Monthly, 2007-2012
Percent
Beef Sirloin
Pork Chops
Chicken Breast
280
260
240
220
200
180
160
140
120
100
80
2007>
Apr
Jul
Oct
2008>
Apr
Jul
Oct
2009>
Apr
Jul
Oct
2010>
Apr
Jul
Oct
2011>
Apr
Jul
Oct
2012>
Apr
Jul
Oct
Source: USDA/ERS

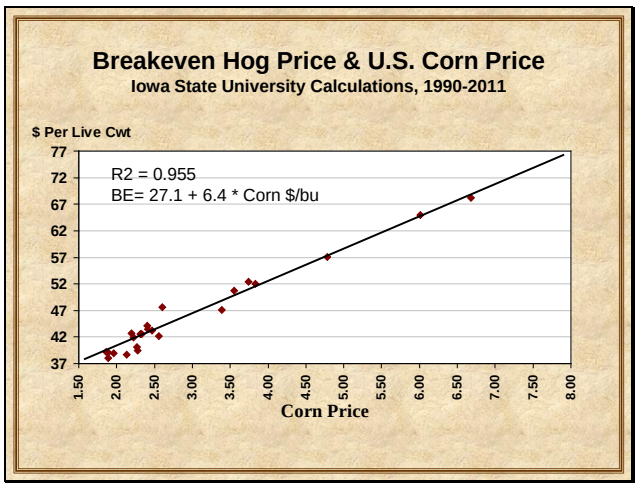

Change in Retail Meat Demand
Base Elasticity = - 0.75
% change from year ago
10
8
6
4
2
0
-2
-4
-6
-8
2002 >
2003 >
2004 >
2005 >
2006 >
2007>
2008>
2009>
2010>
2011>
2012>
May
Sep

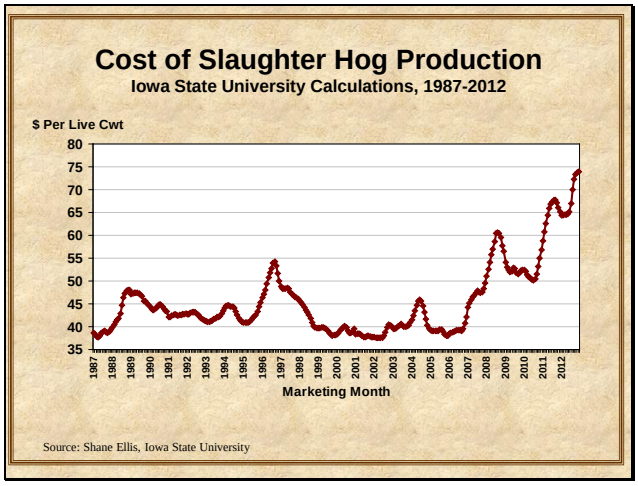

Change in Pork Demand
Base Elasticity = - 0.75
% change from year ago
12
7
2
-3
-8
-13
2002 >
2003 >
2004 >
2005 >
2006 >
2007>
2008>
2009>
2010>
2011>
2012>
May
Sep

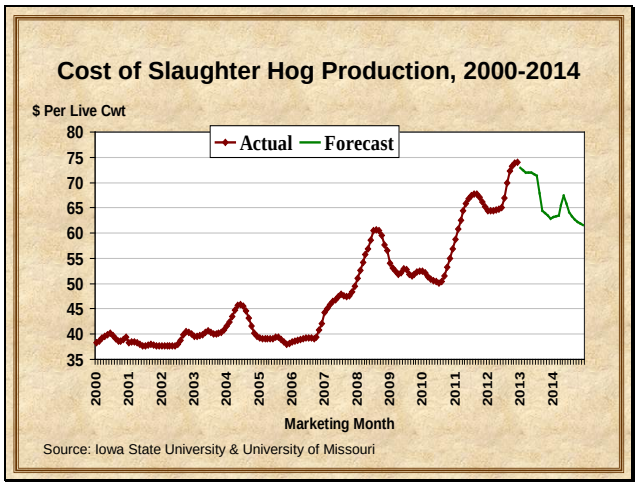

Retail Boneless Pork Prices
Retail Prices, Monthly, 2001-2012
Cents/lb
Bacon
Chops
Ham
Source: USDA/ERS


Change in Pork Export Demand
Base Elasticity = - 0.5
% change from year ago

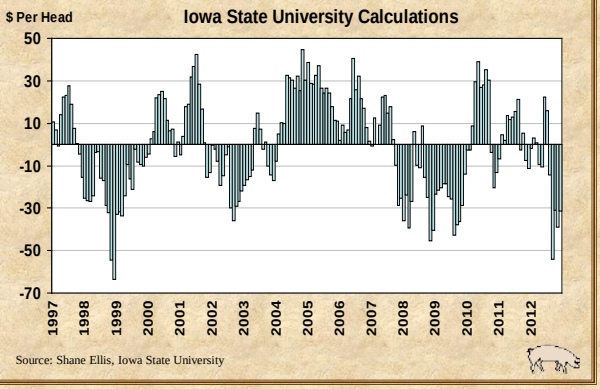

Change in Hog Demand
Base Elasticity = - 0.3
% change from year ago


Breakeven Hog Price & U.S. Corn Price
Iowa State University Calculations, 1990-2011
$ Per Live Cwt
R2 = 0.955
BE= 27.1 + 6.4 * Corn $/bu
77
72
67
62
57
52
47
42
37
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
7.50
8.00
Corn Price


Cost of Slaughter Hog Production
Iowa State University Calculations, 1987-2012
$ Per Live Cwt
80
75
70
65
60
55
50
45
40
35
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Marketing Month
Source: Shane Ellis, Iowa State University

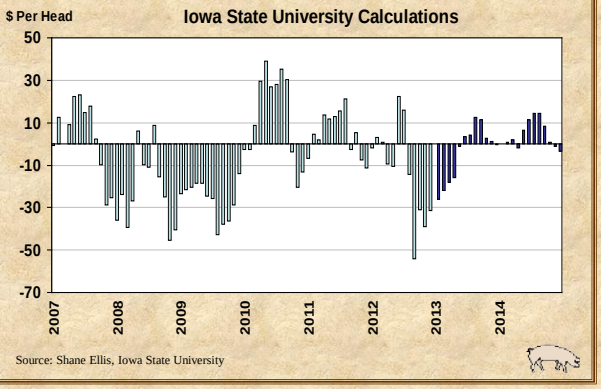

Cost of Slaughter Hog Production, 2000-2014
$ Per Live Cwt
Actual
Forecast
80
75
70
65
60
55
50
45
40
35
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Marketing Month
Source: Iowa State University & University of Missouri

Iowa Farrow to Finish Profits, 1997-2012



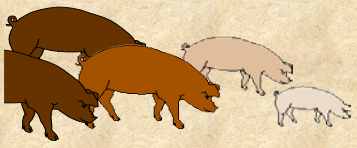
Source: Shane Ellis, Iowa State University

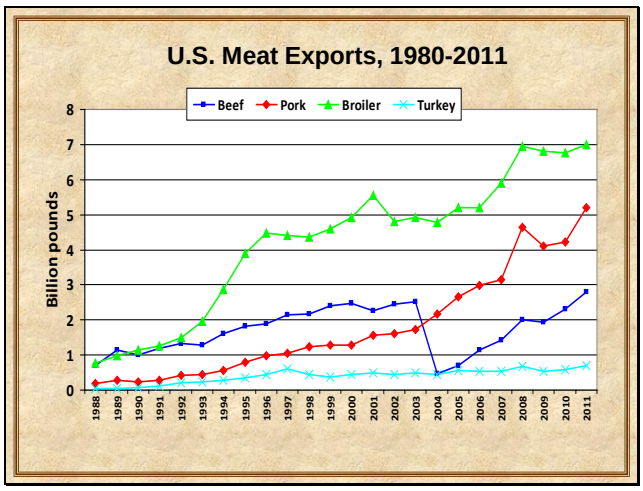
Iowa Farrow to Finish Profits, 2007-2012

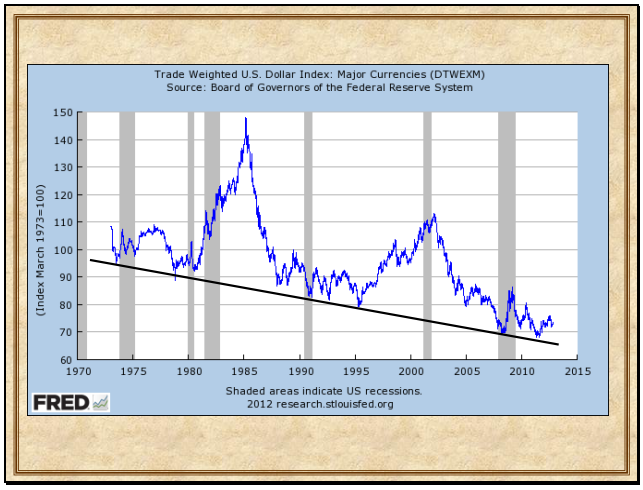


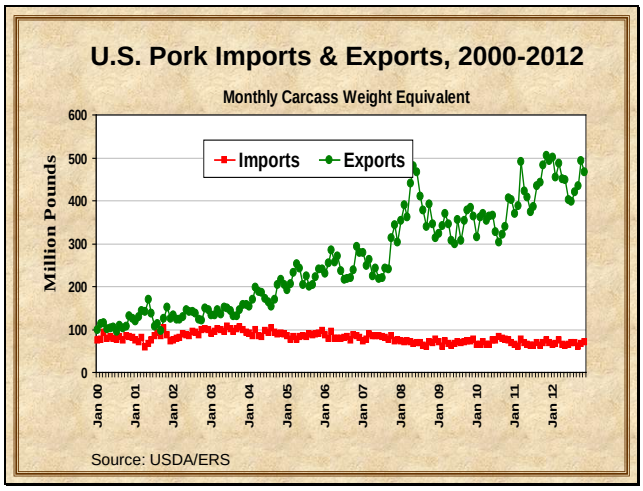
Source: Shane Ellis, Iowa State University

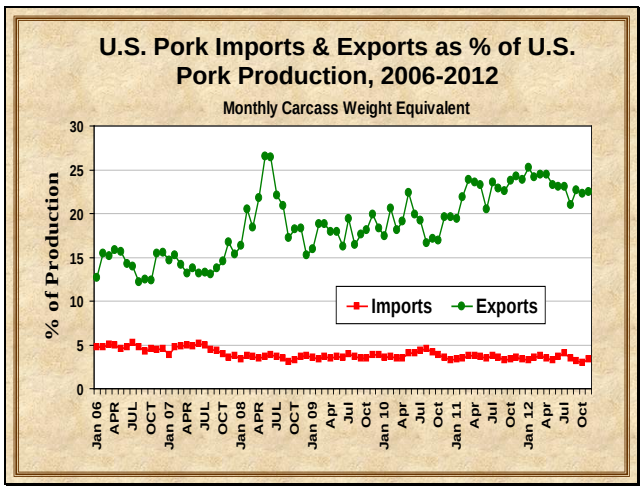
International Trade

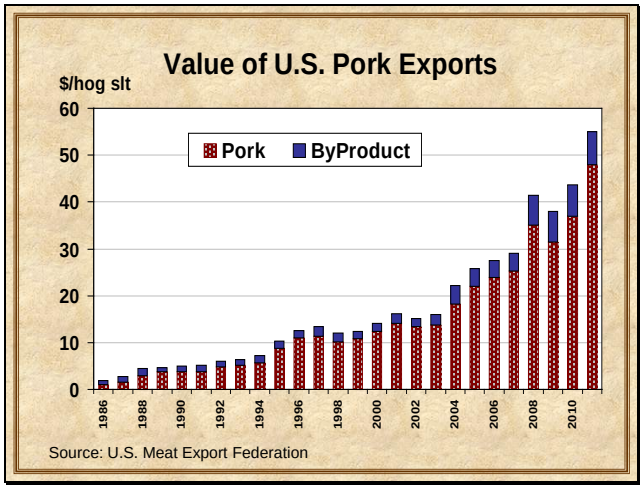


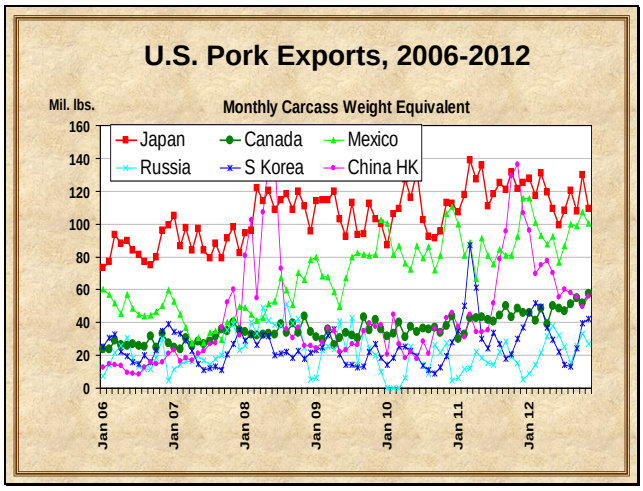

U.S. Meat Exports, 1980-2011
Beef
Pork
Broiler
Turkey
Billion pounds
0
1
2
3
4
5
6
7
8
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011

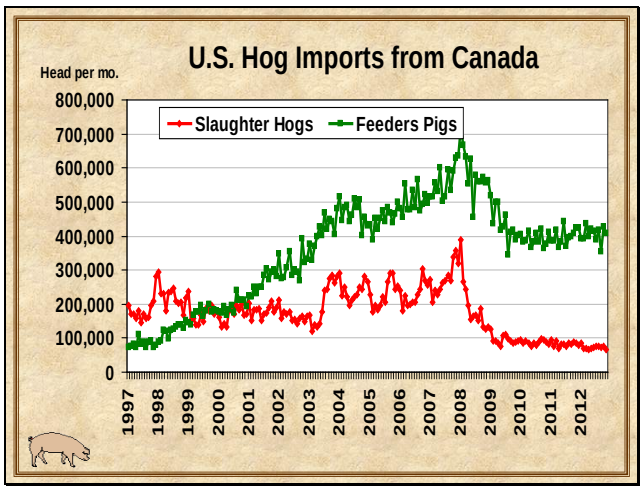

Trade Weighted U.S. Dollar Index: Major Currencies (DTWEXM)
Source: Board of Governors of the Federal Reserve System
(Index March 1973=100)
150
140
130
120
110
100
90
80
70
60
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
FRED
Shaded areas indicate US recessions.
2012 research.stlouisfed.org


U.S. Pork Imports & Exports, 2000-2012
Monthly Carcass Weight Equivalent
Imports
Exports
Million Pounds
0
100
200
300
400
500
600
Jan 00
Jan 01
Jan 02
Jan 03
Jan 04
Jan 05
Jan 06
Jan 07
Jan 08
Jan 09
Jan 10
Jan 11
Jan 12
Source: USDA/ERS

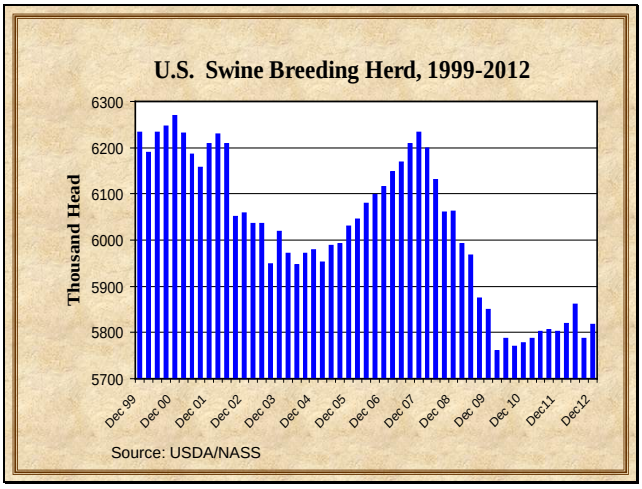

U.S. Pork Imports & Exports as % of U.S. Pork Production, 2006-2012
Monthly Carcass Weight Equivalent
% of Production
Imports
Exports


Value of U.S. Pork Exports
$/hog slt
Pork
ByProduct
Source: U.S. Meat Export Federation


U.S. Pork Exports, 2006-2012
Mil. lbs.
Monthly Carcass Weight Equivalent
Japan
Canada
Mexico
Russia
S Korea
China HK

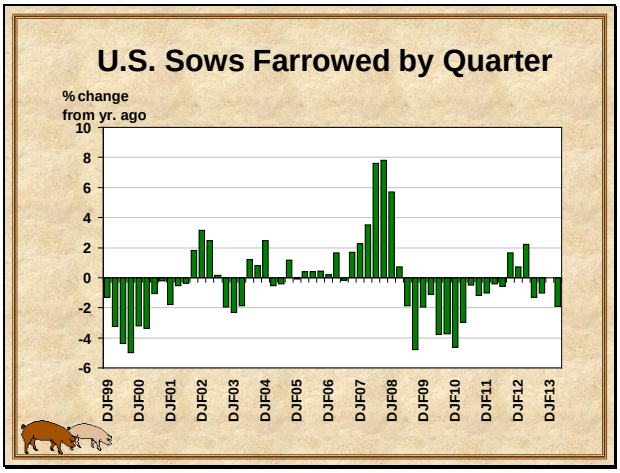

U.S. Hog Imports from Canada
Head per mo.
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Slaughter Hogs
Feeders Pigs
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

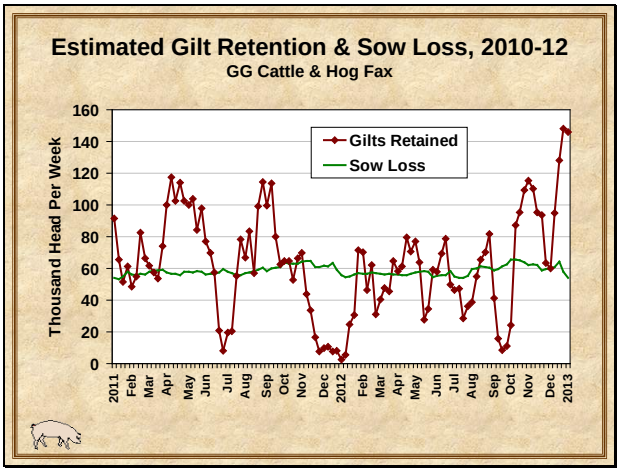

Inventory Surveys

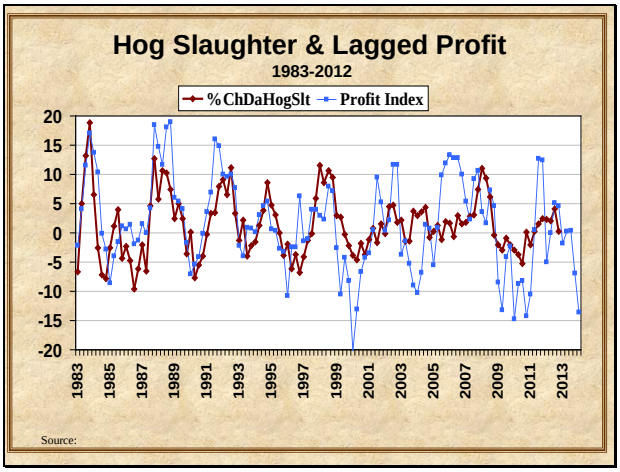


U.S. December Hog Inventory

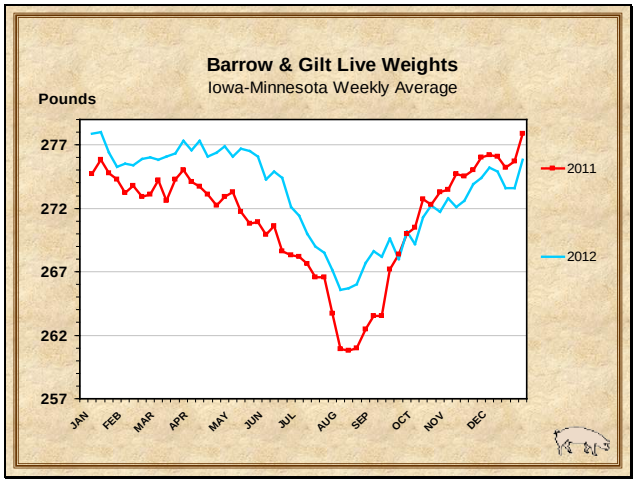
All Hogs & Pigs	100.0
Kept for Breeding	100.2
Kept for Marketing	100.0
Under 50 lbs	99.6
50-119 lbs.	100.0
120-179 lbs.	100.0
180 lbs. and over	100.4
Mar-May Farrowings	102.2
Jun-Aug Farrowings	98.7
Sep-Nov Farrowings	99.0
Dec-Feb Farrowing Intentions	100.0
Mar-May Farrowing Intentions	98.1

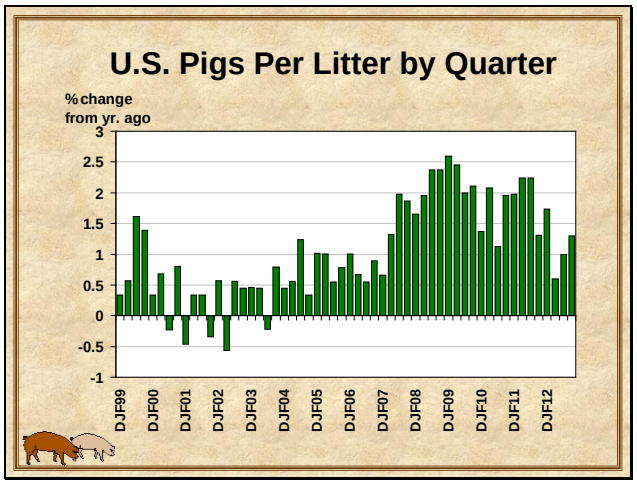

U.S. Sows Farrowed by Quarter
% change
from yr. ago
10
8
6
4
2
0
-2
-4
-6
DJF99
DJF00
DJF01
DJF02
DJF03
DJF04
DJF05
DJF06
DJF07
DJF08
DJF09
DJF10
DJF11
DJF12
DJF13

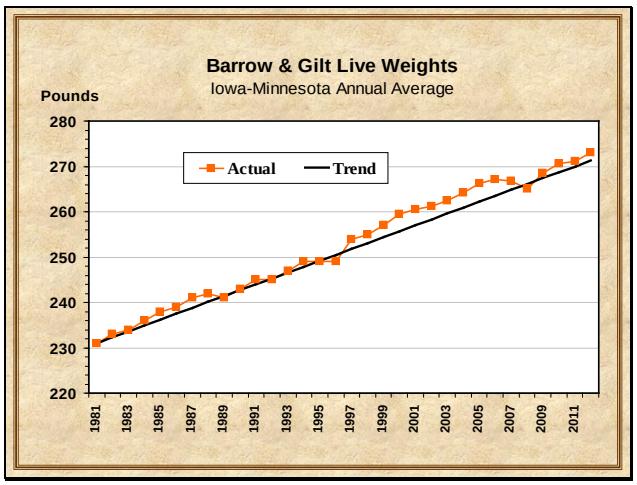

Estimated Gilt Retention & Sow Loss, 2010-12
GG Cattle & Hog Fax
Thousand Head Per Week
160
140
120
100
80
60
40
20
0
Gilts Retained
Sow Loss
2011
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2012
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2013

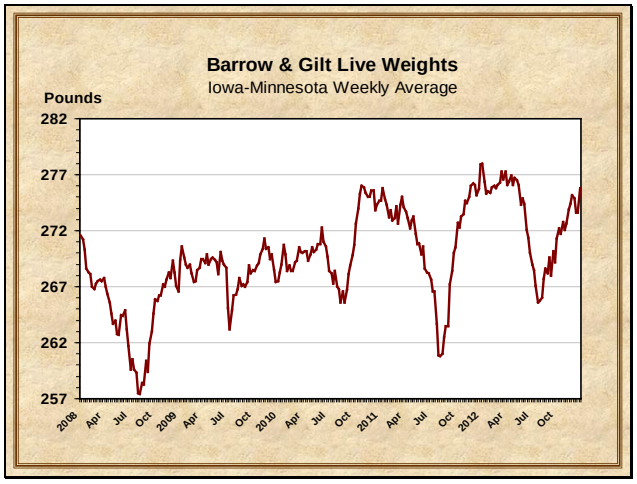

Hog Slaughter & Lagged Profit
1983-2012
% ChDaHogSlt
Profit Index
20
15
10
5
0
-5
-10
-15
-20
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
Source:

Productivity Growth

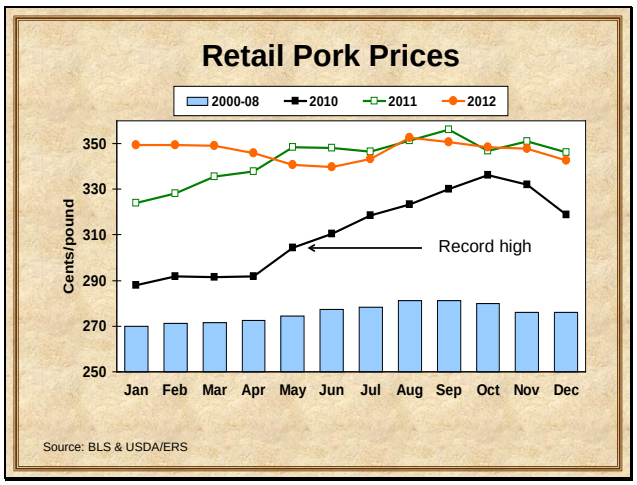




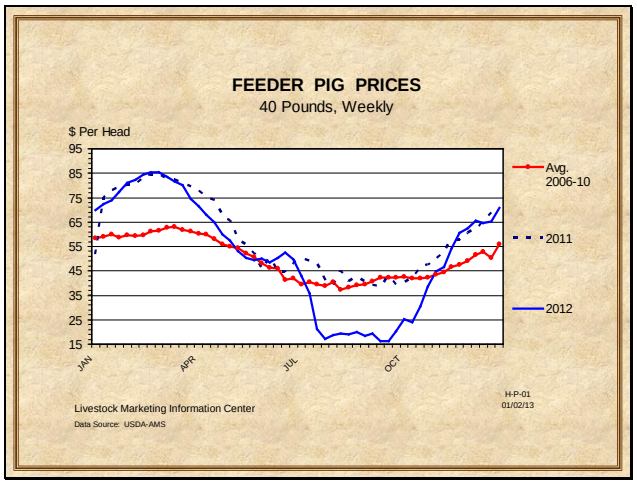

Barrow & Gilt Live Weights
Iowa-Minnesota Annual Average
Pounds
280
270
260
250
240
230
220
Actual
Trend
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011

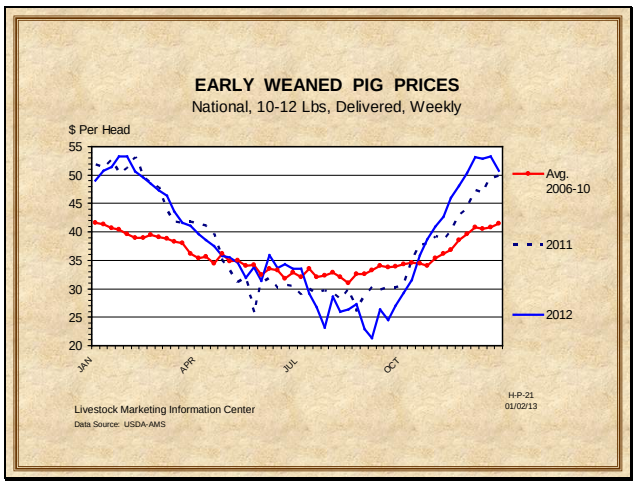

Barrow & Gilt Live Weights
Iowa-Minnesota Weekly Average
Pounds
282
277
272
267
262
257
2008
Apr
Jul
Oct
2009
Apr
Jul
Oct
2010
Apr
Jul
Oct
2011
Apr
Jul
Oct
2012
Apr
Jul
Oct

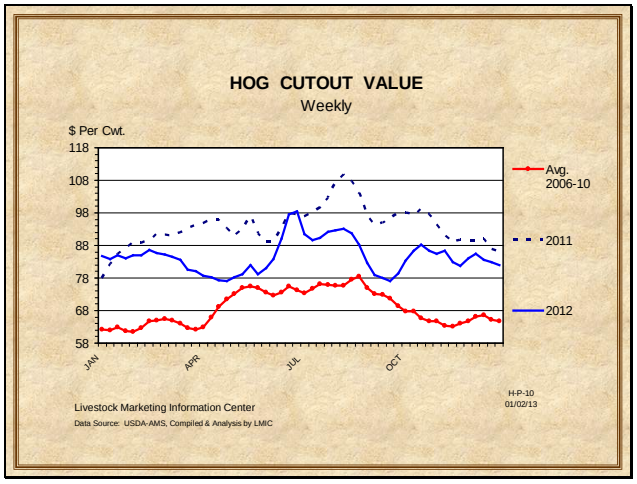

Prices

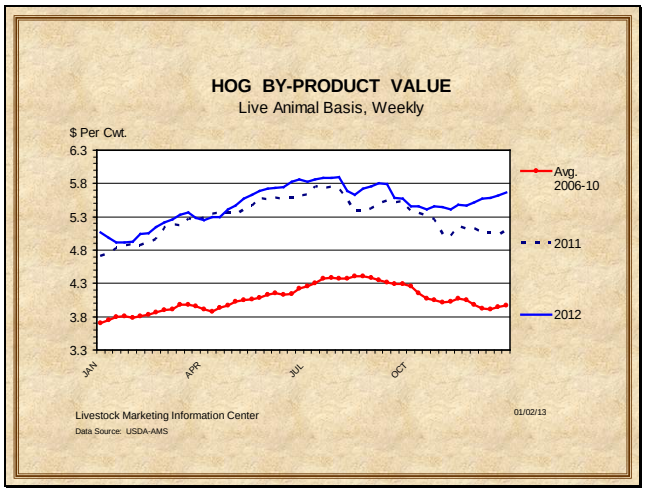

Retail Pork Prices
2000-08
2010
2011
2012
Cents/pound
350
330
310
290
270
250
Record high
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Source: BLS & USDA/ERS

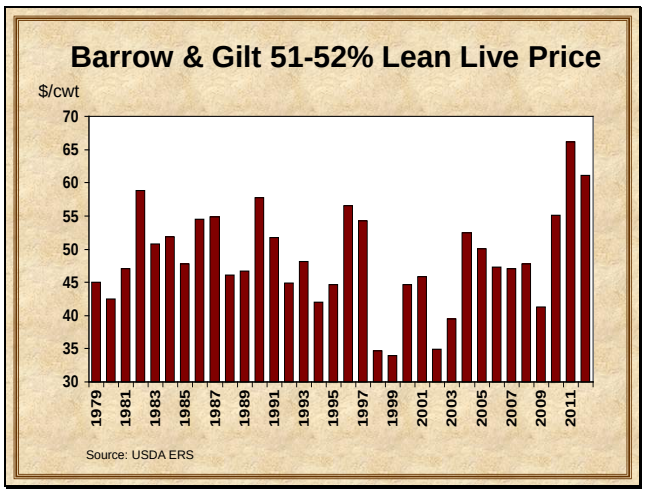

U.S. Retail Pork Prices, 2000-2012
Cents Per Pound
380
360
340
320
300
280
260
240
220
200
Jan 00
Jan 01
Jan 02
Jan 03
Jan 04
Jan 05
Jan 06
Jan 07
Jan 08
Jan 09
Jan 10
Jan 11
Jan 12

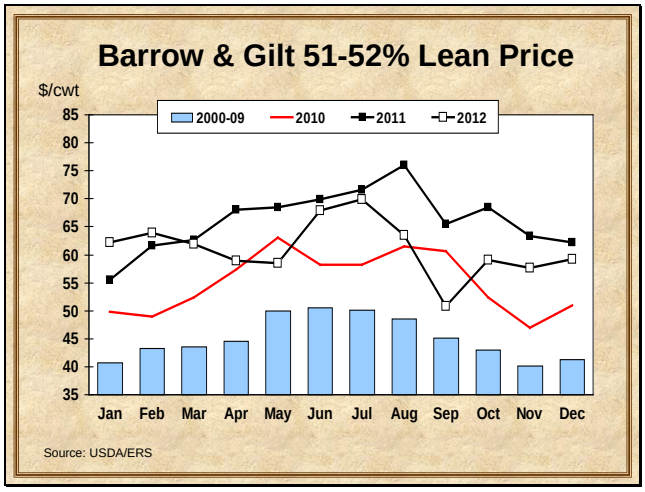

FEEDER PIG PRICES
40 Pounds, Weekly
$ Per Head
95
85
75
65
55
45
35
25
15
JAN
APR
JUL
OCT
Avg. 2006-10
2011
2012
Livestock Marketing Information Center
Data Source: USDA-AMS
H-P-01
01/02/13

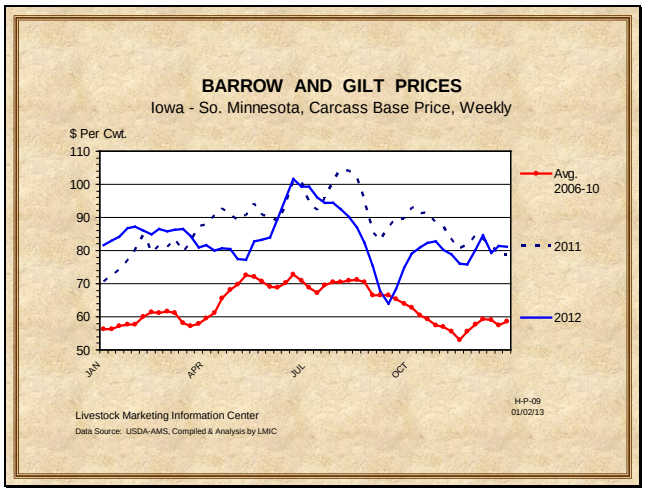

EARLY WEANED PIG PRICES
National, 10-12 Lbs, Delivered, Weekly
$ Per Head
55
50
45
40
35
30
25
20
JAN
APR
JUL
OCT
Avg. 2006-10
2011
2012
H-P-21
01/02/13
Livestock Marketing Information Center
Data Source: USDA-AMS

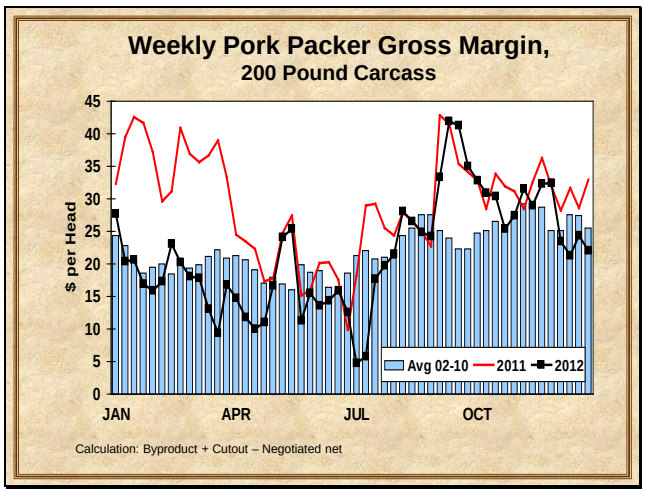

HOG CUTOUT VALUE
Weekly
$ Per Cwt.
118
108
98
88
78
68
58
JAN
APR
JUL
OCT
Avg. 2006-10
2011
2012
H-P-10
01/02/13
Livestock Marketing Information Center
Data Source: USDA-AMS, Compiled & Analysis by LMIC

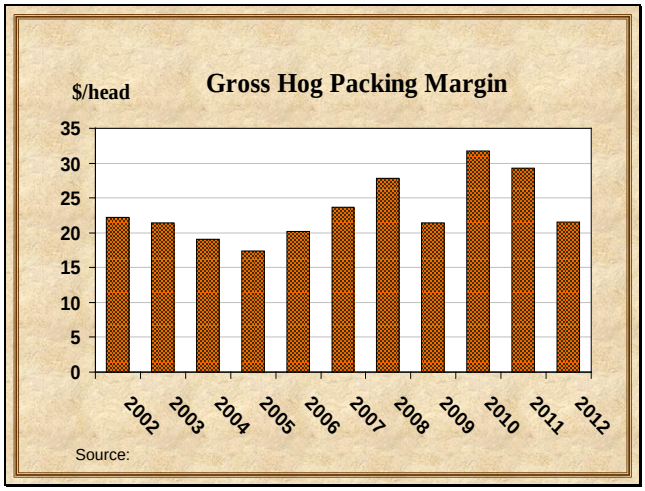

HOG BY-PRODUCT VALUE
Live Animal Basis, Weekly
$ Per Cwt.
6.3
5.8
5.3
4.8
4.3
3.8
3.3
JAN
APR
JUL
OCT
Avg. 2006-10
2011
2012
01/02/13
Livestock Marketing Information Center
Data Source: USDA-AMS


Barrow & Gilt 51-52% Lean Live Price
$/cwt
70
65
60
55
50
45
40
35
30
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Source: USDA ERS


Barrow & Gilt 51-52% Lean Price
$/cwt
2000-09
2010
2011
2012
85
80
75
70
65
60
55
50
45
40
35
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Source: USDA/ERS


BARROW AND GILT PRICES
Iowa - So. Minnesota, Carcass Base Price, Weekly
$ Per Cwt.
110
100
90
80
70
60
50
JAN
APR
JUL
OCT
Avg. 2006-10
2011
2012
H-P-09
01/02/13
Livestock Marketing Information Center
Data Source: USDA-AMS, Compiled & Analysis by LMIC


Weekly Pork Packer Gross Margin,
200 Pound Carcass
$ per Head
45
40
35
30
25
20
15
10
5
0
JAN
APR
JUL
OCT
Avg 02-10
2011
2012
Calculation: Byproduct + Cutout – Negotiated net


$/head
Gross Hog Packing Margin
35
30
25
20
15
10
5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Source:


My Forecast

Forecast Change in Meat Production

Type	---Percent Change--- 2011-12	2012-13
Beef	- 1.1%	- 4.3%
Pork	+2.2%	+0.2%
Chicken	- 0.7%	- 0.4%
Turkey	+3.3%	+0.3%
All Meats	+0.1%	- 1.3%

Source: USDA-OCE WASDE, January 2013

Commercial Hog Slaughter Forecast

Million Head

	2011	2012	2013	------Change------ 11-12	12-13
Qtr 1	27.483*	28.104*	**27.762**	+ 2.3%	- 1.2%
Qtr 2	26.110*	26.659*	**26.811**	+ 2.1%	+0.6%
Qtr 3	27.379*	27.963*	**28.437**	+ 2.1%	+1.7%
Qtr 4	29.888*	30.411*	**30.349**	+ 1.7%	- 0.2%
Year	110.860*	113.137*	**113.360**	+ 2.1%	+0.2%

*actual

Note: Q4 11 & Q3 12 & Q1 13 have only 63 slaughter days

Iowa-Minn Hog Price Forecast

Negotiated Base Price Per Carcass Hundredweight

	2010	2011	2012	2013
Qtr 1	$66.81*	$79.28*	$84.78*	$80-84
Qtr 2	$79.04*	$91.80*	$85.53*	$87-91
Qtr 3	$79.44*	$94.03*	$82.65*	$86-90
Qtr 4	$65.20*	$85.03*	$80.04*	$78-82
Year	**$72.67***	**$87.54***	**$83.25***	**$83-87**

*actual price – prior day purchased

Iowa-Minn Live Hog Price Forecast

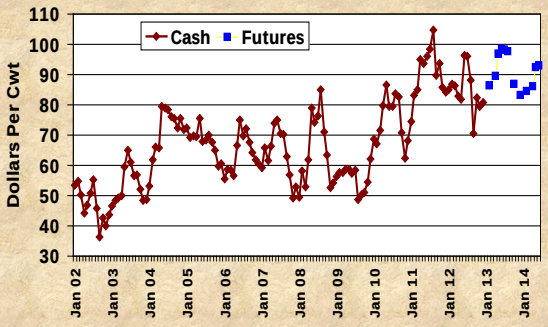
Negotiated Live Base Price Equivalent

	2010	2011	2012	2013
Qtr 1	$50.78*	$60.25*	$64.43*	$61-64
Qtr 2	$60.07*	$69.77*	$65.00*	$66-69
Qtr 3	$60.37*	$71.46*	$62.81*	$65-68
Qtr 4	$49.56*	$64.62*	$60.83*	$59-62
Year	**$55.19***	**$66.53***	**$63.27***	**$63-66**

*actual carcass price x 76%

Net Slaughter Hog Price,

Monthly Average 2002-2012



Thru June 2014 all hog futures contracts are above $83 per cwt

Major Uncertainties

- Domestic pork demand
- Meat exports
  - Exchange rates
- Corn prices & cost of gain
- Competing meat supply
- Societal pressures

May 2012 Gestation Facilities Survey

Number of sows	Firms	Million Sows	----in open pen gestation---- current	in 2 years	change
100,000 & up	10	2.333	16.4%	23.8%	+7.4
10,000-99,999	38	1.161	18.9%	21.3%	+2.4
1,000-9,999	22	0.102	20.2%	20.7%	+0.5
Survey Total	70	3.596*	17.3%	22.9%	+5.6

* approximately 62.6% of U.S. sows

Source: University of Missouri

May 2012 Gestation Facilities Survey

Number of sows	Firms	Million Sows	----in open pen gestation---- current	in 2 years	change
100,000 & up	10	2.333	16.4%	23.8%	+7.4
10,000-99,999	38	1.161	18.9%	21.3%	+2.4
1,000-9,999	22	0.102	20.2%	20.7%	+0.5
Survey Total	70	3.596*	17.3%	22.9%	+5.6

* approximately 62.6% of U.S. sows

Why are large operations moving to pens?

Any Questions?

….Notes…..Notes…..Notes…..Notes

….Notes…..Notes…..Notes…..Notes

SWINE PROFITABILITY CONFERENCE

February 5, 2013

"Appendix Articles"

by
Mike Tokach, Bob Goodband, Joel DeRouchey,
Steve Dritz, and Jim Nelssen
K-State Swine Nutrition Team

…..Notes…..Notes…..Notes…..Notes

Starter Pig Amino Acid Requirements to Gut Health Concerns

Mike Tokach, Bob Goodband, Joel DeRouchey, Steve Dritz, and Jim Nelssen
K-State Swine Nutrition Team

Abstract

Immediately after weaning, the gut undergoes extensive remodeling in the adaption from a liquid to dry diet. This adaptation period presents significant challenges to the nutritionist in devising diets that assist the pig's transition to dry feed while meeting cost expectations. From an amino acid perspective, an important dietary attribute to minimize gut challenge and diet cost is to reduce the crude protein in the diet through the optimal inclusion of crystalline amino acids. Reducing crude protein decreases the quantity of fermentable protein entering the large intestine, which lowers post weaning diarrhea. It also lowers the requirement for protein sources, such as soybean meal, that present immunological challenges to the gut and decreases inclusion of expensive specialty protein sources. Diets for early weaned pigs are often formulated to 1.65 to 1.7% total lysine or greater. Formulation to lower lysine levels (1.35% standardized ileal digestible (SID) or 1.5% total lysine) decreases the requirement for expensive protein sources while having minimal effect on pig performance. When using diets with lower SID lysine, levels of other amino acids relative to lysine are crucial. Suggested ratios relative to lysine are 58% for methionine and cysteine, 62% for threonine, 65% for valine, and 52% for isoleucine (60% if high levels of blood products are used). The tryptophan to lysine ratio continues to be debated with recommended ratios ranging from 16.5 to 20% depending on nutrient loadings and the particular experiment. Specific amino acids (ex. Glycine and either glutamine or arginine) appear to meet the need for nonessential amino acids and have specific roles for gut development.

Gut remodeling after weaning

Heo et al. (2012) provide an excellent review of the gastrointestinal changes that occur in weaned pigs after weaning. As a brief summary of their review, the gastrointestinal changes at weaning include:

- Increased stomach gastric pH because of decreased acid secretion capacity and decreased lactic acid production due to lowered lactose intake. These changes may increase susceptibility of piglets to enteric infections at weaning
- Gastric motility is reduced which reduces stomach emptying. The lower motility may allow for pathogenic bacteria to proliferate in the intestinal tract.
- Decreased villus height (due to villus atrophy) and increased crypt depth. (hypertrophy of crypt cells) in the small intestine (partly, but not entirely due to decreased intake at weaning) results in decreased digestive capability.
- Decreased lactase (and other pancreatic enzyme) secretion for first 3 to 5 days after weaning.
- Reduction in net absorption of fluid and electrolytes and malabsorption of nutrients in small intestine immediately after weaning. The low ileal digestive capability could lead to osmotic diarrhea by increasing the quantity of nutrients presented to the hindgut.
- In the large intestine, crypt cell number is decreased, which lowers absorptive capacity of large intestine. This reduced absorptive capability can lead to diarrhea when there is excessive fluid loss from the small intestine.

Minimizing challenge to the gut

The changes in the gastrointestinal tract mean that the gut is compromised at weaning and time is required for the pig to fully recover their digestive and absorptive capacities. The goal of nutritionists is to help the pig transition through this phase without incurring excessive diet cost. Some ingredients and diet formulation techniques help the pig counteract some of the normal gut changes that occur at weaning. For example, adding lactose to the diet increases lactic acid production, which lowers gastric pH. Reducing the acid binding capacity of the diet decreases the requirement for acid to buffer the pH. Decreasing the soybean meal level in the diet decreases the challenge that an immature digestive tract has in dealing with legume proteins. High levels of soybean meal can cause transient hypersensitivity when the immune system reacts to an unfamiliar protein source (Engle, 1994).

Another method to decrease the challenge that the diet poses to the gastrointestinal system is to lower the crude protein level in the diet. Reducing the crude protein content lowers the need for soybean meal or other protein sources. Presenting the large intestine with a large quantity of undigested nitrogen appears to be a factor in postweaning diarrhea (Heo et al., 2012). Lowering the quantity of protein in the diet decreases the ammonia concentration in the small intestine (Bikker et al., 2006) and urea nitrogen and volatile fatty acids in the ileum (Nyachoti et al., 2006). It is thought that the decreased nitrogen concentrations are due to reduced protein fermentation by the bacteria (De Lange et al., 2010).

Until recently, lowering the crude protein level in the diet usually corresponded with reduced growth performance because the minimum requirement for the fourth, fifth, or sixth amino acids (often tryptophan, valine, or isoleucine) or nonessential amino acids that have a role in gut development (arginine, glutamine, or glycine) were not met. Numerous recent research trials have demonstrated that performance can be maintained when the crude protein level in the diet is reduced by using crystalline amino acids to replace intact protein sources (Heo et al., 2009; Lordelo et al., 2008; Nemechek et al., 2011a).
In order to lower the crude protein level in the diet, we need to first ensure that we are not formulating the diets above the lysine requirement. The requirements for other essential amino acids in relation to lysine must also be known to allow crude protein to be lowered to minimal levels.

Lysine requirements for nursery pigs

Numerous research trials have explored the SID lysine requirement of nursery pigs in recent years. Researchers at Kansas State University and the University of Missouri conducted a series of experiments under field and university conditions to determine the lysine requirement from 5 to 10 and 10 to 25 kg. For the lighter weight range, the requirement estimate was found to be between 1.35 and 1.40% SID lysine (4.0 to 4.2 g/Mcal ME; Gaines el al., 2003; Nemechek et al., 2011b). This requirement was similar to the estimate found by Dean et al. (2007) of 1.4% SID lysine or 18.9 g of lysine per kg of gain for 6 to 12 kg pigs.

For 10 to 25 kg pigs, Kendall et al. (2008) conducted 5 experiments with 3,628 pigs and found the SID lysine requirement to be 1.30% SID lysine (3.80 g/Mcal ME). This was equivalent to 19 g of SID lysine per kg of gain. Schneider et al. (2010) titrated energy and lysine levels simultaneously in two separate trials with different genotypes. With one genotype, the optimal SID lyine:ME ratio was approximately 3.4 to 3.6 g/Mcal ME, while the optimal ratio was 3.9 to 4.2 g/Mcal ME for the other genotype. However, when expressed relative to gain, the requirement was approximately 19.0 g of SID lysine/kg of gain for both genotypes. In another large field study, Lenehan et al., (2003) found the SID lysine requirement for 10 to 20 kg pigs was 1.40%; however,

when calculated on a g/kg of gain basis, the optimal level was again 19 g of SID lysine/kg of gain. In a cooperative study involving several universities in the United States, Hill et al. (2007) confirmed that the lysine requirement of nursery pigs of modern genotypes were higher than recommendations of NRC (1998).

Although lysine requirements of nursery pigs have increased in recent years and vary with environmental conditions and genotype, when expressed relative to growth rate, empirical studies in recent years have consistently found the requirement to be 19 g per kg of gain.

Threonine:lysine ratio

The large difference between apparent and standardized digestibility values for threonine has caused some confusion by nutritionists with this amino acid over the years. Deficiencies of threonine cause real, but relatively small reductions in growth and efficiency as compared to deficiencies of the other major amino acids. This has led to an underestimation of requirements and under-formulation for threonine by many nutritionists.

Van Milgen and Le Bellego (2003) conducted a meta-analysis of 22 different studies and found the optimal threonine:lysine ratio increased from 58% at 15 kg to 65% at 110 kg using a linear-plateau model. Use of curvilinear models resulted in higher requirement estimates. In two separate experiments, Lenehan et al. (2003, 2004) found an optimal threonine:lysine level of 64 to 66% for 10 to 20 kg pigs. James et al. (2003) also found the optimal threonine:lysine ratio to be 60 to 65% for 10 to 20 kg pigs. Although Wang et al. (2006) did not report a SID threonine:lysine ratio, the growth rate of pigs in their study can be used to estimate the SID lysine requirement (19 g/kg of gain) to calculate an SID threonine:lysine ratio. Their data would suggest the ratio is at least 60% of lysine for growth and 67% for immunity. Li et al. (1999) also demonstrated that the threonine requirement for immunity was higher than the requirement for growth.

TSAA:lysine ratio

Considerable research has been conducted in recent years on the total sulfur amino acid requirement and individual requirements for methionine and cystine. It is generally assumed that methionine must constitute at least 50% of the TSAA ratio (NRC = 48% on weight basis); however, recent data (Gillis et al., 2007) suggests that methionine may need to be slightly greater (55% on weight basis; 50% on molar basis) than cystine in the ratio.
For nursery pigs, Dean et al., 2007 suggested that the requirement for total sulfur amino acids was 10.1 g/kg gain or 54% of lysine for 6 to 12 kg pigs. Gaines et al. (2005) found a slightly higher ratio of 57 to 61% depending on the response criteria and method of assessing the breakpoint with 8 to 26 kg pigs. Yi et al. (2006) found a similar TSAA:lysine ratio of 58% for optimal ADG with 12 to 24 kg pigs. In a series of experiments, Kansas State University researchers found a similar range of SID TSAA:lysine ratios of 57 to 60% for 10 to 20 kg pigs with Genetiporc (Schneider et al., 2004) and PIC (Schneider et al., 2006) pigs.

Tryptophan:lysine ratio

Research on the optimal tryptophan to lysine ratio is difficult to conduct. Because of the relatively small inclusion rates and small differences in range of tryptophan levels tested (ex. 14 to 22% of lysine), diet manufacturing is a challenge to ensure the very low additions are thoroughly mixed. Also, tryptophan is a difficult amino acid to analyze and different analytical techniques yield different results adding to the confusion. There is also disagreement in the quantity of tryptophan present in key basal ingredients used in many of the research trials, which can dramatically impact

the projected ratios because the basal ingredients make up such a large proportion of the tryptophan in test diets. Finally, the level of other large neutral amino acids in the diet may influence the response to increasing tryptophan levels. The optimal tryptophan:lysine ratio suggested by most researchers ranges from 16 to 20%. Although this range is relatively small, the difference can lead to large changes in diet formulation and cost and inclusion of other crystalline amino acids in the diet.

On the low end of the recommended range for nursery pigs, Ma et al. (2010) suggested that the SID tryptophan:lysine requirement may be as low as 15% for 11 to 22 kg pigs; however, data from Nemechek et al. (2011a) demonstrates that 15% SID tryptophan:lysine results in lower ADFI and ADG than a ratio of 20%. Guzik et al. (2002) estimated the SID tryptophan requirement for nursery pigs at 0.21, 0.20, and 0.18% of the diet for 5.2 to 7.3 kg, 6.3 to 10.2 kg, and 10.3 to 15.7 kg pigs, respectively. Using the SID lysine levels suggested above, these ratios would all be less than 16% of lysine. Jansman et al. (2010) found higher estimates for SID tryptophan for 10 to 20 kg pigs, both as a percentage of the diet (0.22%) and as a ratio to lysine (21.5%). In a review of 33 experiments, Susenbeth (2006) summarized that the SID tryptophan:lysine requirement is below 17.4% and likely near 16.0%. Susenbeth (2006) also concluded that feeding at 17% would include a safety margin to cover most of biological variations and that the tryptophan:lysine ratio seemed to be unaffected by body weight, growth rate, lysine and protein concentration in the diet, or genetic improvement of the animals.

There is conflicting data on the impact of sanitary conditions on the tryptophan requirement of nursery pigs. Le Floc'h et al. (2007) found that the requirement to pigs in low sanitary conditions may have a higher response to tryptophan due to the increased requirement of the immune system. However, Frank et al (2010) found the opposite response with pigs having a greater response to increasing trp:lys in clean environment than in a dirty environment.

Valine:lysine ratio

Although there are some differences in the estimates for the optimal valine:lysine ratio, we believe that much of the difference may be in the basal valine and lysine levels used in diet formulation. If you formulate the same corn-soybean meal diets with crystalline amino acids using NRC (1998) and INRA or Brazilian (Rostagno, 2005) amino acid values for the corn and soybean meal, a diet containing 65% SID valine:lysine with NRC values will contain 68% SID valine:lysine with INRA values and 69% with values from Rostagno (2005). These differences are minor, but may explain much of the difference between the valine:lysine estimates of 70% from Europe (Barea et al., 2009a) compared with 65% from the United States (Gaines et al., 2010)

Numerous valine trials have been published in the last 10 years. Mavromichalis et al. (2001) was one of the first publications to suggest that the valine requirement of nursery pigs was greater than the level suggested by NRC (1998). Their data suggested that 10 to 20 kg pigs required 12.5 g of SID lysine per kg of gain. Gaines et al. (2010) found a similar requirement of 12.3 g of SID lysine/kg of gain for 13 to 32 kg pigs. Using the requirement of 19 g of SID lysine per kg of gain for nursery pigs found by several researchers and discussed earlier in this paper, a SID Val: SID Lys of 66% can be calculated, which is similar to the 65% reported by Gaines et al. (2010) for 13 to 32 kg pigs and 65 to 67% reported by Wiltafsky et al. (2009b) for 8 to 25 kg pigs. The 65% SID valine:lysine ratio was recently confirmed by Nemechek et al. (2011a) using 7 to 12 kg pigs. A ratio of 65% using NRC (1998) ingredient nutrient values is equivalent to a ratio of 69% using Brazilian ingredient nutrient values of Rostagno (2005).

Isoleucine:lysine ratio

Similar to other amino acids, our understanding of the optimal ratios of isoleucine to lysine has increased greatly in the last 10 years. The main confusion in understanding the optimal isoleucine to lysine ratio is the interaction between isoleucine and other branch chain amino acids, in particular leucine. Excess leucine in the diet increases branch chain keto dehydrogenase levels which leads to catabolism of all branch chain amino acids, leading to increased requirement for isoleucine due to the increased breakdown of circulating levels.

Spray dried blood cells have been used in several isoleucine studies to create a basal diet with a low isoleucine:lysine ratio (Parr et al., 2003, 2004; Kerr et al., 2004). The problem is that blood cells contain high leucine levels, which later were determined to increase the isoleucine:lysine recommendation. Subsequently, Fu et al (2005a,b), Fu et al (2006a,b,c), Dean et al. (2005), and Wiltafsky et al (2009a) demonstrated that the SID isoleucine:lysine requirement was 60% or greater in diets containing blood meal or blood cells and closer to 50% for diets without high levels of blood cells. The requirement of 50% or less for SID isoleucine:lysine when blood cells are not included in the diet was confirmed by Barea et al. (2009b) for 11 to 23 kg pigs. Lindemann et al. (2010) also found the SID isoleucine:lysine requirement to be between 48 and 52% for ADG. Norgaard and Fernandez (2009) found that increasing the isoleucine:lysine ratio from 53 to 62% did not influence performance of 9 to 22 kg pigs. It appears that the SID isoleucine:lysine is less than 52% for diets don't contain a protein source that provides excess leucine in relation to the isoleucine level, such as blood products. Caution is advised with all branch chain amino acids; however, as feeding as little as 5% below the minimum ratio (ex. 45 vs 50% of lysine) will greatly reduce feed intake and daily gain.

Nonessential amino acid requirement

Although the order can vary with different dietary ingredient mixtures, typically the first 5 limiting amino acids for most practical diets are lysine, threonine, methionine, tryptophan, and valine. However, formulating diets with high levels of synthetic amino acids to the optimal ratio for the first 5 limiting amino acids often has resulted in poorer performance than diets with higher levels of intact protein sources. Kendall et al. (2004) found that certain nonessential amino acids (Ex. glycine) were required in corn-soybean meal diets with high levels of synthetic lysine and that the nitrogen could not be provided by nonprotein nitrogen. In a series of experiments, Powell et al. (2009a,b) and Southern et al. (2010) found that glycine and another amino acid to provide nitrogen were required in diets formulated to the fifth or sixth limiting amino acid in order to maintain feed efficiency at similar levels to control diets.

Another method to ensure that the diet contains enough nonessential amino acids is to place a maximum on the total lysine to total crude protein ratio in diet formulation. The biological basis for a lysine:CP ratio originates from the level of total lysine as a percentage of crude protein in muscle, which ranges from 6.5 to 7.5% (NRC, 1998). Although an average lysine:CP ratios of 6.8% is often cited, a higher lysine:CP ratio can be used in the diet because the lysine released during normal muscle protein breakdown is conserved and recycled with greater efficiency than other amino amino acids. Ratliff et al. (2005) suggested that the total lys:CP ratio should not exceed 7.1%. Nemechek et al (2011b) found that feed efficiency was only poorer when the total lysine:CP ratio exceeded 7.35%. More research is clearly needed to continue to improve our understanding of nonessential amino acid needs of the pig.

Nonessential amino acids appear to play a particularly important role immediately after weaning due to their high requirement for intestinal growth. Glutamine serves as a primary fuel for the intestinal mucosa. Glutamine and glyine stimulate polyamine sysnthesis. Arginine is the precursor for polyamines and nitric oxide which is important for regulation of intestinal blood flow and migration of intestinal epithelial cells. Numerous other roles of the nonessential amino acids are reviewd by Wu (2011).

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Table 1. Suggested minimum SID amino acid ratios for growing swine[a]

Amino acid	Pig weight range, kg					
	4 to 25	25 to 40	40 to 60	60 to 80	80 to 100	100 to 130
Lysine	100	100	100	100	100	100
Threonine	62	61	61	62	63	64
Methionine	28	28	28	28	28	28
Methionine + cysteine	58	56	56	56	57	58
Tryptophan[b]	16.5	16.5	16.5	16.5	16.5	16.5
Isoleucine[c]	52	52	52	52	52	52
Valine	65	65	65	65	65	65
Arginine	42	40	38	36	34	34
Histidine	32	32	32	32	32	32
Leucine	100	100	100	100	100	100
Phenylalanine	60	60	60	60	60	60
Phenylalanine + tyrosine	94	94	94	94	94	95

[a]Adapted from Shannon and Allee, 2010 with updates by authors. Ratios are based on NRC (1998) nutrient levels for ingredients. Nutritionists should review their ingredient nutrient values relative to NRC (1998) to apply these ratios to their diets.

[b]Tryptopan:lysine ratio appears to be increased when the diet contains large excesses of large neutral amino acids (leucine, isoleucine, valine, phenylalanine, and tyrosine)

[c]Ratio is at least 60% when high levels of blood meal or cells are included in the diet. Ratio may be lower than 52% when blood cells are not included, but more research is required to verify and to determine the optimal ratio of isoleucine to leucine.

Swine Nutrition and Management Systems that Alter Productivity and Carcass Traits

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Introduction

The swine industry has experienced tremendous change in recent years. Annual productivity continues to increase rapidly due to increased litter size and heavier market weights. The increase in litter size has potential negative ramifications on fetal muscle fiber development and subsequent meat quality. Increased feeding of ethanol byproducts (ex. DDGS and other high fiber ingredients) decrease carcass yields and change the fatty acid profile of pork. The use of carcass modifiers, such as ractopamine, and the recent approval of immunological castration will provide further challenges and opportunities. Production systems are adapting their feeding regimens, marketing programs, genetics, and other management practices to fit specific end market targets (ie. different processors). Depending on market outlet, this can result in a wide disparity in cost of production. These industry changes and potential ramification on producer profitability and downstream carcass traits are the focus of this paper. As swine nutritionists and Extension Swine Specialists, most of our work is on the live production side and thus, the focus of the discussion will be from that perspective.

Genetic changes and litter size

Although genetic technology is the focus of another presentation in this session, any discussion on changes in the swine industry must include the rapid progress in genetic improvement. The days of three breed rotational breeding programs and simple, single trait selection for characteristics such as backfat are long gone. Almost the entire industry has moved to commercial breeding stock suppliers who use a nucleus and multiplier-based system with maternal line genetics used for the sow herd matched with specific terminal sire lines. Most sows are at least 50% Landrace with Yorkshire × Landrace being the most common sow used in commercial herds. These sows are bred to Pietran- or Duroc-based lines as the dominant terminal sires although Hampshire-based lines are still being used by some producers.

This focus on maternal and terminal line genetics has allowed the industry to increase productivity at a rapid rate. After very little change before 1997, pigs per litter has steadily climbed at the rate of 0.12 to 0.13 pigs per litter for the last 15 years. As a result, the entire U.S. industry has increased pigs weaned per litter from 8.6 in 2001 to just over 10.0 pigs at the end of 2011 (Figure 1). A recent National Pork Board study using data from 1.8 million sows in North America found that in 2005, total born and number born alive were 11.82 and 10.77 pigs per litter, respectively (Knauer and Hostetler, 2012). In 2010, total born and number of pigs born alive increased to 13.03 and 11.83, respectively. Impressively, pigs per mated female per year increased at a rate of 0.44 pigs per year from 21.5 in 2005 to 23.6 in 2010 (Table 1). This is a phenomenal rate of improvement in reproductive performance and the corresponding R^2 of 0.99 indicates the consistency of year over year improvement in these traits. The rate of improvement also suggests that litter size will continue to increase as long as genetic selection for this trait continues.

What does selection for hyper-prolific sows and the subsequent increase in litter size mean to meat scientists? Foxcroft et al. (2006) describes the negative influence of increased litter size on muscle fiber development and growth retardation in a portion of the piglets. This leads to increased

variability in birth weight and postnatal growth. As litter size increases, birth weight decreases linearly. Light weight pigs at birth are slower growing and less feed efficient than heavy birth weight pigs (Gondret et al., 2004; Nissen et al., 2004; Berard et al., 2008). The lightest pigs at birth have a lower total number of myofibers, percentage of muscle tissue, total protein, total fat and semitendinosus weight while the percentages of internal organs, skin, bone, and total water are highest compared to their heavier littermates (Rehfeldt et al., 2004). The size of the myofibers is much larger in these lightweight pigs, which may be associated with greater longissimus drip loss compared with heavy birth weight pigs (Rehfeldt et al., 2004). Gondret et al., (2006) also demonstrated that the large muscle fiber area in pigs with a low birth weight was at least partly responsible for decreased tenderness of meat from these pigs. The light birth weight pigs also had greater activity of fatty acid synthase and malic enzyme in backfat and enlarged subcutaneous adipocytes compared with heavy birth weight pigs.

These studies raise concern in the industry that the continued selection for larger litter sizes will lead to slower growth and poorer feed efficiency, and could lead to meat quality issues. Most of these studies were conducted comparing the lightest and heaviest pigs within the litter. Two recent studies explored the litter size question more directly by separating the effects of birth weight and litter size (Berard et al., 2008; Beaulieu et al., 2010). These studies concluded that increasing litter size will reduce average pig birth weight, which impacts growth rate and feed efficiency; however, increasing litter size had very little effect on meat quality. The impact of selection for litter size on meat quality may vary with genotype. Foxcroft et al., (2006) suggest that hyperprolific lines with high ovulation rates and associated high in utero fetal mortality leads to higher variation in piglet birth weight as opposed to sows with more moderate ovulation rates and lower in utero fetal mortality. This is a fertile area of discussion in the swine industry.

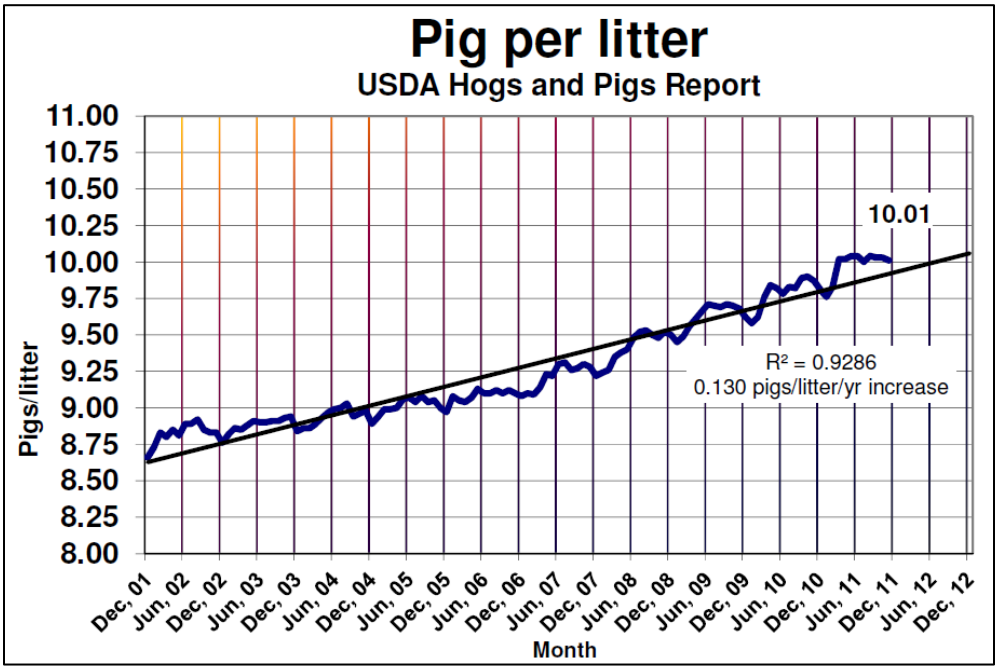

Figure 1. Pigs weaned per litter (USDA ARS, 2011)

Table 1. Changes in swine productivity from 2005 to 2010 (Knauer and Hostetler, 2012)

Averages	2005	2006	2007	2008	2009	2010	Slope	R^2
Sow productivity								
Pigs weaned per litter	9.30	9.39	9.55	9.72	9.98	10.08	0.16	0.97
Preweaning mortality, %	13.7	14.1	14.0	14.2	14.0	14.8	0.15	0.62
Pigs per mated female	21.5	21.9	22.4	22.9	23.4	23.6	0.44	0.99
Finisher, 23 to 118 kg								
Mortality, %	6.67	6.28	7.12	5.95	5.42	5.23	-0.31	0.65
Exit weight, kg	117.7	116.9	117.8	117.9	118.8	119.9	0.5	0.74
Average daily gain, g	735	763	799	785	799	799	14	0.69
Feed efficiency	2.83	2.77	2.77	2.80	2.74	2.75	-0.01	0.56
Caloric efficiency, kcal/kg gain	9,403	9,361	9,233	9,220	9,259	9,467	0.18	0.00

Steady increase in market weight

Besides the increase in sow productivity, the next most consistent long-term trend in the swine industry has been the increase in carcass weights. In the short term, live pig weights have increased by 0.5 kg per year for the last six years. Figure 2 illustrates that this trend has been longer than the increase in sow productivity with carcass weights increasing steadily for over 50 years. Most swine production systems are constrained by time or weeks they have to raise a group of pigs to market weight. For example, a system may have only 24 weeks, or a fixed amount of time, to get a pig from weaning to 275 lb or heavier before the barn must be emptied to allow another group of pigs to enter the barn. In almost all cases, the days available for pig growth within a production system have not increased. Thus, the increase in market weight is mostly driven by an increase in growth rate with leaner, heavier muscled modern genotypes. Similar to the decision for processors to increase target weights to spread fixed costs of processing a pig over more total weight, producers lower their fixed costs per unit of weight gain by increasing market weights. The improved feed efficiency of lean genetics allows producers to economically increase target weights just as processors have increased their weight targets.

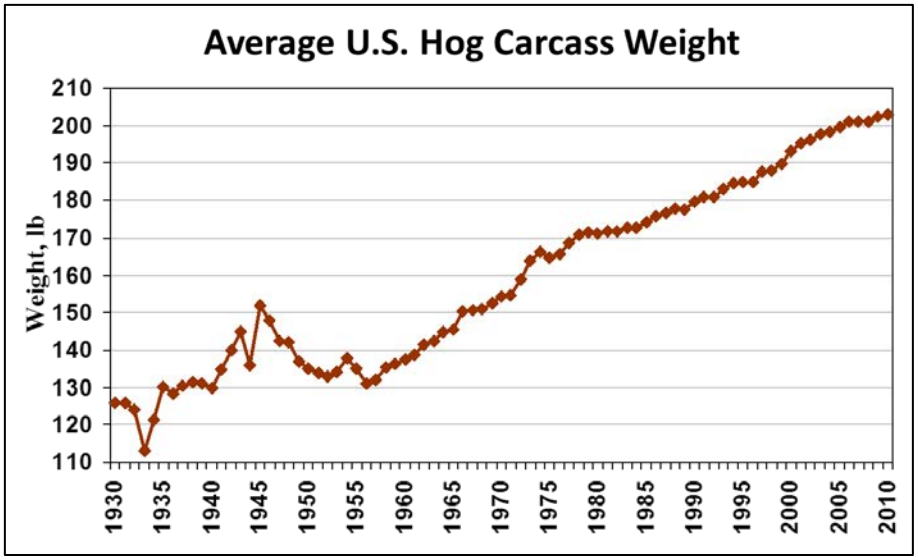

Figure 2. Average pig carcass weight in United States.

Increased use of byproducts from ethanol and food production in swine diets.

One of the greatest changes impacting the cost of production of all segments of the livestock industry in the last 10 years has been the increased use of corn for ethanol production (Figure 3). On a percentage basis, corn used for feed has decreased from over 50% to approximately 35% while corn usage for ethanol production is nearing 40% of U.S. production. This change in corn supply for feed has required livestock producers to explore alternative feed ingredients for use in diets.

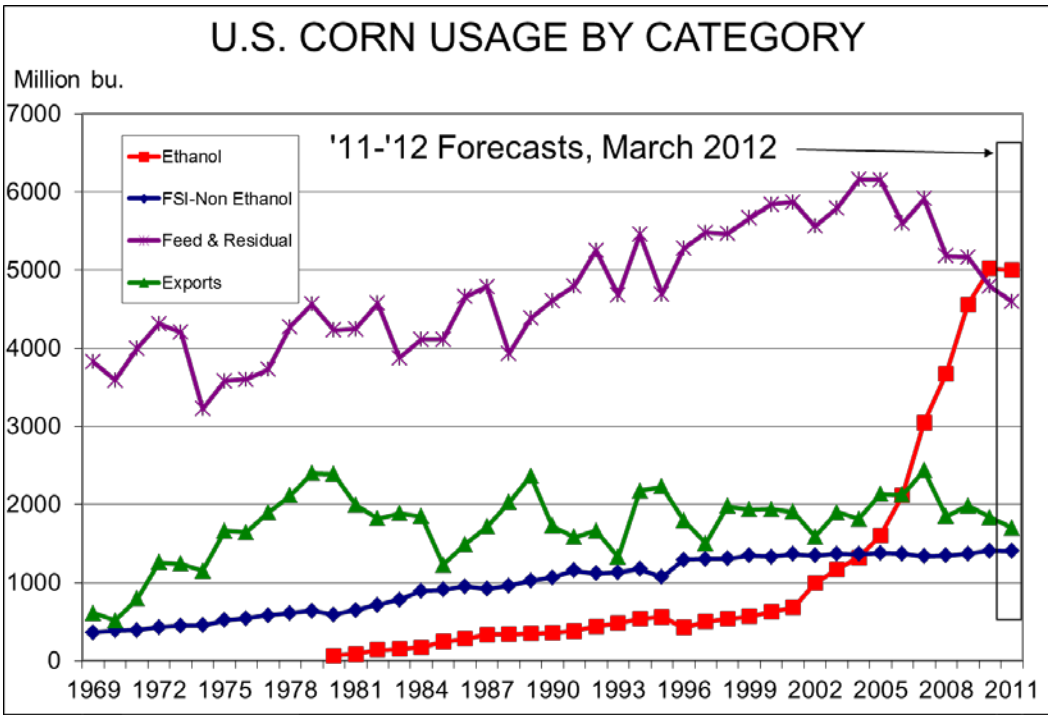

Figure 3. Corn usage by category (Source: Steve Meyer, Paragon Economics, Inc.).

The main alternative ingredient used in pig diets is the byproducts of ethanol production, most notably, dried distillers grains with solubles (DDGS). Other ingredients, such as bakery byproducts and flour milling byproducts (ex. wheat middlings) also are often used as energy sources. The increased use of these byproducts in swine diets add two components to the diet, unsaturated fat and fiber, that can greatly impact the product delivered to the processor.

Stein and Shurson (2009) reviewed the effects of feeding DDGS on pig performance and carcass and fat quality. In short, increasing dietary DDGS reduces dressing percentage and belly firmness, and increases iodine value of fat stores. The influence of DDGS on other carcass measurements, such as backfat and loin depth, is dependent on whether ADG and ADFI are reduced when DDGS are added to the diet. If ADG is not reduced, backfat and loin depth and belly thickness is similar for pigs fed DDGS and those fed corn-soybean meal diets without DDGS. If ADG is reduced, their review indicated that belly thickness, backfat thickness, and loin depth are all reduced. This observation is of particular interest because many new ethanol byproducts are lower in oil and higher in fiber content than conventional DDGS.

Adding unsaturated fat to the diet, especially linoleic acid (C18:2), increases the unsaturated fatty acid content of pork fat (Benz et al., 2011). Decreasing the feeding duration of the unsaturated fat source lowers the content of fatty acids in the fat depot (Xu et al., 2010; Benz et al., 2011). However, even long term removal of the fat source from the diet results in a more unsaturated fat than if the fat source was never added to the diet. This response has been demonstrated for soybean oil (Benz et al.; 2011), DDGS (Xu et al., 2010), and a combination of DDGS and wheat middlings (Asmus et al., 2011). Although data is not available, additions of bakery byproducts or other ingredients that increase the dietary content of unsaturated fats would be expected to produce a similar response.

The changes in fat composition and belly firmness with the addition of DDGS are quite consistent; however, other quality measures are not affected as consistently. Leick et al. (2010) fed up to 60% DDGS and found that while DDGS altered belly characteristics that would influence bacon slicing, other traits like bacon shelf life and loin quality were not substantially affected. Goehring (2010) found that feeding 20% DDGS reduced belly firmness and altered the fatty acid profile as expected, but did not affect belly processing or bacon sensory characteristics. Also feeding 20% DDGS, Widmer et al. (2008) also found no effect of DDGS, high protein DDG, or corn germ on cooking loss, shear force, and bacon distortion scores or the overall palatability of bacon and pork chops.

Clearly fatty acid profiles and fat firmness are changed as an unsaturated fat source is added to the diet. The influence of this change on the product value varies by customer. Thus, it is not surprising that some processors with strong Japanese export business and fresh belly customers are quite concerned with fat firmness. Other customers that predominantly market fresh pork to domestic markets or bellies for microwavable bacon are less concerned with fat firmness.

The fat content of DDGS products is changing rapidly. Ethanol processors are adopting new technologies to remove much of the oil from DDGS. While this change may alleviate a portion of the fat firmness concerns due to unsaturated fat, it will result in distiller byproducts with lower energy and, thus, less value for swine producers. Removing the fat concentrates the protein and fiber content. Increasing the fiber content in the diet increases the weight of the large intestine and lowers dressing percentage (Asmus et al., 2011). The influence of fiber on large intestine weight is the cause of decreased dressing percentage when DDGS is fed up to marketing time. Although the effect on fat firmness by adding fiber to the diet is not as great as the impact of adding unsaturated fat, increasing the fiber content will still increase iodine value and result in slightly softer fat, as demonstrated by Asmus et al. (2012) when adding wheat middlings to the diet.

Ractopamine

The effect of dietary ractopamine on pig performance has been well documented. Feeding 5 to 10 ppm of ractopamine for 14 to 35 days before market increases growth rate and improves feed efficiency (Apple et al, 2007). The review of Apple et al. (2007) also found that dressing percentage, loin muscle area, and fat free lean index increased and tenth rib fat depth decreased as ractopamine level in the diet or feeding duration increased. Similarly, the feed efficiency response is dose dependent. With the recent increase in feed cost and market price, the economic benefit of ractopamine has increased due the improved value of the feed efficiency and carcass weight benefit. Thus, producers using ractopamine have increased the feeding duration and dosage compared with usage in the past.

Because feeding ractopamine increases carcass lean and decreases fat content, it also increases the degree of unsaturated fatty acids including increased linoleic acid content and total

polyunsaturated fatty acids in loin muscle and backfat. However, the effect doesn't appear to be consistent across all fat depots. The iodine value of subcutaneous fat stores, such as backfat increases by approximately 2 to 3 mg/g when 10 ppm ractopamine is fed for 35 d before market (Apple et al., 2008), whereas composition of fatty acids in loin muscle only appears to be significantly influenced when high levels of ractopamine (20 ppm) are fed (Apple et al., 2007). Most experiments have found no negative effects of ractopamine on fresh pork color, firmness, or water holding capacity (Apple et al. (2007) or bacon and belly quality traits (Scramlin et al., 2008). Some have found decreased marbling when feeding ractopamine (Leick et al., 2010), but this response is not consistent (Apple et al., 2007).

Because ractopamine affects pig behavior, heart rate, catecholamine profile, and makes pigs more difficult to handle (Marchant-Forde et al., 2003), it makes pigs more susceptible to handling and transport stress. The swine industry must ensure handling practices are reviewed at the farm and processor level to minimize transport and handling related mortality and downer animals. The increased feeding duration of ractopamine highlights the need for continual focus in this area.

Immunological castration

Immunological castration is not a new technology (Dunshea et al.; 2001), but the recent approval in the United States and Canada has renewed interest in the potential use. A key advantage of immunological castration is that the male pig retains the characteristics of an intact boar until the second immunization, about 4 to 6 weeks before marketing. Thus, the increased protein deposition, lean muscle mass and reduced fat deposition of boars improves overall feed conversion compared with conventional, surgically-castrated pigs. A recent review of 11 studies by Dunshea (unpublished) indicated that immunized males have improved ADG (149 g/d), F/G (0.35), live weight (2.2 kg), and carcass weight (0.45 kg), and lower backfat (2.6 mm), but also had lower dressing percentage (-1.63%) than barrows. The backfat and belly thickness of immunological castrated pigs can be changed by increasing the feeding duration after the second vaccination. Feed intake increases rapidly after the second vaccination. Although feed efficiency continues to be improved at this stage compared to surgically-castrated pigs, fat and protein deposition are much greater for immunological castrated pigs allowing fat composition to be altered via feeding duration. Extending the feeding duration from 4 to 6 weeks after the second vaccination reduces iodine value of fresh bellies to similar iodine values as surgically-castrated barrows (Boler et al., 2012). Increasing dietary lysine levels fed to immunological castrated males, above those normally fed to surgically castrated pigs, also increases carcass primal cutting yield (Boler et al., 2011). However, immunological castrated pigs also have thinner and less firm bellies (Boler et al., 2012) than their surgically castrated counterparts.

The acceptability of immunological castration by U.S. pork processors will drive its application in the industry. The technology clearly works to control boar taint. Proper application within production and changes in processing plants to allow processing of immunological castrated pigs will determine whether the level of success of this technology.

Processor expectations and requirements

Each processor in the U.S. pork industry has different expectations for products delivered to their facilities. This is based on the value of the products they produce and market. These different expectations result in signals sent to producers that determine final market weight, facility utilization, trucking cost, diet cost, genetic selection, biosecurity, and labor requirements.

Processors use weight discounts to encourage producers to market pigs closer to plant's ideal weight range. A processor that has relatively low weight discounts is more forgiving to light or heavy weight pigs. This allows the producer to market more pigs from initial loads from the barn, have fewer marketing events (the number of times groups of pigs are sold from a barn), and sell a greater percentage of their pigs to the primary market. Thus, facility utilization is increased, market weight is increased, trucking and labor cost are reduced, and biosecurity is improved. The reduction in marketing events from a facility decreases the labor and trucking costs because there are fewer partial loads from the barn. This improves biosecurity because the partially-filled truck doesn't have to go to another barn to fill the load, increasing the risk of disease transmission from one barn to another. It is difficult to easily place an economic value on some of these differences, especially for items such as biosecurity. However, it is easy to see 8% or greater differences in facility utilization between production systems marketing to a processor with a "narrow window" with higher weight discounts and production systems marketing to a packer with a wider weight window. An 8% difference in facility utilization is worth about $3/pig space per year. Decreasing the weight discounts also allows producers to market at heavier weights which lowers cost of production by spreading fixed costs over more total pounds of pork.

The biggest value difference for producers is when pigs are marketed outside the optimal weight range for the processor. Using the example in Figure 4, a semi-load of pigs marketed 15 lb above the optimal market weight would have a discount of approximately $1.50/pig for the packer with a wide weight window. For the packer with the narrow weight window, marketing pigs at 15 lb above the ideal weight would result in a discount of approximately $6.00/pig. The wide weight window is much more forgiving for loads marketed above or below the optimal market weight.

Requiring certain fat traits (ex. iodine value in belly or jowl fat) influences diet formulation and can result in increased cost of production. Because quantity of DDGS, bakery products, or other ingredients are limited by fat targets for one processor, but not for others, diet formulations and feed costs can vary greatly for producers marketing to the different processors. For example, one producer may need to limit their DDGS inclusion rate to 15% of the diet to meet low iodine value targets. Another producer without those requirements may be able to feed 30 to 40% DDGS in most of their finishing diets. At current costs, the result is a $2.50 to 4.00 per pig difference in production cost due to differences in feed cost.

Genetic source requirements are another area where one processor may differ from another. A terminal sire line may be prohibited by one processor, but allowed by another processor. The prohibited sire line may have significant advantages in live production (ex. reduced mortality and number of cull pigs) that more than offsets the reduced value for the processor. As a result, a genetic source requirement can dramatically increase a producer's cost of production.

A final difference between processors can be their acceptance of technology such as ractopamine. With current prices, feeding ractopamine can increase profitability by $2 to 4/pig. Therefore, , a producer marketing to a processor that does not allow ractopamine use must be paid a higher price to compensate for the reduced profit potential.

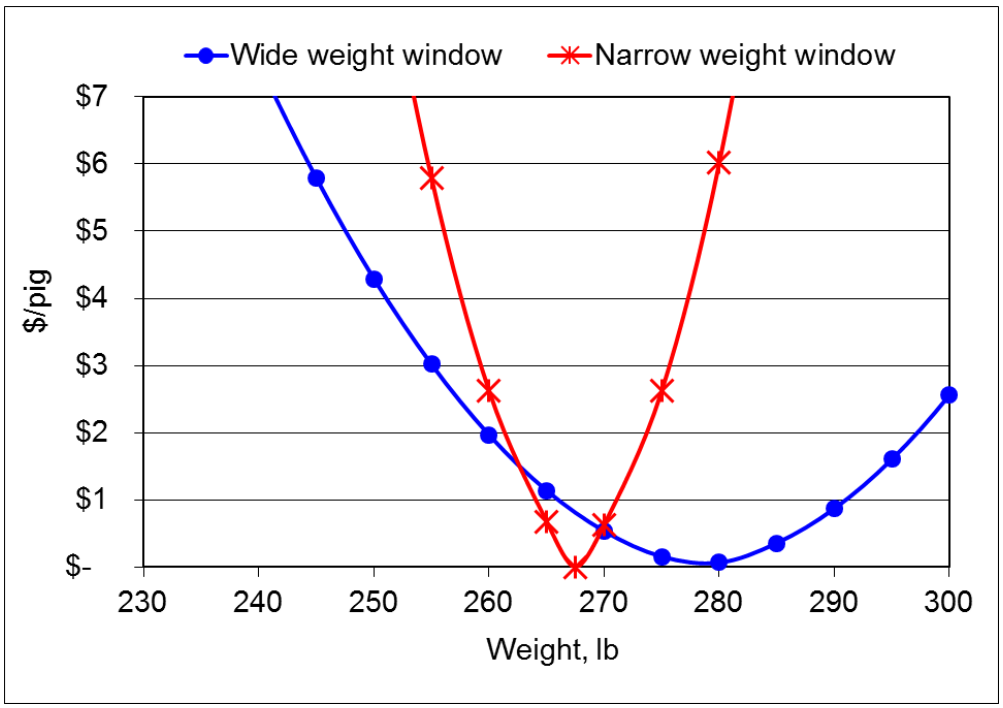

Figure 4. Average lost profitability per pig for a load of pigs marketed to two different processors with a narrow or wide weight window ($80/cwt and $250/ton final diet cost).

Conclusion

The swine industry continues to undergo rapid changes that impact production costs and the quality of pork delivered to the processor. This paper has touched upon some of the technology implemented by pork producers to help lower their cost of production. For example, litter size is increasing at 0.13 pigs per litter each year. While this is a benefit for the pork producer, it may negatively affect muscle fiber development which could lead to decreased pork quality. The increasing use of ethanol byproducts (ex. DDGS) has resulted in fat quality concerns, especially for export markets and belly processors. Yet again, this is an opportunity for the producer to help lower cost of production by $2 to 4 per pig. Increases in feed cost also have resulted in the increased dose and feeding duration of ractopamine, which while profitable to the producer, makes pigs more susceptible to transport stress and elevates the need for proper handling techniques to minimize downer or fatigued pigs. Immunological castration provides a new challenge for producers and processors to determine whether they can capture the potential value of this technology. Finally, pork processors' purchasing programs and specifications regarding ideal carcass weight ranges have led to major differences in barn utilization, feed cost, and cost of production for different swine producers.

The objective of my presentation has been to try to educate meat scientists and processors about these technologies that are economically favorable to producers but may have negative ramifications on pork quality. U.S pork producers are some of the most efficient producers in the world. We all want to produce a safe, nutritious, and desirable product to feed the worlds growing need for protein. Our hope is that we can find compromise in cost structure for producers and pork quality for packers. Obviously, there is need for enhanced communication between pork producers and packers to solve these issues.

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