2009

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
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Co-sponsored by

Kansas Pork Association
College of Veterinary Medicine, KSU
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Tuesday, February 3, 2009
Forum Hall, K-State Union

SWINE PROFITABILITY CONFERENCE

KSU Forum Hall
K-State Union
Tuesday, February 3, 2009

Program Agenda

Morning Program

9:15 a.m.	Registration
9:30 a.m.	Jack and Pat Anderson Lecture in Swine Health Management: **What I'm Telling My Clients About Their Future in the Swine Industry** *Dr. Joe Connor, Carthage Veterinary Service, Carthage, IL*
10:30 a.m.	**Successfully Controlling Risk in the New Era of Price Volatility** *Bob Taubert, Co-owner and CEO of New Horizon Farms, Pipestone, MN*
11:15 a.m.	**Market Hog and Grain Price Outlook for 2009 and Beyond** *Dr. Darrell Mark, Ag Economist, University of Nebraska*
Noon	**Lunch**

Afternoon Program

1:15 p.m.	**Change IS Coming – What Do We Need to Do?** *Panel Discussion including* *Dr. Joe Connor, Carthage Veterinary Service* *Dr. Steve Henry, Abilene Animal Hospital* *Bob Taubert, New Horizon Farms*
2:15 p.m.	**Changing the Culture of a Business/Institution** *Dr. Jon Wefald, President, Kansas State University*
3:15 p.m.	**Adjourn**

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KSU Forum Hall
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SWINE PROFITABILITY CONFERENCE

February 3, 2009

Jack and Pat Anderson Lecture in Swine Health Management:
"What I'm Telling My Clients About Their Future in the Swine Industry

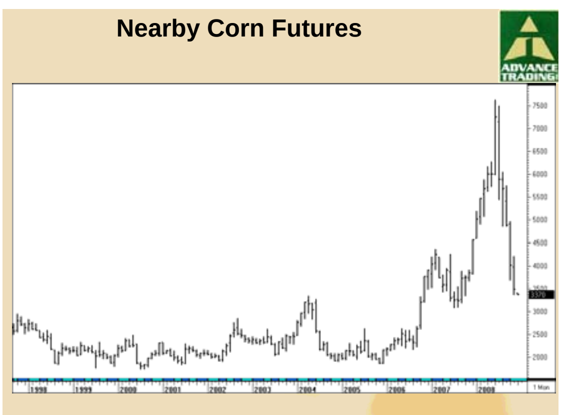
by

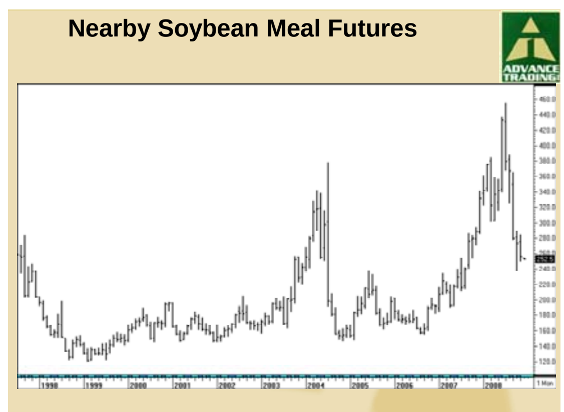
Dr. Joe Connor
Carthage Veterinary Service
Carthage, IL

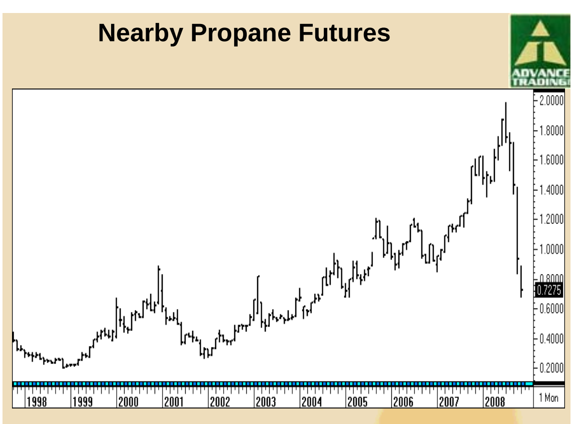
Jack and Pat Anderson Lecture in Swine Health Management:
"What I'm Telling My Clients About Their Future in the Swine Industry?"

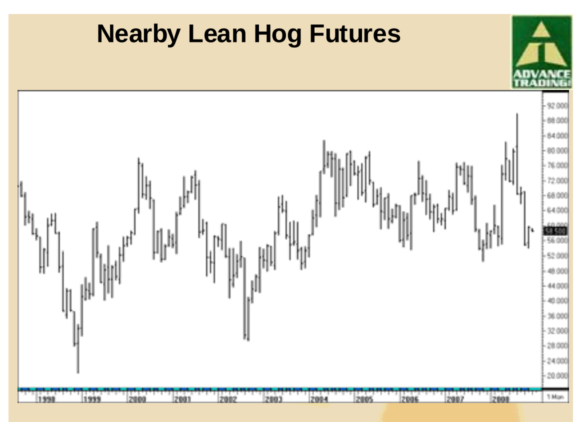
Dr. Joe Connor, D.V.M., M.S.
Carthage Veterinary Service, Carthage, IL

I appreciate the opportunity to present at the widely recognized KSU Swine Days. I must tell you that when Dr. Jim Nelson called, I did not return his call for several days because I have learned that when he calls he always wants something. I did my best convincing that there are much better speakers than I am, particularly with respect to this topic. Having said that, this is a topic that is on the minds of all of us. Historically, when we think about volatility, we have been concerned about the slaughter price as the primary volatile commodity and we have been in a pattern of narrow up and down ranges in the key cost inputs. In 2007, some of the cost inputs such as labor, workers' compensation, insurance, and miscellaneous started out pacing sow productivity in the farrow-to-wean units. Then along came 2008 with 100+ percent increase in corn and soybean meal driving the farrow-to-wean cost from $30 to $40 per head and wean-to-finish from $60 to $100 per head. The historical trend of propane, corn, soybean meal, and lean hog futures are enclosed. No one in this audience needs to be reminded of the volatility in the markets and the complete reversal over a single crop season of prices. As Tom Hanks said in Apollo 13, "Well, let's hope we don't have to do that again."









Face the brutal facts. We are in a high stakes game and you must decide if you want to be a player. It is not only the volatility of inputs, but it is the competitive balance around the world to meet future protein needs in the face of environmental and welfare challenges. I would encourage you to listen to or read *Good to Great*.[1] This is an analysis of companies that have a high rate of return over a prolonged period of time. *Good to Great* compares and contrasts similar businesses and the decision making process to keep them sustainable. It is the same in your business.

It is a time to reflect the long-term future in the pork business and whether each of us are involved in a model that is correct for the future. This was a year to have a marketing plan on both inputs, outputs, and to continually review that plan. This was a year to minimize losses or accept small profits. Find the commodity advisors you are comfortable with and develop a relationship.

In 2009, for those that survive, the land-based system that produces your own grain is clearly in the driver's seat and has the opportunity to expand. The integrated model without a land base is being stressed. The problem with this is that the majority of producers cannot expand in both land and pigs simultaneously.

Most of us cannot even foresee the challenges in the next 10 years. We are too focused on challenges within the next one to three years. Just last week, we received notification that herds must file by January 20, 2009 for environmental emissions if they are a CAFO. Unfortunately, they probably forgot that the day was a holiday in Illinois, and thus the immediate scramble to hit the deadline was all more pressing.

With the change in input costs, we will enter a higher slaughter price plateau. The higher slaughter value changes the metric for interventions. Strategies that traditionally may not have been cost effective are now cost effective. Interventions that were traditionally too costly now may be the most cost effective.

Health will remain the king. The emergence of PCV2 acted as another reminder. All of us have experienced the joy of high health status populations, marketing 96 percent of the pigs placed with very few culls to deal with or pigs to euthanize. We have also experienced populations of high mortality, high morbidity, low average daily gain, high feed per gain, and decline in percent lean. Health remains a key driver of the predictability of a system. Emerging pathogens will occur and old pathogens will adapt to create havoc within the production. The natural cycle will continue. Critique decisions that pull you away from a system established to handle emerging diseases and pathogen drift. In our business, there is always the pull of barriers and economics that contrast the ideal system. Data suggests that as population sizes within a site increases, performance decreases. We often start with one 2,400 head barn per site, but if it is a successful contract grower, we allow them to put another 2,400 head barn on that site, and then later another 2,400 head barn on that site. The economic constraints and management constraints favor this, but the ideal blueprint for optimizing performance sustainability may not favor this. Establish a high health production system.

There are no standard health programs. Herd health programs are a continued series of calculated efforts individually designed for each farm to maximize production and optimize costs. The ideal program is continual re-evaluation based on population medicine and cost effective management. I have established numerous standard practices only to have producers not fully implement because of lack of continual follow-up. Great programs are pig level.

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[1] Collins, Jim. 2001. Good to Great. *Harper Audio CD*

Stay current on records and set aside time monthly and quarterly to understand what the records are telling you. It is too easy to discount the numbers because of month-to-month influences that you are aware of. If you cannot stay current on records, outsource them, but request that your company or business has both production and financial records that are staying in the general accounting principles. Do not let this distract you. Continually review your top 10 costs.

The old saying is that you cannot change what you cannot measure. This is a key motivator of action plans. Be creative in measuring whatever you are trying to change. I have found it very helpful to set a threshold number of observations and to chart those observations in the office on a piece of paper or erasable board. As an example, if your action is to change diarrhea therapy, treat every other litter until you have 100 treatment litters and 100 controls. Tabulate the results. Barn people frequently are under optimistic as soon as any change in therapy occurs. By making them weaker threshold, you can increase the attention paid to that therapy and more accurately interpret success or failure.

Benchmark is the recognition of the best in class achievement in performance. It is a target or standard of excellence against which similar processes can be measured, i.e. it is a metric in contrast. Benchmarking is a continuous process of comparing processes within an organization for performance. It is the search for best practices or processes that lead to efficiency and superior performance. Producers and owners want us to help improve productivity and optimize cost. It is valuable to both benchmark and do benchmarking. To be successful in benchmarking you must be committed to the process, must know the business, and identify what and who to benchmark. Continually study comparable companies and use what is learned from the benchmarking to improve the process. There are a number of sources of data that can be used for benchmarking. Knowing the expected productivity and cost is very important and comparing the production of cost to one of the various benchmarks is helpful in motivating stockmen.

Recognize benchmarks have high value to motivate all of us, but accept that these benchmarks will continue to change and the bar will continue to be raised because of a multitude of factors. There is an inherent desire in your producers to be in the 75th percentile. They expect that you will be a key part of benchmarking, comparing, and contrasting their production to the data within the benchmarks and to help them set realistic production and/or financial objectives.

What productivity is achievable? Challenge yourself by using the productivity and cost benchmarks. It is not too long ago that we considered 40 pigs per female lifetime as a target. Just a few short years, this benchmark has been raised to 50 pigs per sow lifetime and pounds produced have increased to 6,600. We are in a competitive environment, not only in the U.S., but worldwide. Realize that benchmarks will continue to change and you have to use these benchmarks to continually assess the drivers within your own operation.

Forget about averages. Concentrate on being in the top 50 percent and recognize that bar will continually elevate. Stay away from extremes and manage your technology as you would other investments. Look for a balanced production and offer a bonus for the balance system.

Pigs weaned per mated female will continue to be a metric to optimize wean pig cost. A one pig per mated female increase will reduce cost by 3 percent. This should not remove focus from the individual cost components of producing that wean pig. However, still optimize the inputs. As an example, if the same lifetime productivity occurs with a gilt serviced at 300 pounds compared to 375 pounds of body weight, then servicing at 300 pounds optimizes cost because it reduces the feed maintenance cost per lifetime.

Size continues to be a driver primarily influenced by finishing site fill times. Open days in a wean-to-finish barn are extremely costly. To maximize your flow, you need to batch farrow or belong to sow co-ops. There is likely an opportunity in 2009 and maybe 2010 to have lower construction and remodeling costs giving you an opportunity to continue your strategic plan. We will never be static. A good example is today, you that are land based and have solid production are clearly in the driver's seat with many options. You have the opportunity to expand, purchase, or operate other facilities. Be an early adapter, but only if cost effective programs.

Continue to look for cost efficient technologies. These gains can come either in increased productivity or reduced cost. There are a number of strategies pushed forth each year that must be evaluated within your system. Here are some of the recent examples:

1. AB rod for insemination – Trials indicate an increase in productivity and reduction in labor.
2. Gerdis insemination rod – Trials indicate a reduction in labor.
3. Future technology will continue to occur, as an example Improvest®, which is now cleared in 20+ countries, will be introduced into the U.S. in the future. The feed efficiency of feeding intact boars will be huge.

It is not satisfactory today just to send a pig to harvest. It is necessary to send a pig that your buyer can maximize their value. Whether selling wean pigs or selling your own pigs, think as an integrated system increasing pigs per sow per year while increasing the number of low birth weight pigs, and consequently number of lightweight pigs at slaughter. It might not necessarily be the correct objective. Know your customer. Coordination throughout the chain may not immediately bring individual value, but longer term sustains you as a supplier to that customer. With marketing, I see no home runs with long-term packer agreements today. However, there is a lot of singles and doubles to optimize your return. Understand your packer matrix and integrate it in with your genetics to optimize feed conversion, individual pig value within the matrix. Strive to optimize profit for the individual pig. This depends on the cost of adding an additional pound in late finishing and on your packer matrix. The profit optimal average marketing weight can increase gross margin $2.36/head.

There will be a continual lack of human capital and the demographics will continue to change. As I think about our industry, I think about these strengths and weaknesses:

1. Less than 2 percent of us now reside on farms.
2. Less than 50 percent of those 2 percent have ever resided on livestock farms.
3. Our industry has challenges. The average person within works 50+ hours per week. Family members that have not grown-up around livestock struggle with the weekend responsibilities of feed, water, and comfort.
4. There is ongoing turnover, and thus ongoing training required. For many of you, the reality of high turnover rate is daunting. You look at it as a failure within yourself or within your system. Because we have such a shortage of human capital, we do not have the luxury of a readily available labor base of which we can fully sort and match to our system, personalities, etc. Unfortunately, it is typically first-come-first-serve and we frequently move people up within the system and often to a level that is above their own. Many of us have a tolerance for how many people we can manage. Many of you have built your company from the ground up and have had long-term employees. However, to continue to expand and participate in the industry you need to expand, which means you need to put a structure in place to manage and train employees.

I have come to realize that one of the greatest potentials and detriments to production and herd health is pigmanship. Many times facilities are constructed and populated and there is not a commitment to pigmanship resulting in lack of desire to achieve excellent results.

We talk about a closed herd system typically referring to poor management of health. Producers will need to be in a closed information system, which means that you will need to invest in research that would be applicable to your genotype, facilities, and management. You need this to optimize your system.

Producers need to participate in research. You are fortunate in Kansas to have had the University as a leader. If you are not a participant to receive that information, you should do so. As the industry consolidates and systems grow, there will be less and less opportunities for University research due to the change in funding. There will be more effort for supply companies to introduce innovative technology in a prioritization method starting with the largest with a majority of technology. The value is in early adapters and great implementers. As a producer, you will need to be willing to support that research. For that support, you will be part of a board that prioritizes research projects and waits the economic outcome of the project. Unless there is a change and we continually decline in funding for basic research, there may be a deficiency in human capital to conduct basic research. Universities will be continually driven to outside funded research in order to retain staff and they will less likely be able to conduct what we label production research. To capture value you must have systems established that would get the results of the research to you in a timely manner.

We are often puzzled by the inability of science to drive accepted decisions. Fortunately, many times science requires a long time to identify cause, effect, and nebulous categories such as welfare and sow housing. Many of us in this room either have raised or can remember the family raising sows in pens or in outside lots. Those memories make it very difficult to accept some of the welfare actions that are being suggested. At the same time, we recognize that there are compromises that hopefully can achieve both objectives, but only if the objectives are not continually changed. It is always difficult to balance the different disciplines.

Review your entire system with focus on optimizing return. Measure how you are doing with eliminating bottlenecks. Some of the key restrictions are:

1. Double stocking
2. Weaning weight
3. Co-mingling flows
4. Health
5. Vaccinations or lack of
6. Feed ingredients
7. Finishing square feet/pig
8. Feeder design
9. Building design
10. Ventilation
11. SOP implementation

Look for high value with your consultants. Stay with a winner. Pick your advisors carefully. The advice cannot be 100 percent implementable, but if you pick the correct advisor over time, it will be highly valuable. I have come to recognize that with our own consultants the ones that are high value are those that are excellent knowledge base, challenge the system, drive toward answers, and have very quick turnaround time on identifying any actions. When you develop your action plans and review the percentage of plans that are implementable at each meeting with your consultant, a key separation still remains and that is the ability to implement actions. I always have the background that all of my clients have equal access to information. However, they may not fully implement for a number of reasons. A task of your consultant is to knock down those barriers with implementation. Your task as an owner or pigman is to knock down those barriers of implementation at the pig level.

KISS still remains highly effective at the pig level. The job of management is to provide the information and action plans that are easily understood and implementable. The information driving the action plans has to be explained to the barn staff. As an example, feed interruptions and what is classified as a feed interruption. Set up ways for your staff to monitor. If you measure, you will get improvements. As an example, with feed interruptions each feeder has the ability to have an interruption each day. Have the barn staff mark on a chart for 30 days the number of individual feed interruptions and tabulate that at the end of the month. This will drive change.

Producers have a unique opportunity to competitively produce pork. The volatility of inputs and the challenges of production, health, human capital, and regulations will separate success from non-success. The successful model is defining action plans that are implementable at the pig barn.

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SWINE PROFITABILITY CONFERENCE

February 3, 2009

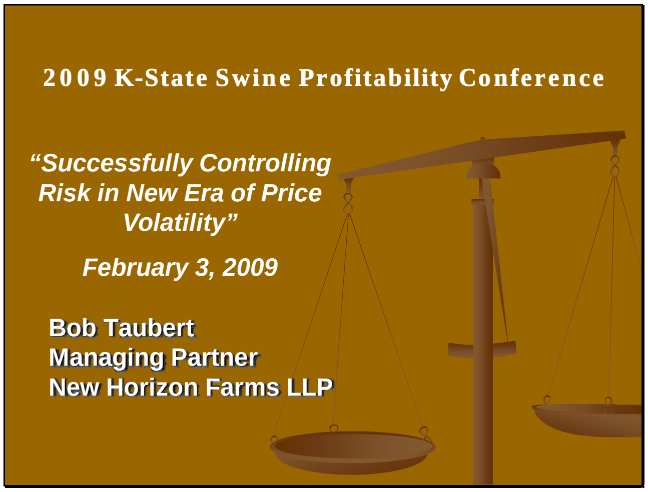
"Successfully Controlling Risk in the New Era of Price Volatility"

by

Bob Taubert
New Horizon Farms
Pipestone, MN

Successfully Controlling Risk in the New Era of Price Volatility

Bob Taubert
New Horizon Farms, Pipestone, MN



"Successfully Controlling Risk in the New Era of Price Volatility"

What is the Goal?

- Can I Be a Hedger or Is Hedging For Me?
- Ultimate Goal is To Develop a ***<u>Sustainable Disciplined Strategy To Ensure Profits & Reduce Risk</u>***
- Set Realistic Goal For Acceptable Rate of Return on Investment
- Return on Investment Must Be Commensurate With The Risk

"Successfully Controlling Risk in the New Era of Price Volatility"

Where to Start?

- Locate Trustworthy Marketing Advisor
- Be Honest With Yourself in Determining Your "All-In" Cost of Production
- Separate Corn & Soybean Meal Costs From Your Overall Cost of Production
- Model Lean Hog Futures to ***<u>Determine The Historical Relative Trading Values of Each Month to Each Other or "Spreads"</u>***

"Successfully Controlling Risk in the New Era of Price Volatility"

What's Next?

- Coming to Grips With Some Facts
- They Are:
  - Your Goal is To Manage The Margin or "Crush"
  - "Crush" is The Lean Hog Price Minus Corn & Soybean Meal Cost Minus All Other Costs
  - You ***<u>Are Not Attempting to Predict Prices</u>*** or Hit The High on Hogs or The Low on Corn as a Way to Be Profitable
  - You Need To Be Looking Well Out Into Future

"Successfully Controlling Risk in the New Era of Price Volatility"

Information is Important; But…..

- It's Only as Good as The Source
- It's Old by The Time You and I Get It
- It's Often Filled with Someone Else's Bias
- It's Often an Overreaction to Outside Forces
- It's Only Relevant in The Context of Managing The Crush!

"Successfully Controlling Risk in the New Era of Price Volatility"

Having Said That; Information is Important!

- Fundamental Information is Important
- USDA S&D Reports, Planting Intentions, Etc. are Important
- Estimates Contained in Quarterly Hog & Pig Reports are Important
- Worldwide Pork & Grain Production Numbers are Important as Is Competing Protein Production
- The Flow of Information Leads to Volatility

"Successfully Controlling Risk in the New Era of Price Volatility"

Volatility

- Volatility Can Lead to Much Anxiety
- The Focus Needs to Be Placed on Managing The Crush Not on The Volatility
- Volatility Creates Higher Highs and Lower Lows
- Increased Volatility Leads to Increased Opportunity to Hedge The Crush

"Successfully Controlling Risk in the New Era of Price Volatility"

"Developing The Model"

- "Model" Was Developed in 2002 Using a Historical Average Annual Corn Price of $2.00/Bushel & $180/Ton Soybean Meal Cost
- "All-In" Other Costs Were Figured @ $82/Head
- Based on Net Return of $5/Head The "Base Target" Was Set At An Average of $60/cwt
- Monthly Futures Targets For Hogs Were Set Based on The Historical Relationship Around $60/cwt

"Successfully Controlling Risk in the New Era of Price Volatility"

Assumptions in The "All-In" Other Costs of $82/Head

- Base Wean Pig Cost of $30/Head Procured Through Management Agreement
- Rented or Leased Growing Facilities
- Feed Manufactured by Toll Miller
- Growing Phase Managed by Management Company
- In Other Words; "Everyone Else Gets Paid First"
- This "All-In" Number Need Customization To Your Operation

"Successfully Controlling Risk in the New Era of Price Volatility"

Price Average of $60/cwt

- Each Trading Month Has a Target Based on The $60/cwt Average
  - February $57.35
  - April $60.00
  - May $65.35
  - June $67.35
  - July $66.35
  - August $63.35
  - October $57.35
  - December $55.35

Hog Margin Worksheet

January 13, 2003		Corn	Meal		
		$2.00	$180.00	All Expense Minus Corn and Meal	
Bushels per Pig		8.2	158 lbs	$82.00 per Head	

	Target	Corn Price	Meal Price	Cost of Production	Margin per Pig Today's Market
JANUARY	$57.35	$2.00	$180.00	$57.46	-$0.21
FEBRUARY	$57.35	$2.00	$180.00	$57.46	-$0.21
MARCH	$60.00	$2.00	$180.00	$57.46	$4.98
APRIL	$60.00	$2.00	$180.00	$57.46	$4.98
MAY	$65.35	$2.00	$180.00	$57.46	$15.47
JUNE	$67.35	$2.00	$180.00	$57.46	$19.39
JULY	$66.35	$2.00	$180.00	$57.46	$17.43
AUGUST	$63.35	$2.00	$180.00	$57.46	$11.55
SEPTEMBER	$57.35	$2.00	$180.00	$57.46	-$0.21
OCTOBER	$57.35	$2.00	$180.00	$57.46	-$0.21
NOVEMBER	$55.35	$2.00	$180.00	$57.46	-$4.13
DECEMBER	$55.35	$2.00	$180.00	$57.46	-$4.13
January '03 - December '03 Average		$2.00 per bu	$180.00 per ton	$57.46 per cwt	$5.39 per head
	TARGET PRICES	CASH CORN PRICE	CASH MEAL PRICE	COST OF PRODUCTION	MARGIN PER PIG

This data is provided for information purposes only and is not intended to be used for specific trading strategies without consulting Professional Ag Marketing Inc. No guarantee of any kind is implied or possible where projections of future conditions are attempted. Past results are no indication of future performance. All information is based upon data that is believed to be reliable, but its accuracy is not guaranteed.

"Successfully Controlling Risk in the New Era of Price Volatility"

Just When You Thought You Had It All Figured Out!

- Fall 2006 Comes Along
- Persistent Australian Drought Impacting Wheat Crop
- Government Increases Mandate for Ethanol
- Speculative Fund Buying of All Commodities
- Weak Dollar Supportive of Exports
- Volatility Increases
- Historical Pricing Levels Begin to Change

"Successfully Controlling Risk in the New Era of Price Volatility"

Hedging Strategy in Need of Change

- Historical Price Plateau for Corn Changing
- Corn Price Begins to "Couple" With Crude Oil
- Could No Longer "Count On" Corn to Be $2.00/bushel & Soybean Meal to Be $180/ton
- The "Model" Needed Modification
- Still Utilized "All-In" Other Costs as Base
- Now Considered All Three "Legs" Together
- New Model Evolved

"Successfully Controlling Risk in the New Era of Price Volatility"

New Model

- Revised Targets Based On Higher Corn & Soybean Meal Costs
- Each Calendar Month Looked @ Individually Rather Than Assuming an Average Corn & Soybean Meal Price for The Entire Year
- Revised "All-In" Other Costs as They Increased
- Set New Hog Price Target for Each Month Based on Individual Monthly Corn & Soybean Costs Plus "All-In" Other Costs

Hog Margin Worksheet

January 13, 2009

[redacted]

All Expense Minus Corn and Meal
$87.00 per Head

	Corn	Meal	
	$3.69	$300.28	
Bushels per Pig:	8.2	158	lbs

	Old Target	Revised Target	Todays Price	Corn Price	Meal Price	Cost of Production:	Margin per Pig Today's Market	Futures Prices		Corn Basis	
JANUARY	$57.35	$68.38	$59.83	$3.43	$305.00	$71.04	-$21.98	Mar '09 Corn	$3.65	($0.22)	JAN
FEBRUARY	$57.35	$68.55	$59.83	$3.47	$305.00	$71.21	-$22.31	May '09 Corn	$3.76	($0.18)	FEB
MARCH	$60.00	$71.37	$65.85	$3.51	$305.00	$71.38	-$10.83	July '09 Corn	$3.87	($0.14)	MAR
APRIL	$60.00	$71.72	$65.85	$3.58	$306.50	$71.73	-$11.52	Sep '09 Corn	$3.97	($0.18)	APR
MAY	$65.35	$77.32	$77.20	$3.64	$306.50	$71.98	$10.23	Dec '09 Corn	$4.11	($0.12)	MAY
JUNE	$67.35	$79.52	$77.90	$3.67	$309.10	$72.18	$11.21	Mar '09 Meal	$305.00	($0.20)	JUNE
JULY	$66.35	$78.73	$78.28	$3.72	$309.10	$72.39	$11.54	May '09 Meal	$306.50	($0.15)	JULY
AUGUST	$63.35	$75.70	$76.73	$3.79	$300.60	$72.36	$8.56	July '09 Meal	$309.10	($0.18)	AUG
SEPTEMBER	$57.35	$69.83	$69.80	$3.82	$300.80	$72.49	-$5.28	Aug '09 Meal	$300.60	($0.15)	SEP
OCTOBER	$57.35	$69.39	$69.80	$3.86	$285.60	$72.05	-$4.41	Sep '09 Meal	$300.80	($0.25)	OCT
NOVEMBER	$55.35	$67.49	$67.35	$3.89	$285.10	$72.15	-$9.41	Oct '09 Meal	$285.60	($0.22)	NOV
DECEMBER	$55.35	$67.70	$67.35	$3.94	$285.10	$72.36	-$9.82	Dec '09 Meal	$285.10	($0.17)	DEC
January '09 - December '09 Average		$72.14 per cwt	$69.65 per cwt	$3.69 per bu	$300.28 per ton	$71.94 per cwt	($4.50) per head				
	OLD TARGET PRICES	NEW TARGET GIVEN TODAYS CORN MEAL PRICE	TODAYS BOARD PRICE	CASH CORN PRICE	CASH MEAL PRICE	COST OF PRODUCTION	MARGIN PER PIG				

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"Successfully Controlling Risk in the New Era of Price Volatility"

Disciplined Approach

- Keep Focus on The Model & The Margin
- Don't Look Back or Second Guess The Trades
- Learn From The Process
- Modify Model When Things Change
- Use Volatility & Wide Swings in The Market to Potentially Enhance Margin With Put Options on the Corn & Soybean Meal & Call Options on The Hogs
- This Can Be Done at Known Cost

"Successfully Controlling Risk in the New Era of Price Volatility"

Some Things Required

- Need To Establish Relationship With "Hedging Advisor"
- Working Capital to Margin Positions
- A Lender That Understands Hedging & That "*If You Are Making Margin Calls You Will Be Making Money & Reducing Their Risk Too!*
- Discipline; "You Can't Be a Part-Time Hedger"
- The Ability to Execute & "Pull The Trigger"

"Successfully Controlling Risk in the New Era of Price Volatility"

Thank You!

SWINE PROFITABILITY CONFERENCE

February 3, 2009

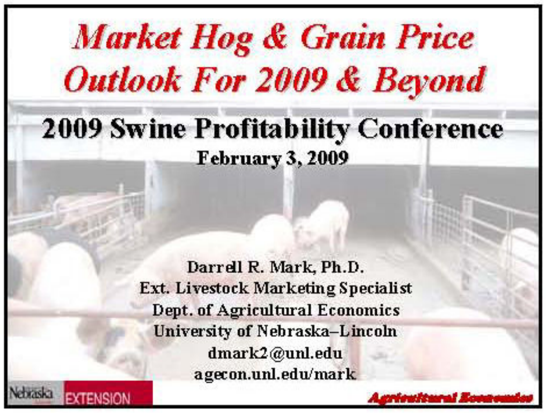
"Market Hog and Grain Price Outlook for 2009 and Beyond"

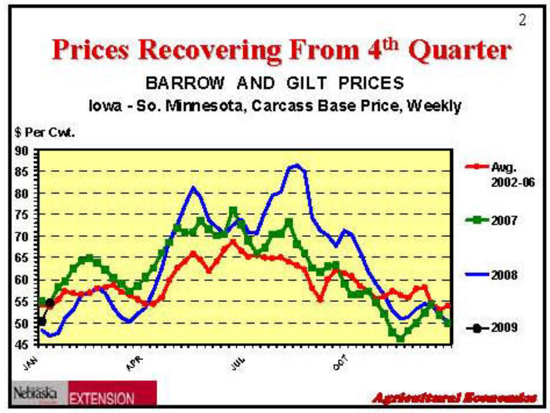
by

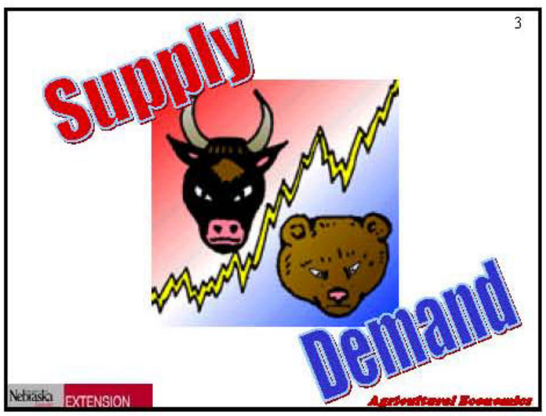
Dr. Darrell Mark
University of Nebraska

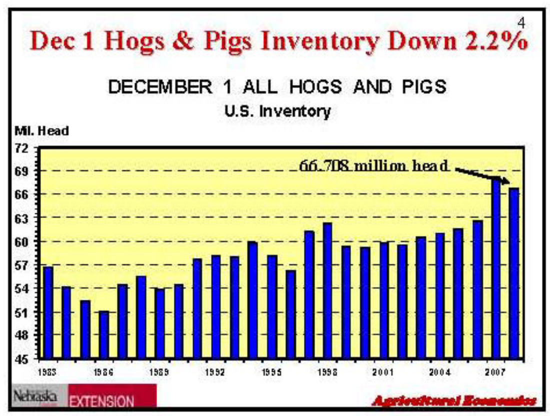
Market How and Grain Price Outlook for 2009 and Beyond

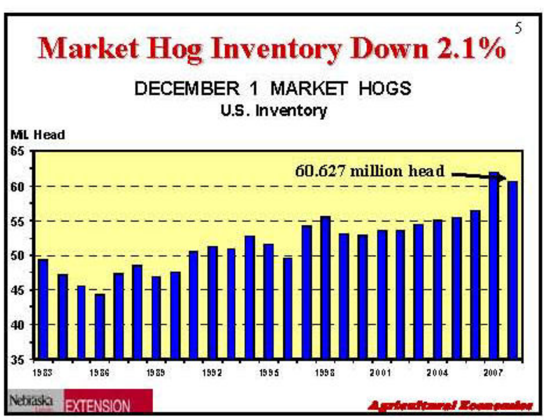
Dr. Darrell Mark
Ag Economist, University of Nebraska-Lincoln

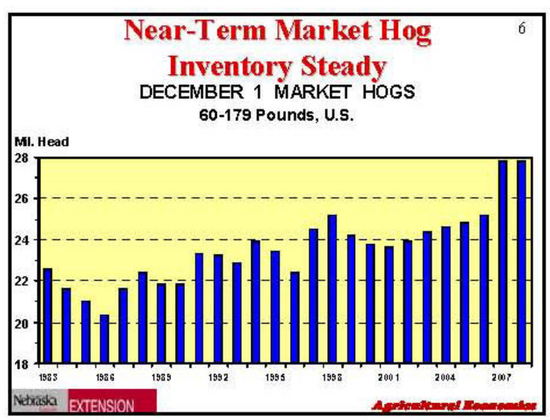








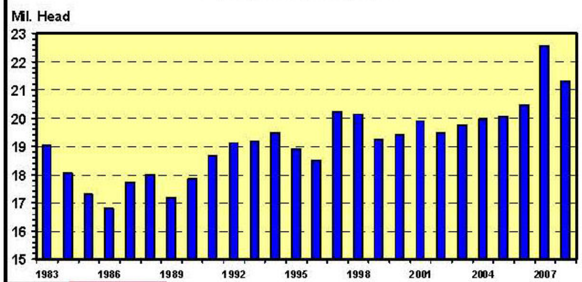




7

Apr-Jun Market Hog Inventory Down 5.5%

DECEMBER 1 MARKET HOGS
Under 60 Pounds, U.S.



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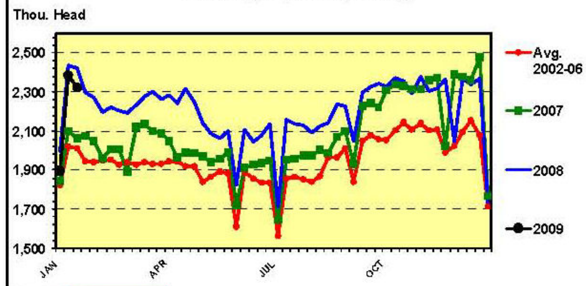
8

2008 Slaughter Up 6.3% From 2007

HOG SLAUGHTER
Federally Inspected, Weekly



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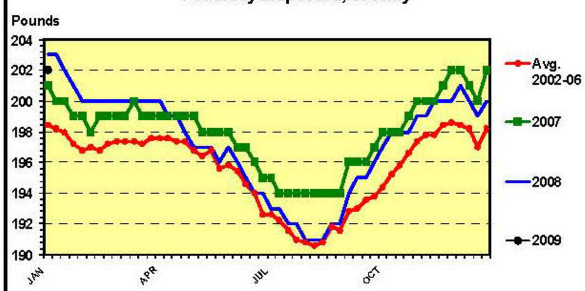
9

Weights Below Year-Ago Levels

BARROW AND GILT DRESSED WEIGHT
Federally Inspected, Weekly



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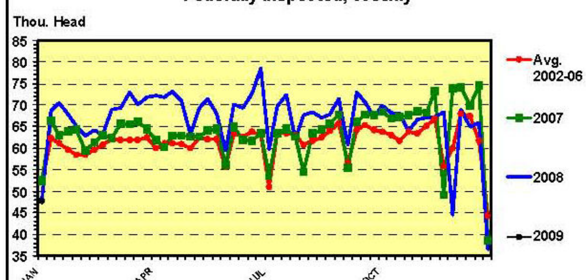
10

2008 Sow Slaughter Up 5.0%, But Dropping In Recent Months

SOW SLAUGHTER
Federally Inspected, Weekly



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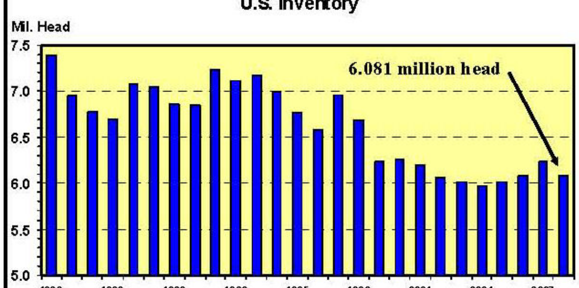
11

Breeding Hog Inventory Down 2.4%

DECEMBER 1 HOG BREEDING HERD
U.S. Inventory



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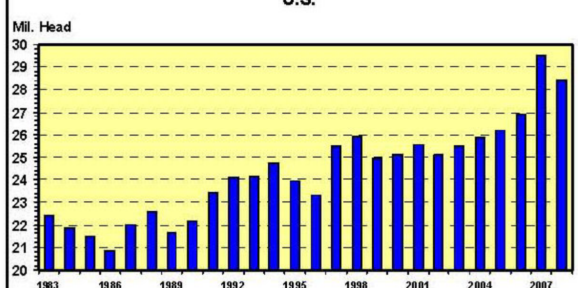
12

Last Quarter's Pig Crop Down 3.7%

SEPTEMBER - NOVEMBER PIG CROP
U.S.



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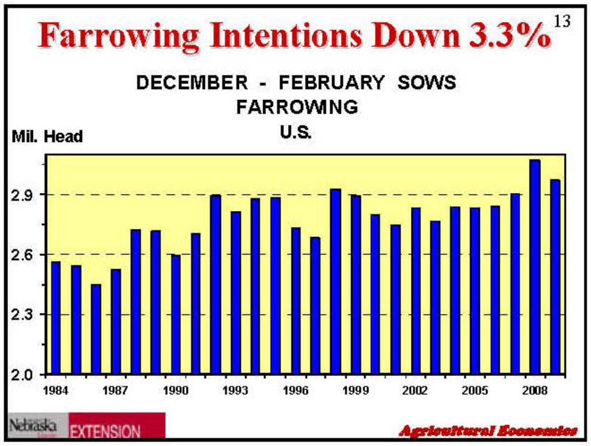
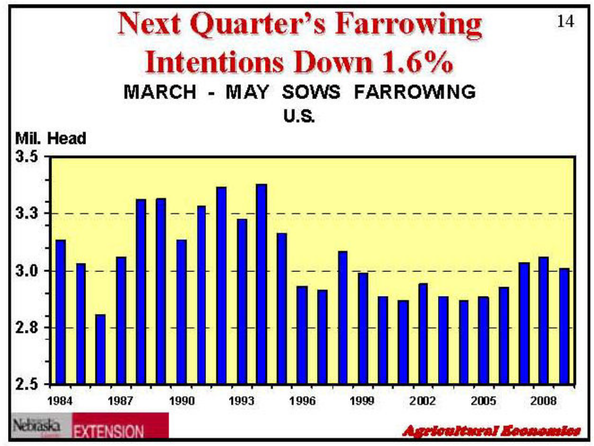
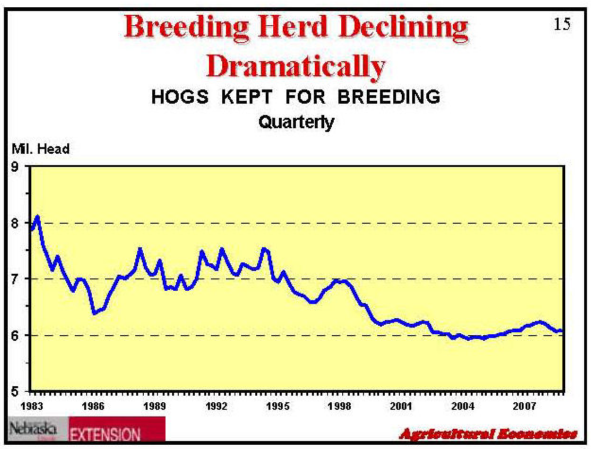
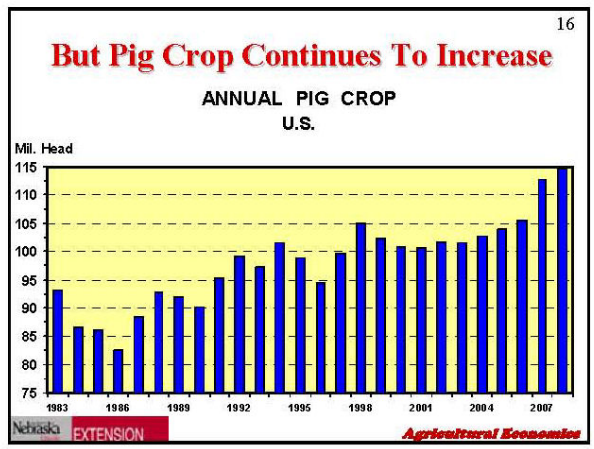
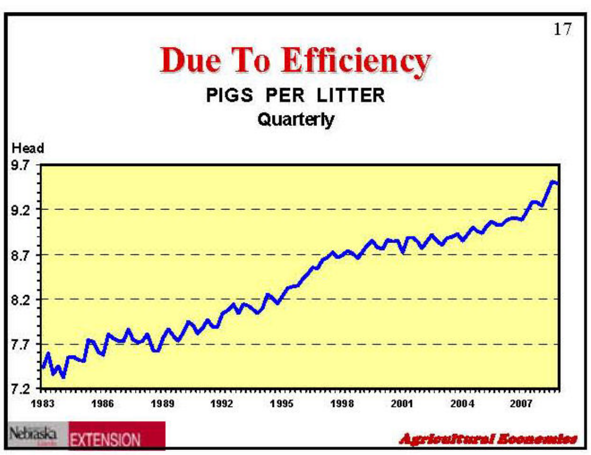
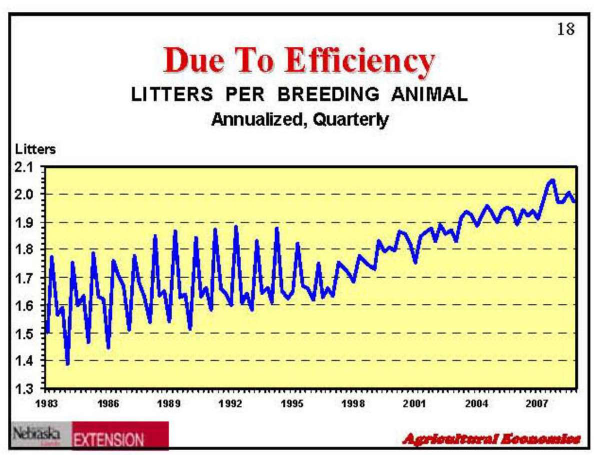

Farrowing Intentions Down 3.3%
13
DECEMBER - FEBRUARY SOWS FARROWING
U.S.
Mil. Head
2.0
2.3
2.6
2.9
1984
1987
1990
1993
1996
1999
2002
2005
2008
Nebraska
EXTENSION
Agricultural Economics


Next Quarter's Farrowing Intentions Down 1.6%
14
MARCH - MAY SOWS FARROWING
U.S.
Mil. Head
3.5
3.3
3.0
2.8
2.5
1984
1987
1990
1993
1996
1999
2002
2005
2008
Nebraska
EXTENSION
Agricultural Economics


Breeding Herd Declining Dramatically
15
HOGS KEPT FOR BREEDING
Quarterly
Mil. Head
9
8
7
6
5
1983
1986
1989
1992
1995
1998
2001
2004
2007
Nebraska
EXTENSION
Agricultural Economics


16
But Pig Crop Continues To Increase
ANNUAL PIG CROP
U.S.
Mil. Head
115
110
105
100
95
90
85
80
75
1983
1986
1989
1992
1995
1998
2001
2004
2007
Nebraska
EXTENSION
Agricultural Economics


17
Due To Efficiency
PIGS PER LITTER
Quarterly
Head
9.7
9.2
8.7
8.2
7.7
7.2
1983
1986
1989
1992
1995
1998
2001
2004
2007
Nebraska
EXTENSION
Agricultural Economics


18
Due To Efficiency
LITTERS PER BREEDING ANIMAL
Annualized, Quarterly
Litters
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1983
1986
1989
1992
1995
1998
2001
2004
2007
Nebraska
EXTENSION
Agricultural Economics

19

Year	Comm. Slaughter (1,000s)	%	Avg. Carcass Wt. (lbs.)	%	Comm. Pork Prod. (Mil lbs.)	%
2009:1	28,992	-2.0	203	-0.6	5,876	-2.4
2009:2	27,014	-3.3	199	-0.8	5,377	-3.9
2009:3	27,699	-3.5	196	-0.2	5,436	-3.5
2009:4	29,845	-3.0	202	0.1	6,027	-2.9
2009	113,550	-3.0	200	-0.4	22,715	-3.1

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20

2008 Canadian Feeder Imports Up 12.7%
Oct-Dec Imports Down 22%

FEEDER PIG IMPORTS FROM CANADA
Weekly

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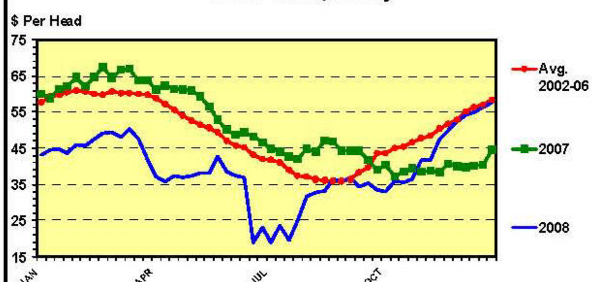
21

FEEDER PIG PRICES
40-50 Pounds, Weekly



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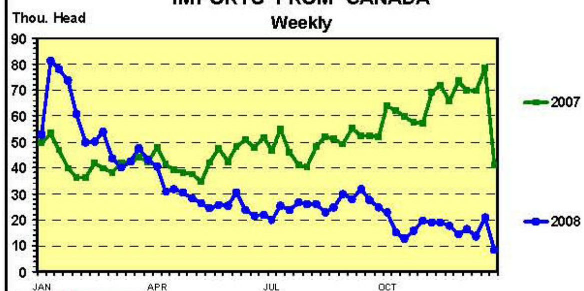
22

2008 Canadian Hog Imports Down 37%
Oct-Dec Imports Down 74%

SLAUGHTER BARROWS & GILTS
IMPORTS FROM CANADA
Weekly



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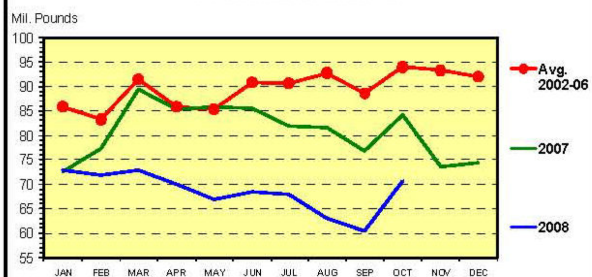
23

Jan – Oct Pork Imports Were Down 16.5%

U S PORK IMPORTS
Carcass Weight, Monthly



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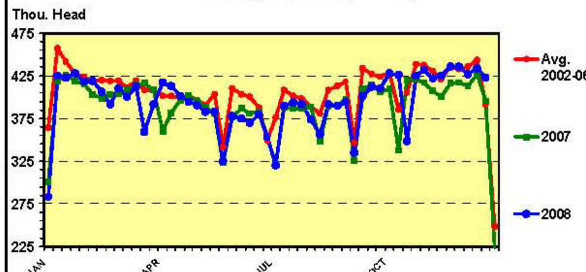
24

Canada Increased Slaughter In
4th Quarter 2008

CANADA HOG SLAUGHTER
Federally Inspected, Weekly



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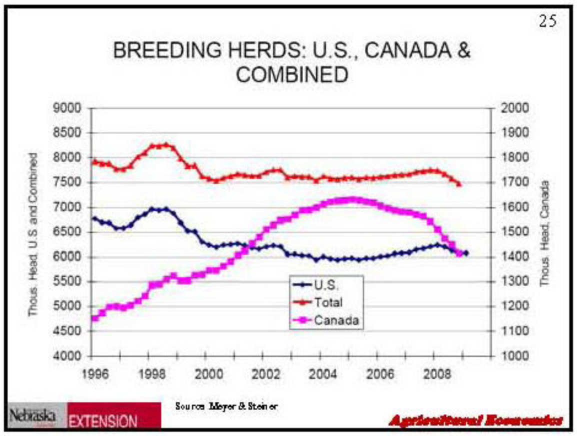
25
BREEDING HERDS: U.S., CANADA & COMBINED
Thous. Head, U.S and Combined
Thous. Head, Canada
U.S.
Total
Canada
Source Meyer & Steiner
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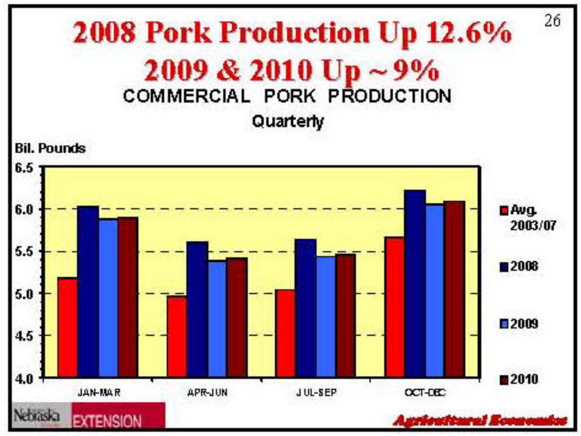
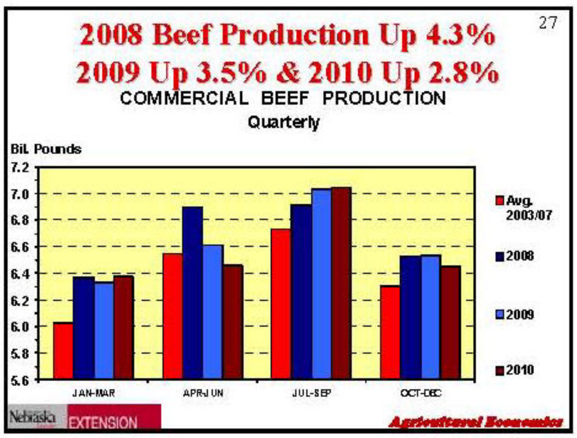
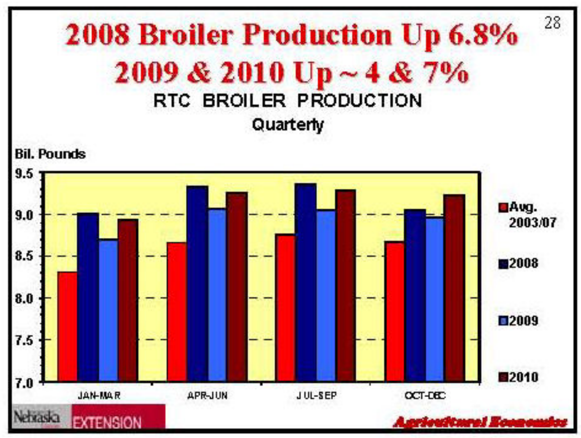
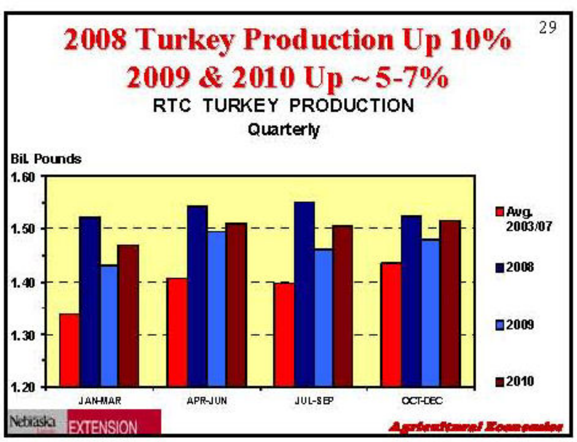
Agricultural Economics


26
2008 Pork Production Up 12.6%
2009 & 2010 Up ~ 9%
COMMERCIAL PORK PRODUCTION
Quarterly
Bil. Pounds
JAN-MAR
APR-JUN
JUL-SEP
OCT-DEC
Avg. 2003/07
2008
2009
2010
Nebraska EXTENSION
Agricultural Economics


27
2008 Beef Production Up 4.3%
2009 Up 3.5% & 2010 Up 2.8%
COMMERCIAL BEEF PRODUCTION
Quarterly
Bil. Pounds
JAN-MAR
APR-JUN
JUL-SEP
OCT-DEC
Avg. 2003/07
2008
2009
2010
Nebraska EXTENSION
Agricultural Economics


28
2008 Broiler Production Up 6.8%
2009 & 2010 Up ~ 4 & 7%
RTC BROILER PRODUCTION
Quarterly
Bil. Pounds
JAN-MAR
APR-JUN
JUL-SEP
OCT-DEC
Avg. 2003/07
2008
2009
2010
Nebraska EXTENSION
Agricultural Economics


29
2008 Turkey Production Up 10%
2009 & 2010 Up ~ 5-7%
RTC TURKEY PRODUCTION
Quarterly
Bil. Pounds
JAN-MAR
APR-JUN
JUL-SEP
OCT-DEC
Avg. 2003/07
2008
2009
2010
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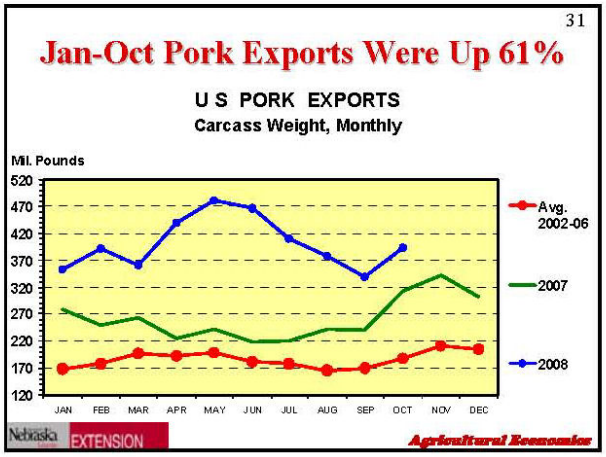
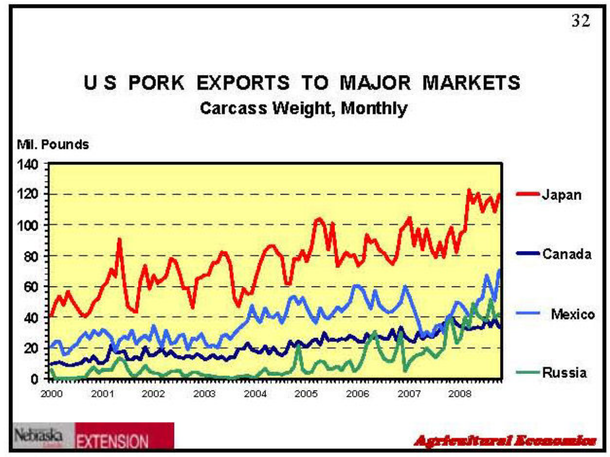
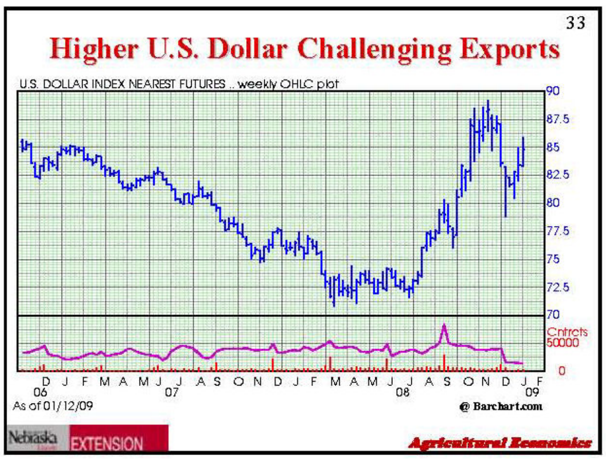
Demand Fundamentals
Nebraska EXTENSION
Agricultural Economics


31
Jan-Oct Pork Exports Were Up 61%
U S PORK EXPORTS
Carcass Weight, Monthly
Mil. Pounds
Avg. 2002-06
2007
2008
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Nebraska EXTENSION
Agricultural Economics


32
U S PORK EXPORTS TO MAJOR MARKETS
Carcass Weight, Monthly
Mil. Pounds
Japan
Canada
Mexico
Russia
2000 2001 2002 2003 2004 2005 2006 2007 2008
Nebraska EXTENSION
Agricultural Economics


33
Higher U.S. Dollar Challenging Exports
U.S. DOLLAR INDEX NEAREST FUTURES .. weekly OHLC plot
Cntrcts 50000
As of 01/12/09
@ Barchart.com
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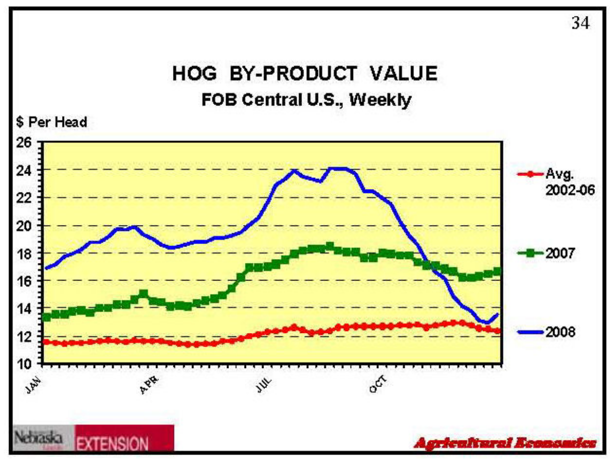
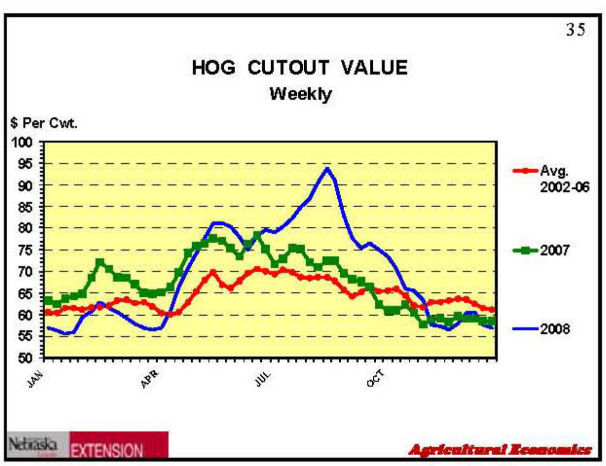
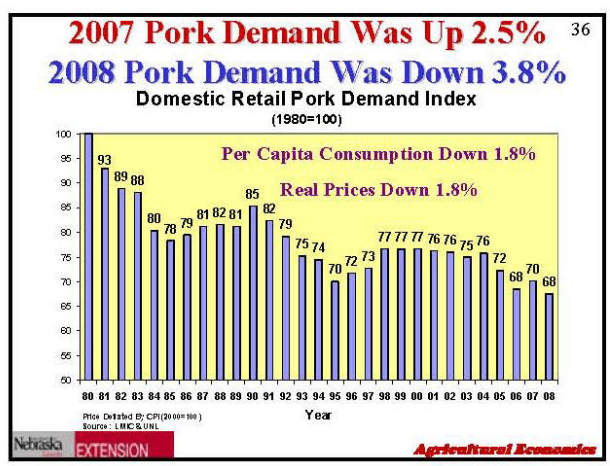
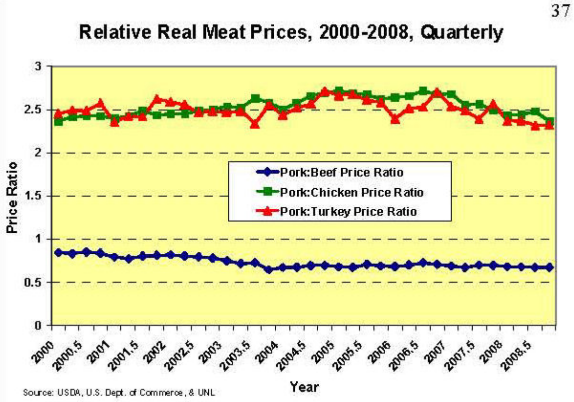

34
HOG BY-PRODUCT VALUE
FOB Central U.S., Weekly
$ Per Head
Avg. 2002-06
2007
2008
JAN APR JUL OCT
Nebraska EXTENSION
Agricultural Economics


35
HOG CUTOUT VALUE
Weekly
$ Per Cwt.
Avg. 2002-06
2007
2008
JAN APR JUL OCT
Nebraska EXTENSION
Agricultural Economics


2007 Pork Demand Was Up 2.5%
36
2008 Pork Demand Was Down 3.8%
Domestic Retail Pork Demand Index
(1980=100)
Per Capita Consumption Down 1.8%
Real Prices Down 1.8%
Year
Nebraska EXTENSION
Agricultural Economics

37



38

Will Domestic Pork Demand Improve In 2009?

Bullish

- Consumers may trade down from beef to pork

Bearish

- Recession, job losses, declines in consumer incomes & equity

	Sept	Oct	Nov
Restaurant Performance Index	96.7	97.1	96.7
Current Situation Index	96.4	96.6	96.2
Expectations Index	97.0	97.6	97.1

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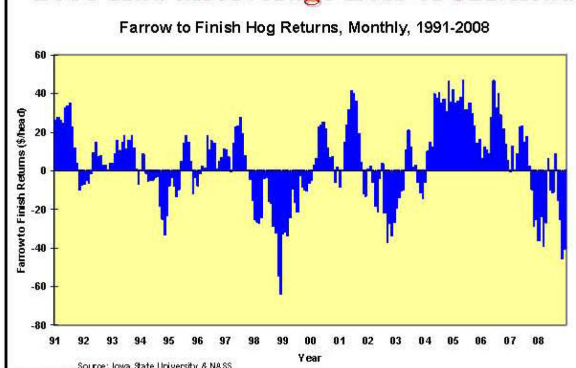
Other Economic Challenges

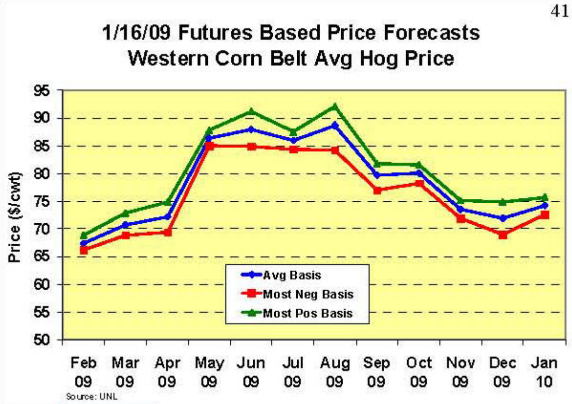
- **International Finance**
  - ✓Foreign exchange has lost value against the US$ (except Japanese yen)
  - ✓Credit availability for purchases
- **Hog Producers**
  - ✓Higher equity requirements
  - ✓Tougher lending requirements
  - ✓More market volatility

40

2008 Had an Average Loss of $21/head



41



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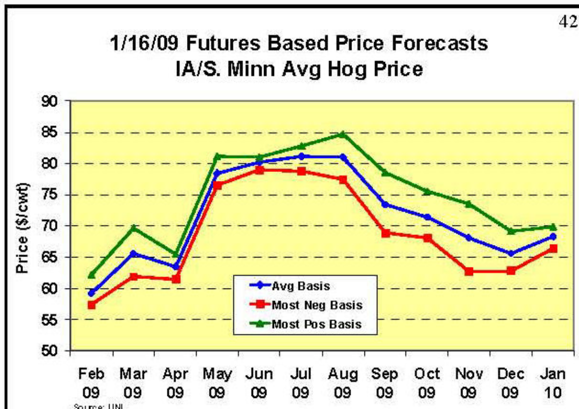

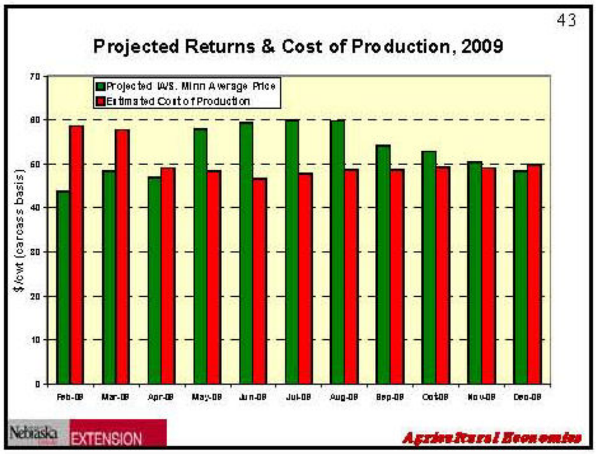

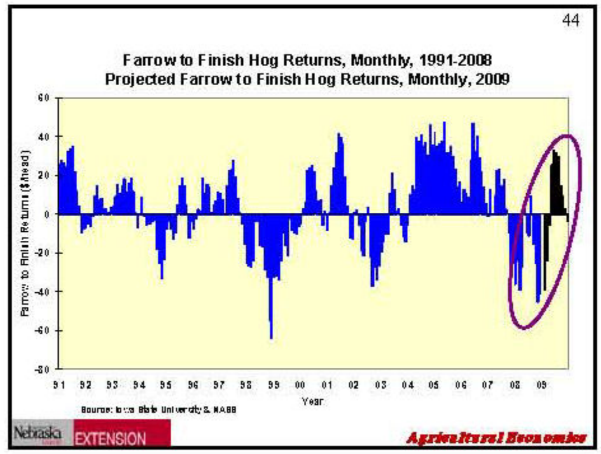

45

U.S. Feed Grain and Corn Supply and Use 1/

Item	2006/07	2007/08 Est.	2008/09 Projections December	2008/09 Projections January
CORN				
Area		Million acres		
Planted	78.3	93.5	85.9	86.0
Harvested	70.6	86.5	78.2	78.6
Yield per harvested		Bushels		
acre	149.1	150.7	153.8	153.9
		Million bushels		
Beginning stocks	1,967	1,304	1,624	1,624
Production	10,531	13,038	12,020	12,101
Imports	12	20	15	15
Supply, total	12,510	14,362	13,659	13,740
Feed and residual	5,591	5,938	5,350	5,300
Food, seed & industrial	3,490	4,363	5,035	4,900
Ethanol for fuel 2/	2,119	3,026	3,700	3,600
Domestic, total	9,081	10,302	10,385	10,200
Exports	2,125	2,436	1,800	1,750
Use, total	11,207	12,737	12,185	11,950
Ending stocks, total	1,304	1,624	1,474	1,790
CCC inventory	0	0	0	0
Free stocks	1,304	1,624	1,474	1,790
Outstanding loans	116	106	200	200
Avg. farm price ($/bu) 3/	3.04	4.20	3.65- 4.35	3.55- 4.25

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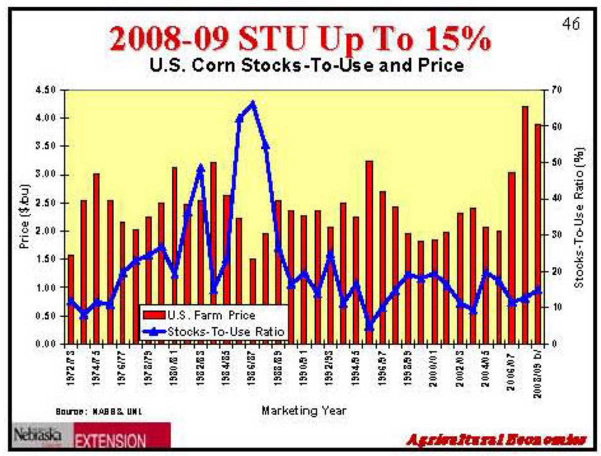
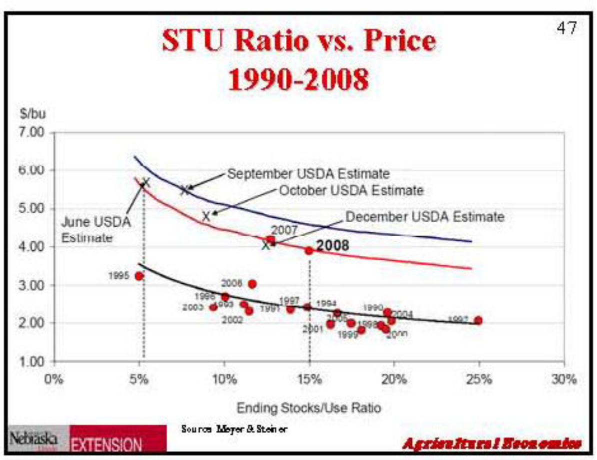
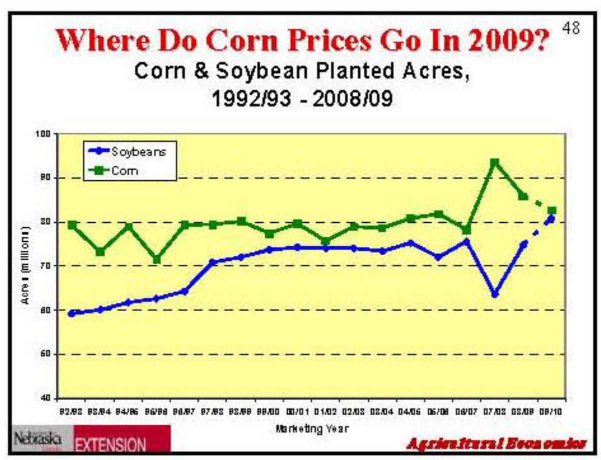
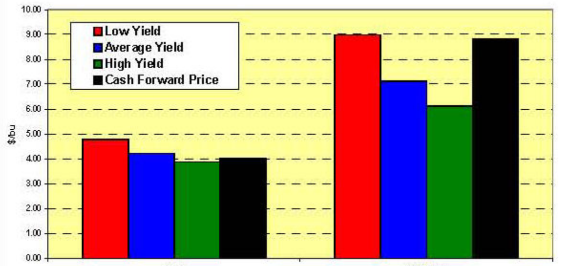






49

Corn & Soybean Cost of Production & New-Crop Cash Forward Prices, North Central Kansas



Source: KSU Budgets

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Estimated 2009-2010 Corn Supply & Use

	Planted Acres	82,700,000
	Harvested Acres	75,257,000
×	Yield Per Acre (trendline)	157
=	Production (thousand bu)	11,815,000
+	Carry In (thousand bu)	1,790
=	Total Supply (thousand bu)	11,816,790
-	Livestock Use (thousand bu)	5,300
-	Ethanol Use (thousand bu)	4,285
-	Other Industrial Use (thousand bu)	1,300
-	Exports (thousand bu)	1,700
=	Ending Stocks (thousand bu)	-768

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Corn Price Outlook

Bullish

- Must buy acres
  - ✓ Higher input costs
- Ethanol plants will stay in market long-run
- Crude oil prices may rally on Mideast instability

Bearish

- Growing carryover & STU ratio
- Weak economy
- Strengthening dollar
- Ethanol demand temporarily lower
- Livestock numbers will be lower

Nebraska EXTENSION — Agricultural Economics

52

Weekly Corn and DDGS Prices for Kansas, 2006-2009

Source: AMS & UNL

Nebraska EXTENSION — Agricultural Economics

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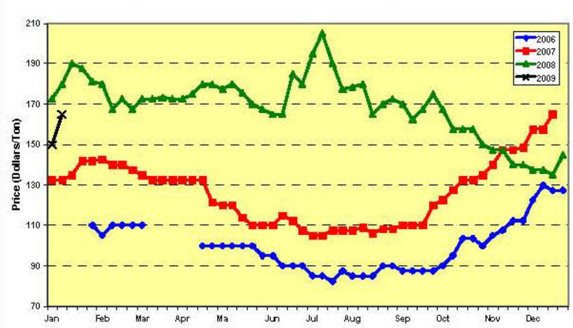
Weekly DDGS Prices for Kansas, 2006-2009



Source: AMS & UNL

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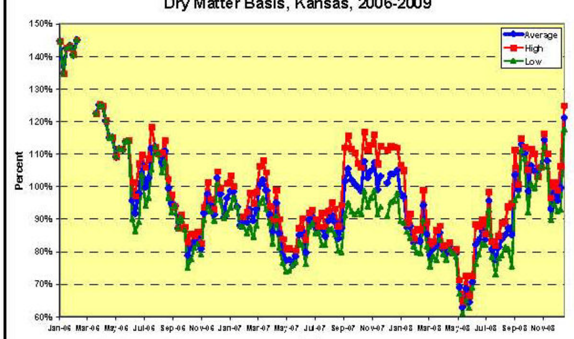
DDGS as a Percent of Corn Price, Dry Matter Basis, Kansas, 2006-2009



Source: AMS & UNL

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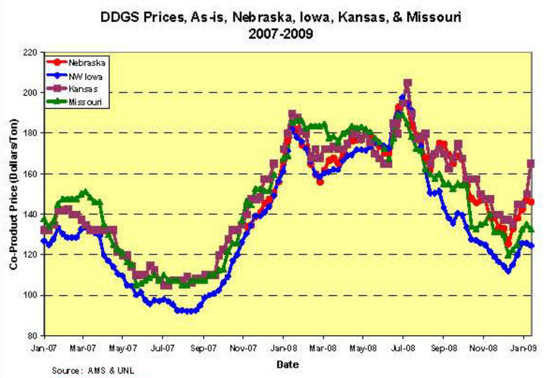

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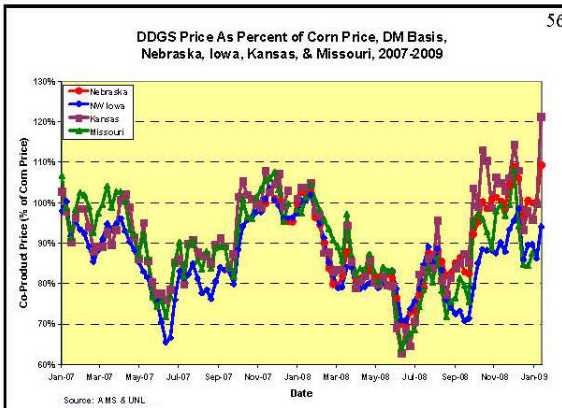

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U.S. Soybeans and Products Supply and Use (Domestic Measure) 1/

Item	2006/07	2007/08 Est.	2008/09 Projections December	2008/09 Projections January
SOYBEANS:		Million acres		
Area				
Planted	75.5	64.7	75.5	75.7
Harvested	74.6	64.1	74.4	74.6
		Bushels		
Yield per harvested acre	42.9	41.7	39.3	39.6
		Million bushels		
Beginning stocks	449	574	205	205
Production	3,197	2,677	2,921	2,959
Imports	9	10	7	8
Supply, total	[illegible]	[illegible]	[illegible]	[illegible]
Crushings	1,808	1,801	1,715	1,683
Exports	1,116	1,161	1,080	1,100
Seed	80	93	90	90
Residual	77	0	72	79
Use, total	[illegible]	[illegible]	[illegible]	[illegible]
Ending stocks	574	205	205	225
Avg. farm price ($/bu) 2/	[illegible]	10.10	[illegible]	[illegible]

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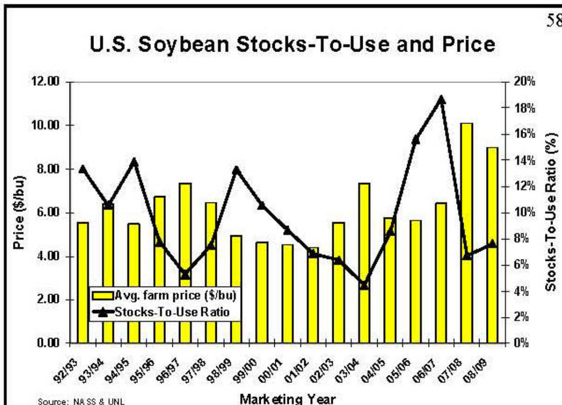

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Soybean Meal Balance Sheet

U.S. Soybeans and Products Supply and Use (Domestic Measure) 1/

Item	2006/07	2007/08 Est.	2008/09 Projections December	2008/09 Projections January
		Thousand short tons		
SOYBEAN MEAL:				
Beginning stocks	314	346	294	294
Production	43,054	42,242	40,741	39,841
Imports	[illegible]	141	165	165
Supply, total	43,524	42,729	41,200	40,300
Domestic	34,374	33,155	32,500	31,600
Exports	8,804	9,280	8,400	8,400
Use, total	43,178	42,435	40,900	40,000
Ending stocks	346	294	300	300
Average price ($/s.t.) 2/	205.44	335.94	240.00-300.00	250.00-310.00

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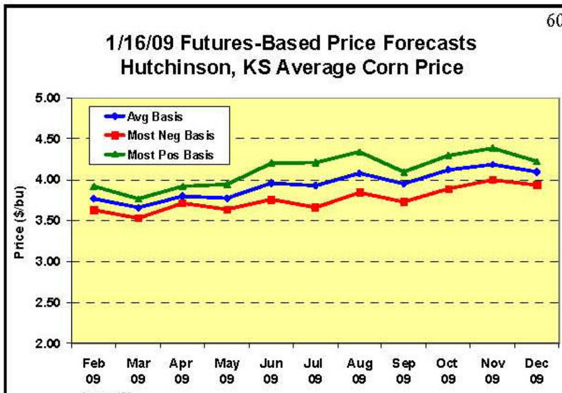

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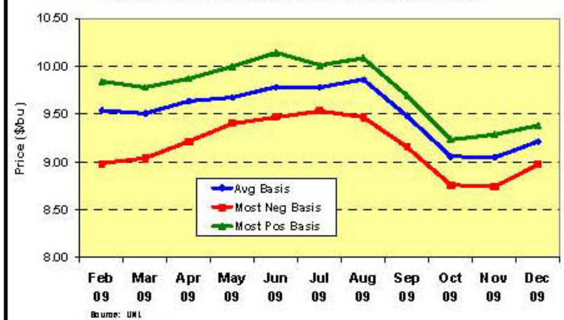
1/16/09 Futures-Based Price Forecasts Hutchinson, KS Average Soybean Price



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Recommendations

1. Calculate cost of production carefully
   - Determine margin & hedge it
2. Hedge market hog price
   - Futures or put options
3. Hedge feed prices
   - Futures or cash market purchases

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For Marketing Information

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Agricultural Economics

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February 3, 2009

"Feeding and Feeder Management Influences on Feed Efficiency"

by
Bob Goodband, Mike Tokach, Steve Dritz,
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KSU Applied Swine Nutrition Team

Feeding and Feeder Management Influences on Feed Efficiency

Bob Goodband, Mike Tokach, Steve Dritz, Joel DeRouchey, and Jim Nelssen
KSU Applied Swine Nutrition Team

Frequently we focus our nutritional programs on diet formulation and feed processing. However, the way we provide feed to pigs can be just as important for improving feed efficiency and margin over feed costs as diet formulation. Items such as the type of feeder we use or how it is adjusted can have a huge impact on profitability. As different types of feeders come and go we need to evaluate new technology and make decisions based on data, not initial cost. Secondly, as we begin to improve our data acquisition, an important factor is making valid comparisons among different growers or production flows. When making comparisons among different producer or grower close-out data, we need to make sure the proper adjustments are being made so we can make fair comparisons. Examples of these are adjusting for different starting and ending weights. Another example involves the recent run-up in fat price. We have been pulling fat from many finishing diet regimens. Pigs fed diets without fat are going to be less efficient and therefore when making yearly or quarterly comparisons this too needs to be taken into account.

Feeder Type

Research on different types of feeders is very difficult to conduct because of the expense of purchasing feeders and modifying a barn to accommodate two or more types of feeders. Recently Bergstrom et al. (2008) conducted a trial comparing a wet/ dry feeder with that of a conventional dry feeder (Figures 1 and 2, respectively).

Figure 1. Wet/dry feeder

Figure 2. Dry feeder

There were 46 pens with 27 pigs (PIC) per pen. The trial lasted 12 weeks. Pigs fed the wet-dry feeder had greater average daily gain (ADG) as a result of greater average daily feed intake (ADFI; Table 1). Furthermore, water usage was lower for those pigs fed with the wet/dry feeder. Frequently producers make decisions on buying feeders based on which is the least expensive. However, in this situation, the more expensive wet/dry feeder can likely be justified by calculating the margin over feed costs for a 13 lb heavier pig.

Table 1. Effects of feeder type on growth performance of finishing pigs

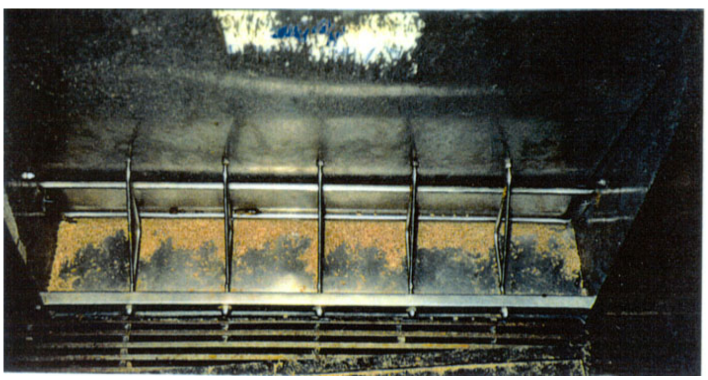
	Feeder Type			
Growth Data	Wet/dry Feeder	Dry Feeder	SEM	P <
Average initial weight, lb	63.2	63.1	0.82	NS
D 0 – 84				
Average daily gain, lb	2.03	1.88	0.01	0.001
Average daily feed intake, lb	5.26	4.86	0.03	0.001
Feed efficiency	2.59	2.58	0.02	NS
Average final weight, lb	234	221	1.38	0.001
Gal H_2O/pig/day	1.48	1.68		
Gal H_2O/lb gain	0.73	0.89		

Adapted from Bergstrom et al. 2008.

Feeder Adjustment

Feeder adjustment also plays a huge role in improving feed efficiency. Improving wean-to-finish feed efficiency from a 2.7:1 to a 2.6:1 will save 26 lb of feed per pig. With an average diet cost of $ 0.15 that is a savings of $3.90 per pig. For many years we have recommended the use of feeder adjustment cards (Figure 3) in which approximately 25% of the pan is covered with feed.

Figure 3. Recommended feeder adjustment



However with new types of feeders, this recommendation may not be correct. In fact, some have been concerned that too tight of feeder adjustment may result in increased out-of-feed events and decreased ADG. A recent study, (Duttlinger et al., 2008) compared growth performance of pigs fed with a feeder at one of three adjustment settings. There were 1,242 pigs used with 15 replications per treatment. The trial lasted 10 weeks. Each pen was fed with a 60 inch long conventional dry feeder with 5 feeding spaces.

Figure 4. Feeder adjustment settings

This feeder has 5 distinct settings (1 to 5) with 1 having the greatest gap width and 5 having the smallest gap width. Pens of pigs were randomly assigned to 1 of 3 feeder settings (1, 3, and 5) and settings were zip tied at the beginning of the trial and not changed for the duration of the trial. Feeders with a setting of 1 (the greatest gap width) had an average of 80% of the pan covered with a range of 65 to 95% coverage (figure 5). Feeder setting of 3 averaged 55% of the pan covered with a range of 35% to 75% covered (Figure 6). Feeder setting 1 averaged 15% of the pan covered with a range of 5 to 25% covered (Figure 7). Feeders were also scored daily to determine the number of plugged feeding spaces. Feeder openings 1 and 3 had no plugged feeders; however feeder setting 5 had a total of 92 plugged feeders. This represents 1 out of 10 feeders with a feed setting of 5 had an average of 1 feed space plugged each day. Based on these results, feeders set on setting 3 had the lowest feed and feed & facility cost per pig. Feeders set on

Figure 5. Feeder setting 1 - 80% of the pan is covered with feed

Figure 6. Feeder setting 3, 55% of the pan is covered

Figure 7. Feeder setting 5, 15% of the pan is covered

Figure 8. Plugged feeder

Table 2. Effects of feeder opening on growth performance of finishing pigs

	Feeder opening[1]		
Item	1	3	5
ADG, lb	2.08	2.05	1.94
F/G	2.40	2.34	2.37
# plugged feeders	0	0	92
Final weight, lb	223	221	213
Feed cost, $[2]	63.23	61.78	62.57
Feed & facility cost, $	76.16	74.89	76.46

[1] One, 3, and 5 represent feeder adjustment widths with 1 being the most open and five being the least. Percentage pan covered averages 80% for setting 1, 55% for setting 3 and 15% for setting 5 (see figures 5, 6, and 7).
[2] Assumes 220 lb of gain and feed cost averaging $0.12 per lb.

Setting 1 had similar ADG as setting 3, but the greater feed wastage increases feed cost and feed & facility cost. Feeder setting 5 restricted ADG and thus it too increased feed and feed & facility cost. These results suggest that for this type of dry feeder, increasing the opening to allow on average 55% of the pan to be covered will not negatively influence feed efficiency or total feed cost.

Adjusting close-out information

More and more producers are using nursery and or grow-finish records to evaluate production. Perhaps one of the easiest and most common forms of growing pig record keeping is done by the use of Excel spreadsheets. Data can then be quickly summarized in pivot tables for evaluation. However there are important limitations when comparing large data sets taken over time or comparing results of different producers or growers within a system. For example if one grower has a feed efficiency of 2.9:1 and a second has a 3.0:1 is the difference between the growers a true reflection of their management? One factor to include is the beginning and ending weight of the pigs. Grower #1 may have marketed his pigs at 270 lb, while grower #2 may market at 290 lb. The differences in final weight could be a greater factor affecting feed efficiency. Because of this variation we use a feed efficiency adjustment factor. Because factors other than purely management can affect feed efficiency, we need to adjust feed efficiency for differences in beginning and ending weight and dietary factors such as adding fat, pelleting, and in some cases grain source.

Nursery feed efficiency adjustments

The data in Table 3 represents an example of adjusting nursery feed efficiency. Both nursery growers have identical feed efficiency; however when we take into account grower B having an 18 lb heavier pig, the adjusted feed efficiency indicates that this grower has the better feed efficiency when based on a common out weight of 55 lb.

The equation to adjust F/G to a common end point (55 lb) in this example is:

Actual F/G - 0.008*(weight out – 55 lb)

Table 3. Nursery close-out comparison

Data	A	B
Weight In:	13.6	11.1
Weight Out:	56	74
Average Days on Feed:	45	58
Average Daily Gain:	0.94	1.08
Feed Efficiency	1.59	1.59
Adj. Feed Efficiency (55 lb)	1.58	1.44

Finishing feed efficiency adjustments

Several factors impact finisher feed efficiency. Expected feed efficiency will be influenced by the entry weight and market weight of the pigs, energy level of the diet, and whether or not the diets are pelleted. In order to compare feed efficiency among groups, adjustment factors for these major items must be used. Adjustment factors have been developed for entry weight and market weight of the pigs, energy level of the diet, and whether the diets are in pellet or meal form. Therefore, variation among close outs can be accounted for by these factors and may aid in detecting differences among groups for other factors, such as feed wastage.

An example of the importance of adjusting finisher feed efficiency is represented in Table 4. We have 5 different growers within a production system. Market weights range from 272 to 264 lb. Average daily gain appears to be consistent among the growers with the exception of grower 4, who also had the greatest death loss. Feed efficiency appears to be relatively similar with growers 1 and 3 having the best F/G followed by growers 2 and 4, and lastly grower 5. But overall the differences among the 5 growers are relatively small. However when we adjust F/G for in- and out-weight, grower 1 has the best F/G by a wide margin.

The following equation can be used to compare different groups with different ending weights and market weights:

Adjusted F/G =observed F/G + (50 – entry wt) × .005 + (250 – market wt) × .005

Table 4. Finishing close-out comparison (2007 data)

	Grower				
Item	1	2	3	4	5
Weight In	57	45	47	44	50
Weight Out	272	265	264	266	269
Mortality	4.9%	3.7%	3.7%	5.2%	4.1%
Avg. Daily Gain	1.88	1.87	1.84	1.78	1.88
Feed Efficiency	2.84	2.86	2.84	2.86	2.90
Adj. Feed Efficiency	2.66	2.80	2.78	2.80	2.79
Medication cost	$1.62	$2.24	$3.84	$2.69	$2.95
Feed $/lb Gain	$0.267	$0.281	$0.283	$0.287	$0.286

This equation adjusts all groups to a common entry weight of 50 pounds and market weight of 250 pounds. Further adjustments can be made to compare groups with different grain sources, dietary energy levels, and pelleted or meal diets. The adjustment for energy level uses an adjustment for grain source and fat level in the diet (grain factor – (fat level × 2)), where the grain factor is 1 for corn and fat level is the percent fat in the diet. The adjustment for pelleting is (1– pellet factor), where the pellet factor is the percentage improvement in feed efficiency due to pelleting (generally 4 to 6%).

The factors can be included in one formula to compare all of the factors at the same time:

Adjusted F/G =

$$\frac{\text{observed F/G} + (50 - \text{entry wt}) \times .005 + (250 - \text{market wt}) \times .005)}{[\text{Grain factor}^{1} - (\text{fat level} \times 2)) \times (1 - \text{pellet factor})]}$$

[1] Grain factor = 1 for corn, 1.02 for milo, 1.18 for barley, and 1.07 for wheat

Calculating Opportunity Costs. Now that feed efficiency has been standardized to a common 50 to 250 lb basis, we can calculate opportunity values between the growers. An opportunity value is the dollars that could be saved if a grower could improve the feed efficiency (or mortality and average daily gain, and medication costs) to the best value for the group of growers. For example the growers in Table 4, we can calculate opportunity values for feed efficiency, average daily gain, mortality, and medication costs. The respective equations are:

Feed Efficiency

Observed F/G – the best F/G × (weight out – weight in) × (feed cost per lb of gain/F/G)

Mortality

(Observed mortality – the lowest mortality) × (out weight × market price)

Medication costs

Observed medication cost – lowest medication cost

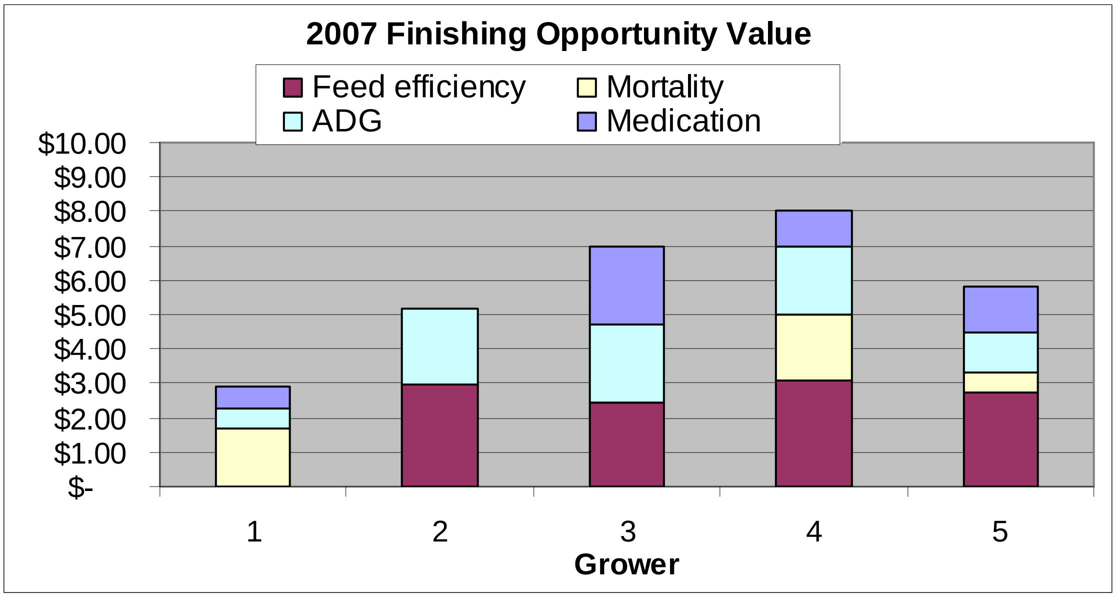
Average Daily Gain

IF (final wt > 275,0,(275-final wt) × (market value- feed cost/lb gain))

The values in the chart represent a $0.50 lb market value and an ideal market weight of 275 lb.

To interpret the data, the chart shows grower 1 having the best F/G (there is no F/G bar for grower 1). Growers, 2, 3, 4, and 5 could save approximately $3.00, $2.50, $3.00 and $2.75 per pig, respectively, if they improved their feed efficiency to that of the best grower, #1.

Figure 9. Opportunity value among different growers



For mortality, growers 2 and 3 have the same mortality which happens to be the best among the group. Growers # 1, 4 and 5 could save approximately $1.80, $2.00 and 0.25 per pig, respectively, if they could lower their mortality to that of growers #2, and #3. For ADG, all growers are marketing pigs below the ideal weight range for this specific packer (275 lb). The equation yields the margin over feed cost (market value – feed cost per lb of gain) times the weight difference between the actual market weight and 275 lb. For growers #1, 2, 3, 4, and 5, these values are approximately $0.25, $1.00, $1.50, $1.00 and $0.50, respectively. Lastly, with medication costs grower #2 has the lowest medication cost per pig. Growers #1, 3, 4, and 5 could save approximately $0.50, $1.10, $1.00 and $0.75, respectively. So not only can we compare among different growers with equalized feed efficiency, we can also determine the value a grower has to equal the best specific trait in that groups of growers.

In conclusion, there are several non-feed factors that play an important role in improving pig performance. It appears that feeder type can dramatically influence daily gain. Feeder adjustment also influences not only feed efficiency, but growth rate as well. Lastly, when comparing production values of different growers we can standardize feed efficiency to make fair comparisons among growers or production systems. We can then calculate economic differences of production traits to determine producer incentive to improve.

SWINE PROFITABILITY CONFERENCE

February 3, 2009

"Boar Nutrition"

by

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Kansas State University

Boar Nutrition

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Introduction

During a preconference session at the 2007 AASV National meeting, we addressed the topic of feeding boars for optimum sperm production and discussed each nutrient area in depth[1]. In reality, most boar nutrition papers repeat the same information because little new research has been conducted in recent years. Instead of repeating that information in this paper, we will address the more practical aspects facing people in the boar stud.

Most boar stud diets are adequate or in excess for amino acids, vitamins, and minerals. The main question for boar stud managers is the level of energy that should be provided to the boars on a daily basis (i.e. how much feed should each boar receive?). We have conducted a couple of interesting experiments to determine how boars were being fed in one of our larger boar studs serving Kansas producers and to help them determine if there was a better way for them to set feeding levels. In this paper, we will relate some of the things that we have learned from this experience and propose a simple method to set feeding levels for boars in studs.

Feed requirements of boars

Four main variables influence the amount of feed that boars should receive on a daily basis: 1) weight of the boar determines the maintenance energy requirement; 2) desired growth rate; 3) energy level of the diet; and 4) accuracy of the feed delivery system (automatic feed line with gestation feed drop in most studs).

How much do boars weigh?

Weight of boars in the stud can be determined by physically weighing the boar with a scale or by using a flank tape, much like we have used with gestating sows. The estimated weight of the boars can be determined using the equation or data presented in Table 1. After weighing boars in studs, we found that the same flank-to-flank equation that we use with sows can be used to estimate weights of boars in a stud[2]. As will be discussed below, the most important time to know the weight of the boar to set the feeding program is at entry into the stud to determine the amount of time to leave them on the first feeding level.

How fast do boars grow in the stud?

In previous studies, slow-growing boars fed at maintenance have shown significantly decreased libido, semen volume, and sperm output. On the other hand, fast-growing boars fed at high rates are thought to have increased leg and libido problems. Rate of weight gain may also have an impact on longevity, and thus affect lifetime semen production.

Even though growth rate is important, boars don’t have a target growth rate in most studs. Establishing a target growth rate is quite beneficial in setting feeding levels because the desired growth rate determines the greatest portion of the boars feed needs other than their maintenance requirement. Instead of having a target growth rate, feed is provided to the boar and after their requirements for maintenance, semen production, and activity is met, the feed left over determines the growth rate. Thus, growth rate is the consequence of the feeding level rather than being used to determine the feeding level.

Instead of weighing boars over time to establish growth curve, we have used a procedure that we developed in finishing pigs where we weighed all of the boars in the stud in a relatively short period of time. By plotting the age of the boar against the weight (Figure 1), a weight per day of age growth curve can be determined[3]. The weight per day of age curve can be used to estimate the ADG at any body weight to develop an ADG curve (Figure 2). The growth rates existing in the stud can be compared to suggested growth curves (Table 2). As shown in the example in Table 2, boars in many studs have faster ADG at lower weights than the suggested targets, which indicates they are probably being fed greater than desired feeding levels.

How much does feed intake vary over a boar's life in the stud?

In a recent trial, we recorded feed box settings for boars in a stud as part of a research project[4]. When the crew in the stud set the feed boxes based on their monitoring of body condition of the boars, there were big changes in growth rates over the course of the trial caused by a cyclic pattern of increasing and decreasing feed allocation of individual boars to either reduce or compensate body condition (Figure 3). Boars were fed as much as 11.2 lb/d when they were below the stud's acceptable body condition and as little as 4.5 lb/d when individual boars were believed to need to lose condition. At this low level of feeding, boars were being fed close to or below their maintenance requirements because the feed boxes were actually dropping less feed than indicated by the volume measurement on the box.

Much like the data found with gestating sows, allowing feed levels to be set based on body condition can result in rapid changes in feed box settings that alter growth rate of the boars substantially.

How much feed are boxes actually dropping?

Feed boxes used in gestation barns and most boar studs are set on a volumetric basis instead of weight. Thus, the box drops a set volume of feed. The volume measurement is impacted by the bulk density of the diet and whether the drop is mounted perpendicular to the feed line[5]. As the bulk density of the diet decreases, volume must be increased to attain the same pounds of intake. Although this seems like a simple concept, most people that adjust the boxes give little thought to the bulk density of the diet. Most diets fed in boar studs include some lower energy ingredient to lower the bulk density and increase the fiber level. If this is not considered in setting feed boxes, boars may be fed considerably less energy and other nutrients than desired. Conversely, some boxes may drop more feed than indicated on the volumetric measure on the feed box. In a recent trial, we found that boxes in one stud dropped approximately 12% more feed than indicated by the settings on the feed box.

Fortunately, when comparing desired feeding levels to actual amounts dropped by various feed drops, inaccuracies are linearly related to the setting on the box[5]. Thus, if you determine that boxes in a stud drop 12% more or less of a particular diet than the setting on the box indicates, you can adjust all feeding levels in a feeding chart by 12% to account for the difference.

Is there an easier way to set feeding levels?

For boars housed in their thermoneutral zone, energy requirements are determined by the energy need for maintenance, growth rate, semen production, and mating activity (Table 3). The requirements for mating activity and semen production are relatively low with the majority of the energy requirement driven by the weight of the boar and desired growth rate. The total energy requirement of the boar increases from 7.9 to 9.3 Mcal/day as it grows from 300 to 700 lb. By dividing this weight range into 100 lb increments, boars can be phase fed based on time to closely meet their energy requirements. In this example, once the boars reach 300 lb, they would be fed 6.1, 6.3, 6.5, and 6.7 lb/day for 3, 4, 6, and 12 months, respectively (Table 4). Weighing the boars or taping them with a weight tape will determine whether the feeding duration should be reduced for the first feeding level. For example, if a group of boars average 350 lb when they enter the stud, the feeding length of the first feeding level should be reduced from 3 months to approximately 6 weeks.

What are the steps to implementing the feeding program?

The steps to implementing this feeding program would be to:

1) Determine energy density of the diet (ME/lb) and adjust feed levels in Table 4 to the energy density of the diet.
2) Determine accuracy of the feed drops to determine whether feed levels in Table 4 need to be increased or decreased by a certain percentage.
3) Determine the weight of boars as they enter the stud to determine the length of time to feed the first feeding level.
4) Set the boxes and monitor individual boars.

Does this feeding program work?

We recently completed a test with one stud where we implemented this feeding strategy and compared it to their previous program of feeding boars based on body condition.[4] Boars that were fed according to the planned feeding strategy followed the desired growth curve (Figure 4) while boars being fed based on body condition were more erratic in growth rate due to fluctuations in feeding levels over the course of the study (Figure 3). Although the number of boars on the study was not great enough to fully test the impact of the feeding program on boar longevity, a higher proportion of active boars (73 vs. 42%) were maintained at the end of the 16-month study in boars fed the planned feeding program compared with those fed based on body condition. Boars fed based on body condition tended to be overfed when initially placed in the stud and underfed during later periods. The results of this trial indicated that AI boars can be fed to a set feeding level to achieve targeted weight gains to influence longevity without affecting semen production and quality. More research is required to validate that the planned feeding regimen influences longevity of boars in the stud.

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Table 1. Predicted pig body weight (lb) using flank-to-flank measurement[1]

Flank-to-flank measurement		
in	cm	Predicted weight, lb
36	91	317
37	94	342
38	97	367
39	99	394
40	102	421
41	104	451
42	107	481
43	109	513
44	112	546
45	114	580
46	117	616
47	119	654
48	122	693
49	124	733
50	127	775

[1]From equation $BW^{0.333}$, kg = 0.0511 × Flank-to-flank, cm + 0.5687

Table 2. Comparison of predicted ADG with Dutch recommendations

BW		Recommended ADG, lb/d		% difference
lb	kg	Dutch Study[1]	Example stud[2]	
330	150	1.10	1.36	+ 23%
440	200	0.88	1.06	+ 20%
550	250	0.66	0.70	+ 6%
660	300	0.44	0.22	- 50%
770	350	0.22	-	-
880	400	0.11	-	-

[1]Kemp and Soede, 2001.
[2]Growth rate of boars in a commercial stud.[3]

Table 3. Daily ME requirement (Mcal ME/d) and feed allowance (lb/d) for adult working boars under thermoneutral conditions

Phase	Weight, lb	Maintenance[1] Mcal ME	Weight Gain[2] Target, lb/d	Weight Gain[2] Mcal ME	Mating Activity, Mcal ME[3]	Sperm Production, Mcal ME[4]	Total ME Requirement, Mcal ME/d	Daily allocation Mcal ME/d	Daily allocation ld/day[5,6]
1	300	4.78	1.30	2.89	0.17	0.1	7.94	8.2	6.1
	340	5.20	1.20	2.66	0.19	0.1	8.15	8.2	6.1
	375	5.55	1.10	2.44	0.20	0.1	8.29	8.2	6.1
2	400	5.79	1.00	2.22	0.21	0.1	8.32	8.4	6.3
	430	6.08	0.90	2.00	0.22	0.1	8.40	8.4	6.3
	455	6.31	0.85	1.89	0.23	0.1	8.53	8.4	6.3
	480	6.54	0.80	1.78	0.24	0.1	8.66	8.4	6.3
3	500	6.72	0.70	1.55	0.25	0.1	8.62	8.7	6.5
	520	6.90	0.65	1.44	0.26	0.1	8.70	8.7	6.5
	540	7.07	0.60	1.33	0.27	0.1	8.77	8.7	6.5
	560	7.24	0.50	1.11	0.27	0.1	8.73	8.7	6.5
	575	7.37	0.50	1.11	0.28	0.1	8.86	8.7	6.5
	590	7.50	0.40	0.89	0.28	0.1	8.77	8.7	6.5
4	600	7.58	0.40	0.89	0.29	0.1	8.86	9.0	6.7
	620	7.75	0.30	0.67	0.30	0.1	8.81	9.0	6.7
	640	7.92	0.20	0.44	0.30	0.1	8.76	9.0	6.7
	660	8.08	0.20	0.44	0.31	0.1	8.93	9.0	6.7
	680	8.24	0.20	0.44	0.32	0.1	9.10	9.0	6.7
	700	8.40	0.20	0.44	0.32	0.1	9.27	9.0	6.7

[1]Maintenance = 0.1823 Mcal ME/kg $BW^{0.665}$.
[2]Weight gain = 2.22 Mcal ME/lb × target weight gain, lb.
[3]Mating activity = 4.3 kcal/kg $BW^{0.75}$.
[4]Sperm production = 0.1 Mcal ME/d.
[5]Diet energy used in calculating feed allocation was 1.4 Mcal ME/lb.
[6]Feed box setting = daily feed allocation, lb/d - (daily feed allocation, lb × % overage or under feeding of the feed box).

Table 4. Example phase-feeding program developed for adult working boars in a commercial boar stud.

Phase	Weight, lb		Energy need,	Feed allocation,	Feeding duration,
	Initial	Final	Mcal ME/d	lb/d[1]	months
1	300	400	8.2	6.1	3
2	400	500	8.4	6.3	4
3	500	600	8.7	6.5	6
4	600	700	9.0	6.7	>12

[1]Must be adjusted to the density of the diet and accuracy of the feed box to determine actual feed box settings.

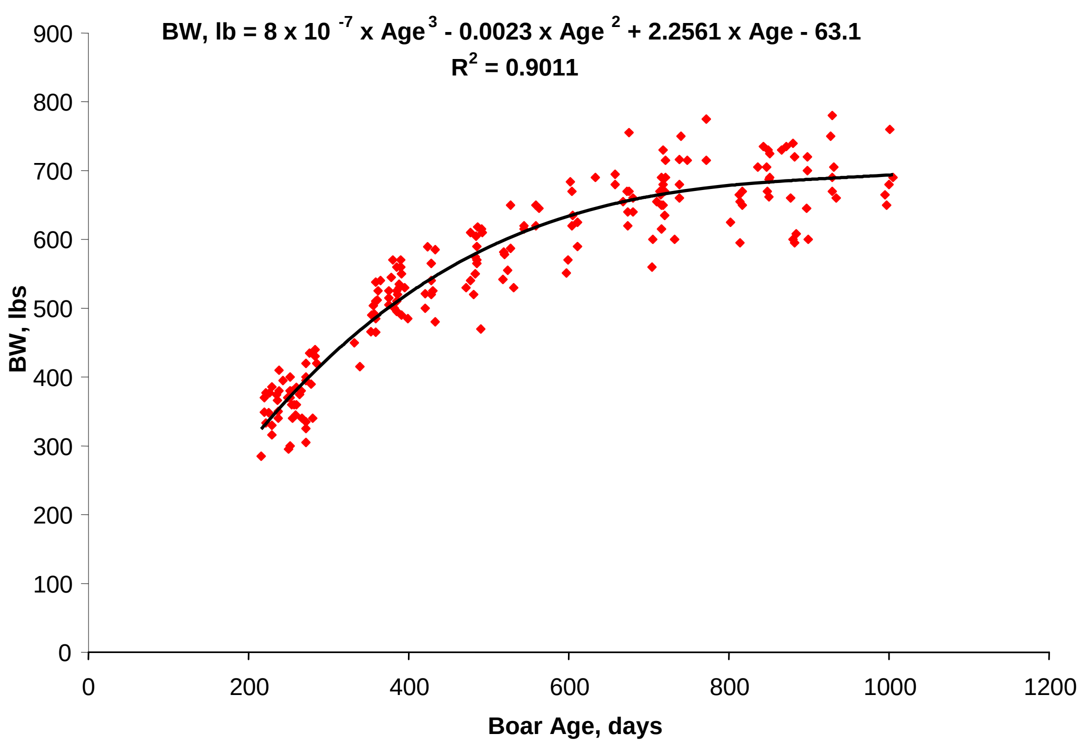

Figure 1. Relationship of Boar Age and Body Weight (214 boars).

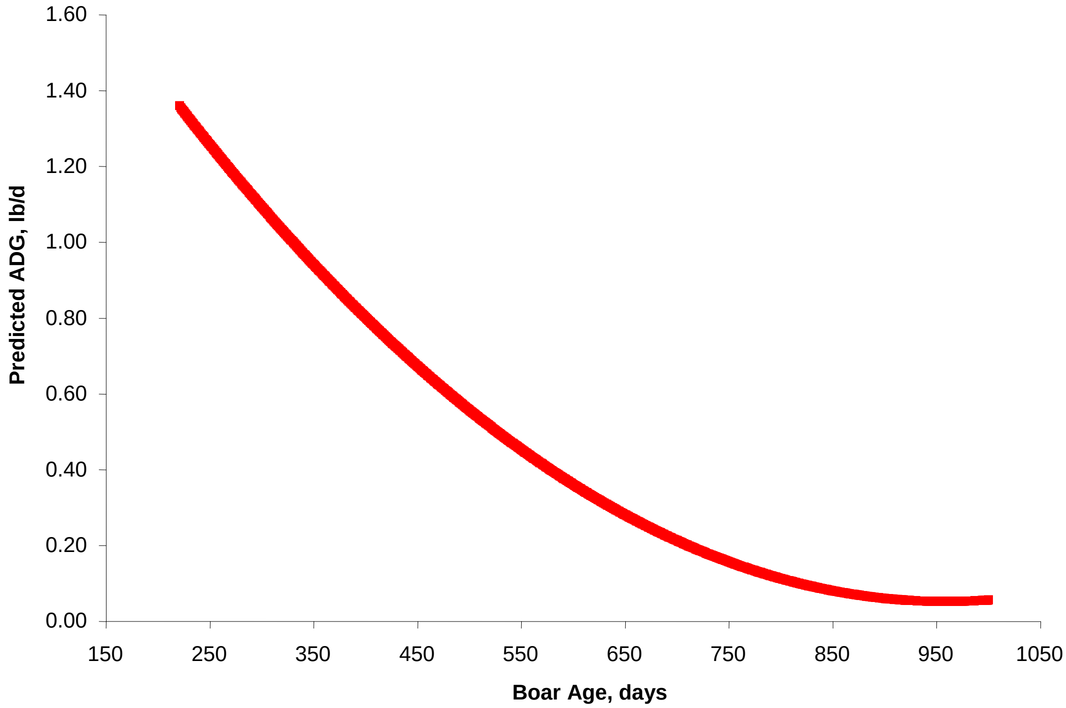

Figure 2. Predicted ADG of Adult Working Boars from 220 to 1000 d of Age.

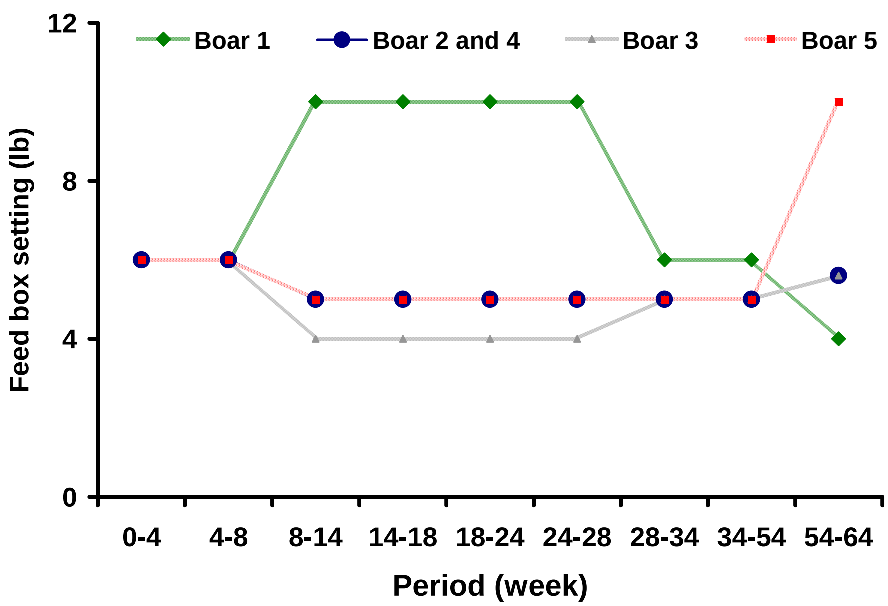

Figure 3. Feed box adjustments of individual boars in the control feeding program.

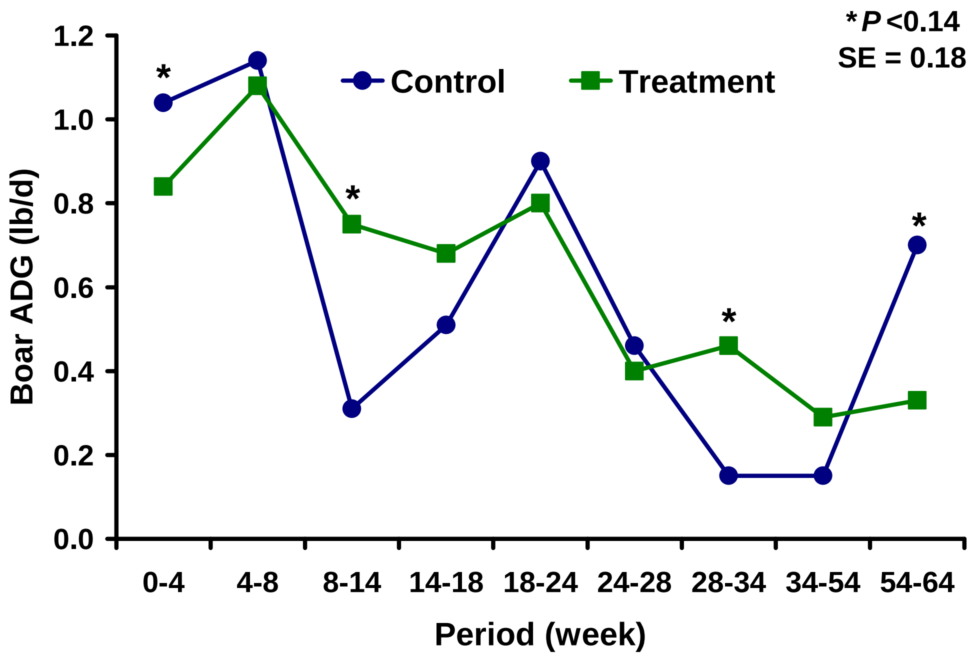

Figure 4. Effect of different feeding regimens on the pattern of growth rates of boars in a commercial AI stud. (Control = 6.7 lb/d for weeks 0 to 8 then fed according to body condition, Treatment = 5.8 lb/d for weeks 0 to 4 and then 6.0 lb/d until end of the study).

SWINE PROFITABILITY CONFERENCE

February 3, 2009

"Digestive System of the Pig – Anatomy and Function"

by
Joel DeRouchey, Bob Goodband, Mike Tokach, Steve Dritz, and Jim Nelssen
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Digestive System of the Pig – Anatomy and Function

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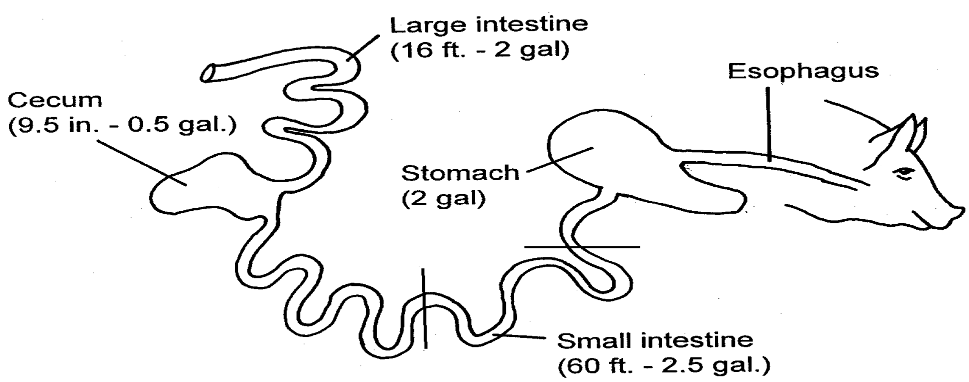
The digestive system of a pig is well suited for complete concentrate based rations that are typically fed. The entire digestive tract is relatively simple in terms of the organs involved which are connected in a continuous musculomembanous tube form mouth to anus. Yet this multi-faceted system involves many complex interactive functions. The goal of this paper is to describe the organs involved in digestive and biological functions (Figure 1).

Figure 1. Digestive anatomy of the pig



MOUTH

The mouth serves a valuable role not only for the consumption of food, but provides for the initial partial size reduction though grinding. While teeth serve the main role in grinding to reduce food size and increase surface area, the first action to begin the chemical breakdown of food occurs when food is mixed with saliva.

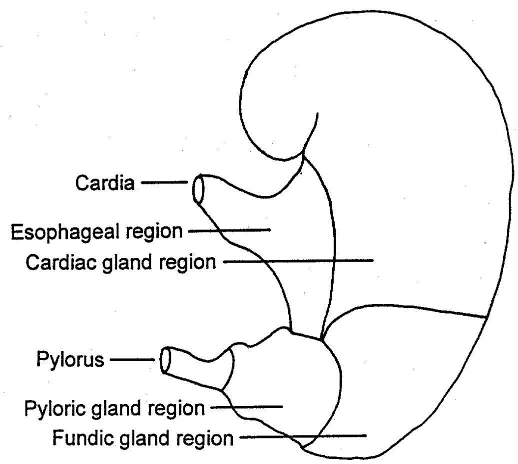
There are three main salivary glands which include the parotid, mandibular, and sublingual glands. Saliva secretion is a reflex act stimulated by the presence of food in the mouth. The amount of mucus present in saliva is regulated by the dryness or moistness of the food consumed. Thereby in a dry diet, more saliva mucus is secreted while in a moist diet, only an amount to assist with swallowing is secreted. Saliva generally contains very low levels of amylase, or the enzyme that hydrolyzes starch to maltose. The contribution of digestive enzymes from saliva is very minor, but still noteworthy.

Once food is chewed and mixed with saliva, it passes though the mouth, pharynx and then the esophagus to the stomach. Movement though the esophagus involves muscle peristalsis, or the contraction and relaxation of muscles to move the food.

STOMACH

The stomach is a muscular organ responsible for storage, initiating the breakdown of nutrients, and passing the digesta into the small intestine. The stomach has four distinct areas which include the esophageal, cardiac, fundic, and pyloric regions (Figure 2). The esophageal region is located at the entrance of the stomach from the esophagus. This region of the stomach does not secrete digestive enzymes, but has significance in that this is where ulcer formation in pigs occurs. Irritation in this area due to fine particle size, stress or other environmental factors can contribute to ulcer formation in swine. Once food passes though this region, it enters the cardiac region. In this portion of the stomach, mucus is secreted and mixed with the digested food. Food then passes into the fundic region which is the first major portion of the stomach that begins the digestive process. In this region gastric glands secrete hydrochloric acid, resulting in a low pH of 1.5 – 2.5. This reduced pH then kills bacteria ingested with the feed. Other secretions in this region are present in the form of digestive enzymes, specifically pepsinogen. Pepsinogen is then broken down by the hydrochloric acid to form pepsin, which is involved with the breakdown of proteins. Finally the digesta moves to the bottom of the stomach, which is the pyloric region. This region is responsible for secreting mucus to line the digestive membranes to prevent damage from the low pH digesta as it passes to the small intestine. The phloric sphincter regulates the amount of chyme (digesta) that passes into the small intestine. This is an important function not to overload the small intestine with chyme so proper and efficient digestion and absorption of nutrients occurs. In addition, once the chyme leaves the stomach, the material is quite fluid in consistency.

Figure 2. Regions of the stomach

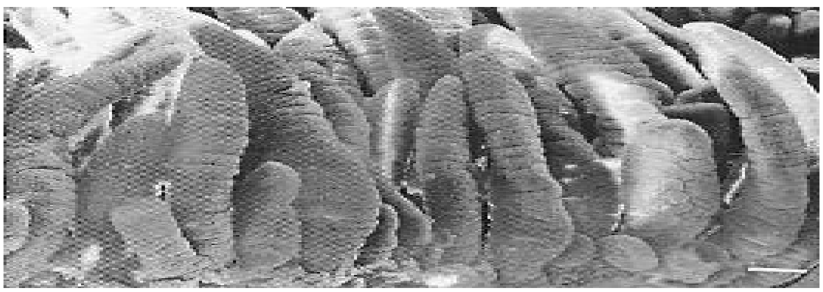


SMALL INTESTINE, PANCREAS, LIVER

The small intestine is the major site of nutrient absorption, and is divided into three sections. The first section is the duodenum. The duodenum is approximately 12 inches long and is the portion of the small intestine that dusts from the pancreas and the liver (gall bladder). The pancreas is involved with both exocrine and endocrine excretions. This means the pancreas is responsible for secretion of insulin and glucagon in response to high or low glucose levels in the body. In addition, it has exocrine functions of secreting digestive enzymes and sodium bicarbonate. The digestive enzymes secreted breakdown or hydrolyze proteins, fats, and carbohydrates in the chyme. In addition, the sodium bicarbonate serves a vital role to provide alkalinity so chyme can be transported though the small intestine without causing cell damage because of the low pH after leaving the stomach. The pancreas serves as the most vial organ in the digestive process for producing and secreting enzymes needed for the digestion of chyme and the prevention of cell damage due to pH. In addition to the pancreas secreting into the duodenum, bile, which is stored in the gall bladder and produced by the liver, is secreted as well. Bile salts, which are the active portion of bile in the digestion process, primarily assist in the digestion and absorption of fat, but also help with absorption of fat-soluble vitamins and aids pancreatic lipase in the small intestine. Finally, bile salts are necessary for the absorption of cholesterol, which takes place in the lower small intestine and are circulated to the liver via the portal vein.

Once the chyme passes though the duodenum, the digestion process is in full swing. Upon leaving the duodenum, enters the middle portion of the small intestine, the jejunum. This portion of the small intestine involves both the further breakdown of nutrients as well as the beginning of absorption of nutrients. Nutrient absorption continues into the final section of the small intestine, the ileum. Absorption of nutrients in the jejunum and the ileum occurs in the area termed "brush border", or the intestinal mucosa (Figure 3). The mucosa is comprised of finger-like projection called villi, which in turn contain more micro-size projections called microvilli. The tips of the micorvilli form web-type structures called glycocalyx. Amino acids and simple sugars released into the brush border membrane are absorbed into the microvilli first, then into the villi, and then pass into the circulatory system. Absorbed amino acids and simple sugars are taken directly to the liver via the portal vein. For dietary fat that is broken down and absorbed into the brush border, they enter the lymphatic system and are released into general circulation via the thoracic duct.

Figure 3. Villus heights of deodenum intestinal mucosa



LARGE INTESTINE

The large intestine or hindgut encompasses four main sections. First, digesta from the small intestine passes into the cecum. The cecum has two sections, first a section that has a blind end, where material can not pass though. The cecum has a second portion where it connects to the colon, where digesta is passed to the rectum and anus where the remaining digesta is excreted.

The main function of the large intestine is the absorption of water. The chyme that passes through the small intestine and into the large intestine initially is very fluid. The large intestine epithelium has a large capacity for water absorption.

Once digesta passes though the ileum into the large intestine, no enzymatic digestion occurs. However, limited microbial enzymes activity does occur in the large intestine, which forms VFA's (volatile fatty acids). These can be readily absorbed in the large intestine. Generally these provide only enough energy to assist in the nutrient requirements of the epithelium of the large intestine. Also, B-vitamins are synthesized in the large intestine and are absorbed in a very limited amount, but not significant to alter nutritional supplementation of them.

With the majority of water removed, the digesta is condensed into a semi-solid material and is passed out the rectum and anus.

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SWINE PROFITABILITY CONFERENCE

February 3, 2009

"How to Make a Nursery Group a Success"

by

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How to Make a Nursery Group a Success

Joel DeRouchey, Mike Tokach, Steve Dritz, Jim Nelssen and Bob Goodband
KSU Applied Swine Nutrition Team

Producers spend a great deal of time and effort caring for and assisting newly weaned pigs to get off to a good start post-weaning. While closing out a successful nursery group can involved many areas, this paper will detail some of the critical factors associated with 1) feed intake; 2) feeder management; and 3) hygiene practices.

MANAGEMENT TO ENCOURAGE FEED INTAKE

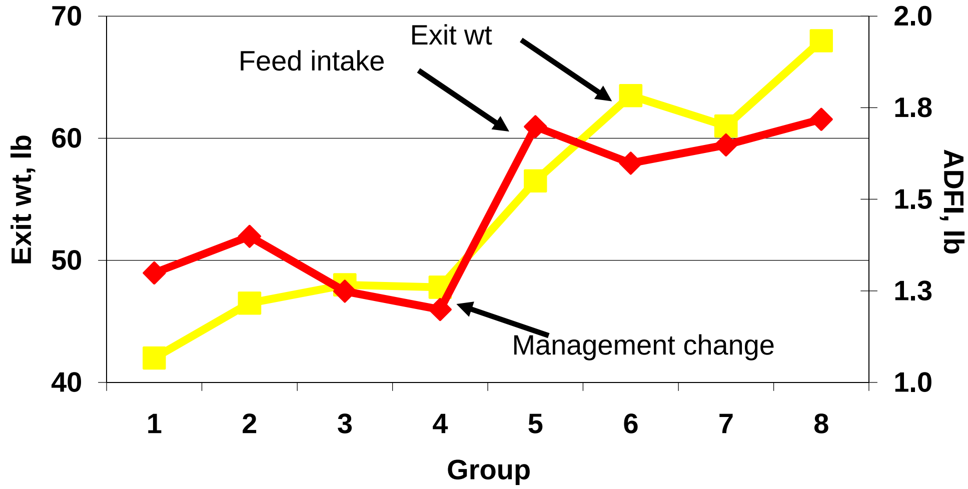
Numerous management procedures are critical to maximizing feed (energy) intake and improving performance in the nursery. The factors necessary to maximize feed intake include a warm draft-free environment and an overall herd health program and pig flow that minimizes exposure to antigens. Providing easily accessible drinking water fixtures and unlimited water supply is essential. An often overlooked, but critical need is a dedicated workforce who can identify the signs of a "starve" out pig and can then gently "teach" the pig where and how to eat with either mat or individual feeding[1].

Conditions to Identify “Starve-out” Pigs

- Mental status – alert or depressed
- Body condition – normal or thin
- Abdominal shape – round or gaunt
- Skin – sleek appearance vs fuzzy
- Appetite –feeding at the feeder or huddled
- Signs of dehydration – normal or sunken eyes

Some pigs simply don’t start eating readily after weaning. Teaching these “starve” out pigs to eat, rather than treating them with an antibiotic will save more pigs. Lastly one of the most important factors in maximizing feed intake is allowing ad libitum access to feed. Many times when pigs exhibit post-weaning diarrhea or loose stools, producers will begin to limit-feed pigs thinking that this will minimize the severity of the post weaning scours. However, failure to investigate causative agents like improper air temperature or ventilation, poor sanitation, or inappropriate ingredient selection or quality can lead to failure to solve the primary problem. Limit feeding in the nursery results in reduced nursery exit weights. This is demonstrated by the exit weight of nursery groups in a large production system (Figure 1). Exit weights typically averaged 40 to 48 lb when nursery managers limit fed pigs the initial week after weaning. However, when management switched to ad libitum feeding by always having feed present in the trough throughout the entire nursery phase (8 weeks), feed intake and exit weights increased dramatically.

Figure 1. Changes in nursery exit weight and feed intake as a result of switching from limited- to ad libitum nursery feed intake



FEEDER MANAGEMENT

Proper and frequent feeder adjustment is the key to excellent feed efficiency and low feed cost in the nursery. Proper feeder adjustment starts with the first additions of feed to the feeder. Regardless of whether the first diet after weaning is in bags or bulk, the feed gate in all feeders should be closed before the first pellets are placed in them. The feed gate then should be opened so that a small amount of feed if visible in the feed pan. Placing pelleted feed into an empty feeder with the agitation gate open will result in large amounts of feed filling the trough leading to feed wastage and difficulty in achieving the proper feeder adjustment.

Although adequate amounts of feed must be present in the feeder at all times after weaning, too much feed present in the pan of the feeder also can decrease growth rate. In an attempt to stimulate feeding behavior, some producers place large amounts of the first diet in the feeding pan. Although the intention is correct, the outcome is negative. Energy deficiency can result from pigs "sorting" the diet and a buildup of fines in the feeding pan. These fines then lodge in the feed agitator mechanism, making it difficult for new feed to flow from the feeder. This problem can be corrected by managing the amount of feed flow in the pan to stimulate development of feeding behavior. Approximately 50% of the feeding pan should be visible in the first few days after weaning. As the pigs become more accustomed to the location of the feed and adjust feeding behavior, the amount of the feed in the feeding pan should be decreased rapidly to less than 25% coverage. Also, feed agitators need to be tested frequently to ensure that the buildup of fines does not prevent them from working freely.

The data in Table 1 depict growth performance before and after the institution of an aggressive feeder-management strategy. Contrary to popular belief, reducing the amount of feed present in the pan did not reduce average daily gain. Feed efficiency and daily gain both improved because of decreased wastage and continual access to fresh feed. Our recommendations are to have feed accessible for newly weaned pigs at all times in feeders that are adjusted correctly to teach the proper feeding behavior.

Table 1. Comparison of pig performance before and after institution of an aggressive feeder-management strategy in the first week after weaning.

	Strategy Change	
Item	Before	After
Weaning weight, lb	12.3	11.7
Day 0 to 7 after weaning		
ADG, lb/d	0.16	0.22
F/G	2.15	1.27

A total of 3,360 pigs used in analysis. Each number is the mean of 2 groups (Before) or 3 groups (After). Each group consisted of 32 pens each with 21 pigs.

ENVIRONMENTAL HYGIENE

The primary objective of hygiene practices is lowering the dose of infectious pathogens that can be transmitted from the environment. It has been well documented that animal performance is increased in "clean vs dirty" environments and cleanliness is probably responsible for a large percentage of the growth performance benefits from all-in/all-out production.[2] Also, because the young pig is more susceptible to infections from enteric organisms, sanitation is especially critical for nursery facilities. Fortunately, most swine pathogens only survive for a brief amount of time outside the host in the absence of organic materials or moisture. Up to 99% of bacteria can be removed by cleaning alone under experimental conditions. However, the relative importance of the stages of sanitation include: 1) 90% removal by removing all visible organic matter, 2) 6 to 7% killed by disinfectants, and 3) 1 to 2% killed by fumigation.[3] However, recent reports indicate that environmental contamination is an important contributor of Salmonella infection. One study found that 27% (7/26) of drag samples obtained from a fully slatted finishing floor just prior to placement of pigs were found to be positive for salmonella.[4]

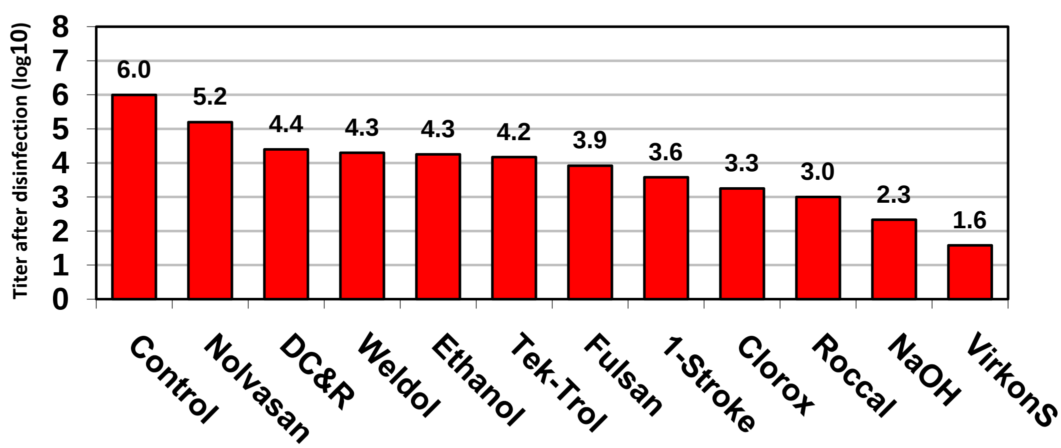
The basic principles of hygiene practices to decrease transmission from group to group from environmental contamination include: 1) Building materials that are easy to clean. Rough surfaces such as concrete are more difficult to clean than smooth surfaces such as wire. Smooth nonporous surfaces will provide easier removal of fecal matter and faster drying. 2) Thorough cleaning and removal of organic matter such as feces and feed. In general, organisms are protected against agents of disinfection by organic materials such as pus, serum, or feces. 3) Proper use of disinfectants, including dilution to proper dosage and application to the proper coverage area. 4) Proper downtime and drying of rooms. Antidotal observations from our group indicate that there is a seasonal nature to enteric problems in nurseries during the late winter and early spring period. We have observed that during this time period, due to environmental conditions, nursery spaces take longer time periods to dry and pigs are commonly placed in nurseries with moist surfaces and humid environments.

A survey of nursery hygiene practices on 129 French farms indicated several practices associated with decreased residual contamination.[5] These practices included damping of the rooms immediately after the removal of the pigs. The researchers hypothesized that damping prevented dying of the fecal matter and increased the ease and thoroughness of cleaning. Use of a detergent also was suggested as associated with decreasing residual contamination. However, in another study evaluating the impact of detergent the researchers were unable to detect any impact and residual contamination after thorough washing.[6] This indicates that using a detergent may be useful to improve the ease of cleaning. However, the detergents may not have much impact on the final amount of residual contamination if cleaning procedures are thorough.

Several other studies indicated that thorough cleaning of organic matter resulted in less residual contamination.[2,6] Additionally, greater distances between the surface of the slurry and the floor were associated with less residual contamination. The authors attributed this risk factor to splash back and recontamination during the cleaning process. Finally, factors associated with disinfectant usage were important. These included proper dilution and application of disinfectant. An evaluation of disinfectant ability to reduce infectivity of porcine circovirus type 2 (PCV2) indicates that commonly available disinfectants vary widely in their ability to neutralize the virus (Figure 2;).[7] This study evaluated 11 commonly used disinfectants in swine farms and research laboratories that included the following disinfectant classes (products tested): ethanol (alcohol), iodine (Weldol), phenol (1-Stroke, Tek-Trol), quaternary ammonium (Roccal D Plus, Fulsan), oxidizing agent (Clorox, VirkonS), alkali (NaOH), and chlorhexidine (Nolvasan). The mean titer after disinfection ranged from $10^{5.2}$ for the chlorhexidine to $10^{1.6}$ for the oxidizing agent VirkonS. This compares to the control titer without disinfection of 10^6. Thus, a reduction from 10^6 to 10^5 results in a 90% reduction, to 10^4 a 99% reduction, to 10^3 a 99.9% reduction and to 10^2 a 99.99% reduction. There are two important points to remember from this study:

1) PCV2 is a small enveloped virus similar to Parvovirus and, thus, difficult to neutralize with disinfectants.
2) This study was done under controlled laboratory conditions and optimized for maximal disinfectant activity. Disinfectant activity may be even less effective in the field setting.
3) Nonetheless, VirkonS appeared to have the best activity.

Figure 2. Reduction in infectivity of PCV2 after a 10 min exposure to disinfectant. Royer et al., 2001.



Until recently, there has been little objective scientific evidence to evaluate hygiene practices in swine operations. With an increased emphasis on evaluating biosecurity practices there have been several recent studies. In addition to the PCV2 disinfectant evaluation, these include the evaluation of farrowing house cleaning protocols, boot bath cleaning procedures and disinfectants, and methods of rapid evaluation of surface contamination in swine facilities. [2,6,8,]

Briefly, the evaluation of farrowing house cleaning protocols evaluated the amount of bacterial surface contamination in a sequential manner after low pressure washing of surfaces, high pressure with or without a detergent, and after application of disinfectant. Bacterial counts were generally lowered by two logs (99%) between the low and high pressure washing irrespective if a surfactant was used or not. Counts were generally lowered by another two logs after disinfection. The major conclusion from this study is that sequential washing and disinfection steps result in reductions in bacteria and each step contributes to the decontamination process.

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SWINE PROFITABILITY CONFERENCE

February 3, 2009

"Feeding to Ensure Healthy Pigs"

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Feeding to Ensure Healthy Pigs

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INTRODUCTION

Feeding to ensure healthy pigs is a goal of all swine nutritionists and nursery pig managers. While several factors can influence pig health, this paper will address the following aspects;

1) Influence of weaning age and weight
2) Matching formulation to nursery pig maturity
3) Maximizing feed intake
4) Growth promotion nutrient levels

INFLUENCE OF WEANING AGE AND WEIGHT

Recent Kansas State University research (Main et al., 2004; 2005) has shown that increasing weaning age through 21 days linearly increases growth rate and reduces mortality from weaning to market. In these studies, wean-to-finish growth performance and productivity (as measured by ADG, mortality, off-test weight per day of age, and weight sold per pig weaned) improved as weaning age increased from 12 to 21 days of age. Linear improvements in growth and mortality rate largely occurred in the initial 42 d post-weaning period, with some ongoing growth improvements in finishing performance. Financial performance improved linearly as weaning age increased up to 21.5 days. Data were then modeled to determine the linear rates of improvement observed as weaning age increased from 15 to 21.5 days (Table 2). Each day increase in weaning age increased initial weight (taken prior to weaning) 256 ± 4 g and weight sold to slaughter 1.80 ± 0.15 kg per pig weaned. In the financial analysis, income over cost increased $0.94 ± 0.07 per wean age d in the limited finishing space scenario and $0.53 ± 0.06 per wean age d in the non-limited space scenario. These studies suggest increasing weaning age up to 21.5 d can be an effective production strategy to improve wean-to-finish growth performance in a multi-site production system.

MATCH DIETARY NUTRIENT LEVELS AND INGREDIENTS WITH WEIGHT AND AGE OF THE NURSERY PIG

The rapidly changing and unique biology of the young pig must be considered in selecting sources and levels of amino acids, carbohydrates and fat. The main considerations for the young pig should be their: (1) high level of body protein deposition; (2) low level of feed intake; (3) high lactase and low amylase, maltase, and sucrase digestive enzyme activities at birth (see Figure 1); and (4) limited ability to utilize dietary fat.

Digestive Development

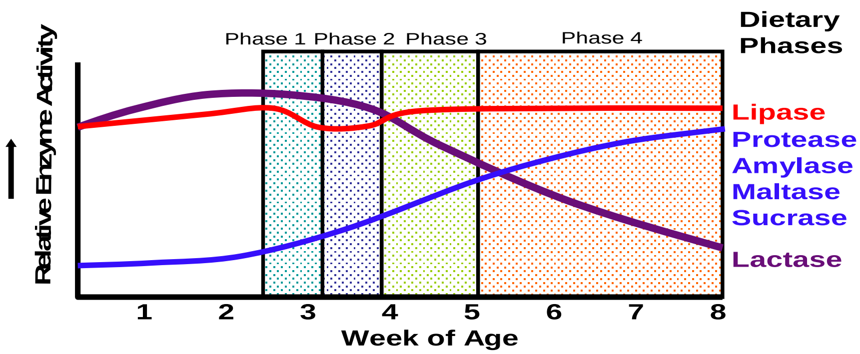

Figure 1. Adapted from Manners et al. (1972) [1] and Kitts et al. (1956) [2]

The newly weaned pig has a tremendous capacity for protein deposition in relation to the level of feed intake. Thus, diets must be formulated with high levels of amino acids. The reduction of disease exposure will improve health status and increase the amino acid requirements of the young pig by increasing the level of protein deposition.

Because feed intake is limited, a highly digestible carbohydrate source is advantageous, both to stimulate feed intake and supply a relatively high net energy value. The high lactase enzyme levels at birth and high digestibility of lactose make crystalline lactose or one of several lactose sources (dried whey, deproteinized whey, whey permeate, etc.) an excellent carbohydrate source for young pigs. As long as the diet contains a basal level of lactose, several other carbohydrate sources can be used for the remainder of the diet while achieving acceptable performance. When using a cereal grain as a main carbohydrate source (corn, sorghum, wheat, barley, or oat products), finely grinding these ingredients (600 to 750 microns) is important to improve digestibility and pellet quality. An important point in formulating diets for very young pigs (< 10 days) is their limited ability to digest sucrose at birth. Thus, sugar should not be used in diets for pigs less than 10 days of age.

The low feed intake of young pigs often leads nutritionists to feed high levels of fat to increase the energy density of the diet. Unfortunately, fat utilization from the diet is limited in the pig before approximately 35 days of age. Poor utilization of dietary fat is not well understood and may be due to a combination of factors including low digestibility during the initial period from changing fatty acid type compared to milk fat after weaning. Also, newly weaned pigs have limited ability to catabolize fat from body stores. However, added dietary fat is extremely important from a feed manufacturing standpoint because it helps lubricate the pellet mill die, and, thus, improves pellet quality of starter diets that contain high levels of milk products. The bottom line is that fat utilization increases with age and fat should be used strategically in the first diets after weaning as an aid in pelleting rather than as a main energy source. As the pig's digestive enzyme systems mature and fat metabolism improves, fat can serve as an increasingly important energy source in dietary phases 3 (15 to 25 lb) and 4 (25 to 50 lb).

Soybean Meal Delay Type Hypersensitivity

An allergenic hypersensitivity to specific proteins contained in soybean meal has been implicated as a primary factor in a post-weaning performance lag often observed in weaned pigs. These findings stimulated research efforts in the early 1990's to determine the performance and economic impact associated with utilizing various levels and types of soy proteins in wean pig diets. Utilizing readily available sources of soy protein (without significantly impacting performance) can offer significant cost savings opportunities.

The pathogenesis of soybean meal hypersensitivity response occurs 3 to 4 days after exposure to adequate soy antigens. This transient hypersensitivity results in digestive abnormalities that include disorders of digestive movement and inflammatory responses in the intestinal mucosa. Villi are sloughed from the small intestinal mucosa and absorptive capabilities are reduced. Increased susceptibility to enterotoxins and bacterial infection also occurs during this hypersensitive time period. Although the exact mechanisms are not known, these changes are thought to be the result of antigen-antibody complexes that initiate the pig's own immune system to produce cytokines and complement. The cytokines and complement are thought to directly cause the damage to the intestinal mucosa. Most importantly, these changes result in reduced growth performance. Recovery occurs after 7-10 days when oral immune tolerance begins to develop and eventually, the intestinal mucosa returns to normal with little evidence of long term damage.

Research efforts completed at Kansas State University demonstrated that delayed exposure to soy protein only delays the hypersensitivity response (Table 1). Pigs fed an all milk diet for the first 14 days post-weaning had greater growth performance in this time period, when compared to those fed an all soy protein based diet. However, when all the pigs were switched to a common diet containing soybean meal (day 14 – 35), pigs previously fed the all-milk protein based diet had decreased daily gain and feed efficiency (Table 1.) In addition, the overall ADG (day 0 – 35) of the milk-fed pigs was decreased. This work indicates that the hypersensitivity was not eliminated. This delayed response lead to an overall decrease in performance. Additional studies have been conducted with graded levels of soybean meal and diets of varying complexity.

These studies have lead to the development of our current recommendations for management of the soybean DTH response. We currently recommend that diets fed immediately after weaning contain 10-20 % soy protein. The health status and/or environment of the weaned pigs will likely have an impact on the level of complicating challenges associated with the hypersensitive period. Therefore, customization of farm or system specific programs may be appropriate. Ideally this exposure to soy protein and induction of tolerance would occur prior to weaning. However, successfully providing exposure during the lactation period has not been practical under commercial conditions.

Additional work with further refined soy products have demonstrated some advantages to utilizing moist extruded products. However, these products do not appear to be cost-effective when compared to the use of high quality soybean meal. Recent development of several small-scale moist extruded soy processing plants throughout the Midwest may provide a readily available further processed soy protein for use in nursery diets.

We believe that exposing young pigs to increasing levels of soybean meal in each diet will allow them to overcome the hypersensitivity to soy protein more quickly, without causing a long-term reduction in performance. The early exposure permits inclusion of soybean meal at higher levels in subsequent diets without reducing growth performance. We minimize the negative effects of the transient hypersensitivity by carefully selecting high quality complementary protein and carbohydrate sources). This approach has consistently proven to be more economical than delaying exposure to soybean meal.

Table 1. The Effect of Exposure to Soybean Protein after Weaning on Starter Pig Performance

Item	Milk Protein	Soybean Meal	CV
d 0-14			
ADG, lb[a]	.66	.48	13.0
ADFI, lb[b]	.65	.61	10.3
F/G[a]	.89	1.31	9.4
d 14-35			
ADG, lb[a]	.89	1.11	14.5
ADFI, lb[a]	1.63	1.78	12.0
F/G[a]	1.86	1.60	9.2
d 0-35			
ADG, lb[b]	.80	.86	12.2
ADFI, lb[b]	1.24	1.31	10.4
F/G	1.56	1.53	6.7

[ab]Milk vs. Soybean meal ($P < .01$ and $P < .05$, respectively).
Kansas State University

Ingredient Quality

With increasing weaning age, some pigs may be fed only a limited amount of a Phase 1 or Phase 2 diets that contain higher levels of specialty protein and lactose sources. However, this does not dismiss the importance of using high quality, highly digestible sources of these products in diets in which they are included. While older weaned pigs have a more advanced digestive tract to digest protein products, they can not utilize poorly processed or heat damaged ingredients any better than a younger, lighter pig. The use of high quality ingredients, such as spray-dried blood meal and lactose sources, from a reputable source can assure that ingredient quality is not a limiting nutritional factor in diets.

IMPORTANCE OF FEED INTAKE

Newly weaned pigs cannot consume enough feed to meet their energy needs for protein deposition. They are in a highly energy dependent state. Thus, any increase in energy intake results in improvements in growth rate and lean deposition. Comprehension of this concept will lead to an understanding of the varying response to diet complexity in different situations.

Feed intake (and, thus, energy intake) is highly dependent on environmental factors. If feed intake is compromised due to health status, environment, management, or other factors, diets that contain a variety of specialty ingredients (commonly called complex diets) can help serve as an aid to increase consumption. Lactose, spray-dried animal plasma, and other palatable ingredients typically used in complex diets will increase feed intake of early weaned pigs. However, if feed intake is excellent due to improved environment and minimal disease exposure, the dependency on complex diets fed to nursery pigs can be reduced.

Key points in understanding the interaction of diet complexity and feed intake are: (1) feed intake drives growth performance in early weaned pigs; (2) complex diets improve feed intake primarily for the first few weeks after weaning; and (3) diet complexity can and should be reduced rapidly as impact on feed intake declines with age and to effectively control feed cost per unit of gain.

Studies have shown that increased feed intake in the post-weaning period will increase nursery growth rate, but that this weight advantage is maintained and in some instances increased in the finishing phase compared with pigs with poor feed intake after weaning. Studies also show that increased feed intake will dramatically reduce the risk of enteric disease in the nursery phase.

GROWTH PROMOTION NUTRIENT LEVELS

Post weaning diarrhea associated with hemolytic *E. coli* are a common, and potentially emerging problem in early wean pigs. Utilizing zinc fortification in excess (3000 ppm ZnO) of the nutrient requirement (100 ppm has been reported to promote daily gain in healthy wean pigs nursery diets with 3000 ppm ZnO post-weaning has also been observed to have beneficial effects in helping control post-weaning *E. coli* associated challenges under field.

Another recent study, demonstrated that pigs supplemented with ZnO at 3000 ppm had a reduced translocation of bacteria to the ileal-mesenteric lymph node. The potential mechanism for this finding, as well as the other beneficial effects demonstrated above is not clearly understood. Zinc has been demonstrated to have an effect on cells undergoing rapid turnover, as it is needed for DNA and protein synthesis. Zinc also seems to play a role in stabilizing cell membranes and modify membrane functions. Therefore, zinc's beneficial impact may be in part due to a direct supportive or protective role of intestinal epithelial cells.

Managing post-weaning *E. coli* challenges is increasingly becoming a more complex. These challenges need an ongoing effort for improved prevention or intervention techniques. Utilizing excess supplemental zinc early in the nursery phase is one option available to help minimize these challenges and promote growth. The environmental concerns associated with feeding zinc are significant. This concern reemphasizes the desire to restrict the 3000 ppm ZnO inclusion in the first two weeks after weaning.

REFERENCES

References available from author upon request.