Keeping Control of Feed Costs in an Uncertain Market

Presented To:

Iowa Pork Producers Association

Regional Meetings

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Outline

- What's new in swine nutrition at Iowa State
  - Hint: Almost everything
- Important basic concepts
  - Hint: It's all about fitting within your production system
- What is "novel?"
  - Hint: It's novel to you if you've never used it before
- Risk associated with using novel feed ingredients
  - Hint: Knowing the risks is the first step in managing them
- Mitigating the risk of novel feed ingredients
  - Hint: Like so much of farming, it's all about risk management
- Specific alternative ingredients
  - Hint: The devil is in the details
- Take home messages

Swine Nutrition Team

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Goal: Applied Swine Nutrition Research Program

To **develop** an understanding of high priority nutrition and management issues to **create** solutions and develop strategies that **support** greater economic success and improved long term sustainability of the pork industry

Research Themes : Applied Swine Nutrition Research Program

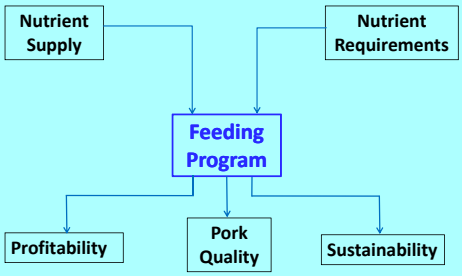
1. Energy metabolism
   - How to best supply energy to the pig
   - How the pig uses energy for growth
2. Ingredient evaluation
   - Evaluation of ingredients
   - Improved approaches to ingredient evaluation
3. Feeding and management
   - Based on industry input and suggestions

Applied Swine Nutrition Research Program: Website

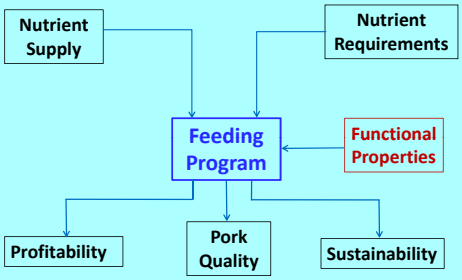
www.ans.iastate.edu/faculty/jfp/acc/

Important Basic Concepts

Framework for Developing Feeding Programs



Framework for Developing Feeding Programs



PRODUCTION CONTINUUM


Breeding

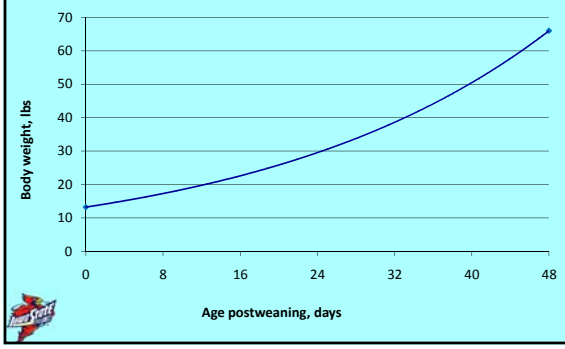

Farrowing


Nursery

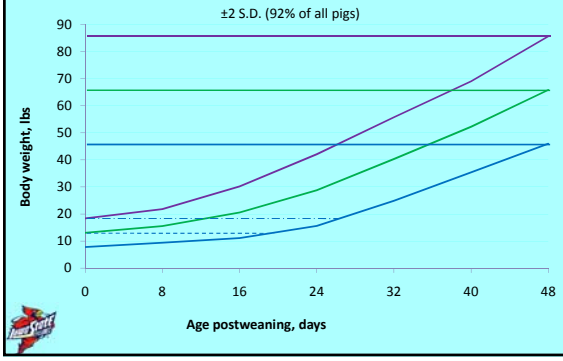

Growout

What occurs in one phase of production often affects outcomes in later phases.
Or
Diagnosing problems in one phase of production often requires consideration of what is happening in earlier phases.

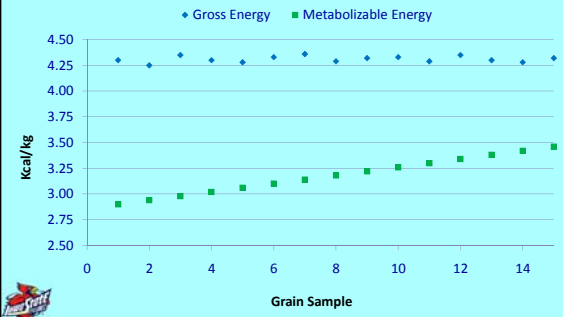
Typical Nursery Growth Curve



Typical Nursery Growth Curve



Generally, benefits of enzyme use are greatest in low quality ingredients



WHAT GETS MEASURED GETS MANAGED

OR

YOU CANNOT MANAGE WHAT YOU DO NOT MEASURE

An (Very) Incomplete List of Ingredients Used in Pig Diets Around the World

- **Corn**
- Wheat
- Barley
- Milo
- Triticale
- Fababeans
- Lentils
- Field peas
- **Soybean meal**
- Full fat soybeans
- Frozen canola seed
- Canola meal
- Hulless barley
- Naked oats
- Sprouted grains
- Tapioca
- **Distillers grains**
- **Wheat middlings**
- Lupins
- Bakery by-product
- Whey (liquid)
- Poultry by-product
- Fish meal
- **Choice White Grease**
- Lard
- AV blend
- Canola oil
- Tallow
- Corn oil
- Poultry grease

Profile of Feed Ingredients Used Around the World

Item	U.S.A.	Europe	Netherlands
Cereal grains	75	48	19
Co-products - oilseeds	15	25	32
Co-products – Food	2	14	32
Fats and oil	3	2	4
Other	5	11	13

Adapted from Zijlstra, 2009

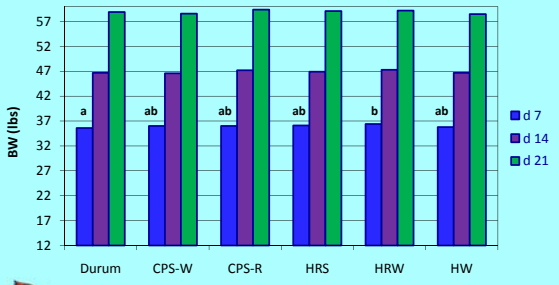
Risks Associated with Adopting New Ingredients

Perception of
Risk
versus
Perception of
Reward

Risks Associated with Adopting New Ingredients

- Accuracy and consistency of nutrient profile (data)
- Palatability
- Risk to performance, pork quality and safety
- Presence of anti-nutritional factors
- Impact on gastrointestinal health, or other biological system
- Risk of contamination: endogenous or exogenous
- Quantity and consistency of supply
- Ease of handling

Impact of Class of Wheat on Weanling Pig Growth

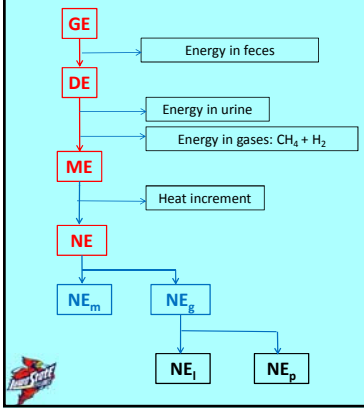


Performance of weaned pigs was similar across wheat classes, including CPS and durum

Energy and Swine Nutrition

Evolving Questions on Energy in Swine Nutrition

1. Will we feed pigs differently in the future than we have in the past?
2. In the past, starch was the major source of energy in pig diets. Will this be the case in the future?
3. Will fiber levels in pig diets increase, and if so, what can we do to maximize outcomes?
4. Will we be able to economically sustain the current primary focus on barn throughput?
5. How will we price novel feed ingredients in pig diets?
6. Should we be considering a switch to the net energy system in place of the existing metabolizable energy system?



Adapted from Ewan, 2001

Comparison of DE, ME, & NE

	DE	ME	NE
		-relative to corn-	
Corn	100	100	100
Soybean meal	104	100	76
Wheat	96	96	94
Field peas	96	94	90
Barley	87	88	89
Canola meal	86	79	60
Tallow	231	234	303

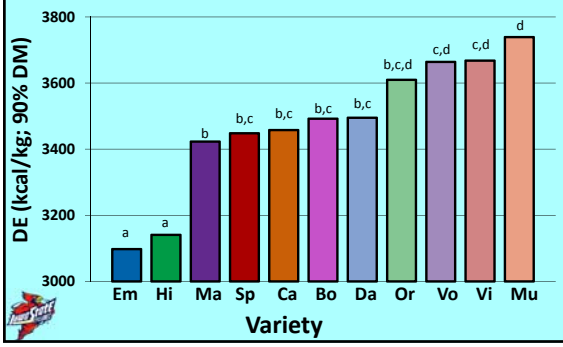
Risks Associated with Adopting New Ingredients

Perception of
<u>Risk</u>
versus
Perception of
<u>Reward</u>

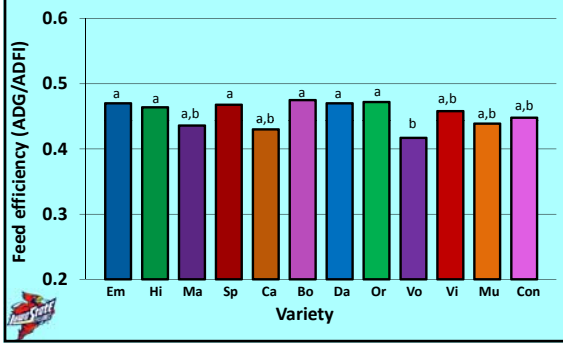
Mitigating Risk: 7 Steps

1. Define chemical and nutrient composition
2. Determine nutrient digestibility
3. Characterize palatability and potential feed intake
4. Identify anti-nutritional factors
5. Determine contamination risks
6. Address physical handling issues, if any
7. Feed it!!

DE Content of 11 Field Pea Samples



Feed Efficiency of Pigs Fed DE-Corrected Diets



Distillers Dried Grains

The pork industry has always competed with other sectors of the economy for feedstuffs: human foods mainly.

Biofuels upset this balance and changed forever the way the world views crops

If biofuels aren't sustained, they can be replaced by other competitors such as biopolymers

Current Commercial Dietary DDGS Inclusion Rates and Estimated Usage

- Grower-finisher diets ~85-90%
  - 20-30% dietary inclusion rates, BUT…….
- Sow diets ~5-10%
  - Gestation – up to 50% dietary inclusion, BUT…..
  - Lactation – 5-10% of the diet
- Late nursery diets < 5%
  - Added at 5-10% of the diet

Dried Distillers Grains with Solubles

	% As Fed	Factor of Corn
Cr. Protein	30.80	3.7
M.E., Mcal/lb	1.74	1.1
N.E., Mcal/lb	0.96	0.9
Calcium, %	0.06	2.0
Total phosphorus, %	0.78	2.8
Avail. Phosphorus, %	0.60	15.3

Dried Distillers Grains with Solubles

	% As Fed	Factor of Corn
SID Lysine, %	0.94	5.5
SID Tryptophan, %	0.24	6.0
SID Methionine, %	0.63	4.2
SID TSAA, %	0.63	2.1
SID Threonine, %	1.14	4.1

Averages, Coefficients of Variation, and Ranges of Selected Nutrients Among 32 U.S. DDGS Sources (100% Dry Matter Basis)

Nutrient	Average	Range
Dry matter, %	89.3	87.3-92.4
Crude protein, %	30.9 (4.7)	28.7-32.9
Crude fat, %	10.7 (16.4)	8.8-12.4
Crude fiber, %	7.2 (18.0)	5.4-10.4
Ash, %	6.0 (26.6)	3.0-9.8
Swine ME, kcal/kg	3810 (3.5)	3504-4048
Lysine, %	0.90 (11.4)	0.61-1.06
Phosphorus, %	0.75 (19.4)	0.42-0.99

Source: Shurson

Fat Quality Characteristics of Market Pigs Fed Corn-Soy Diets Containing 0, 10, 20, and 30% DDGS

	0%	10%	20%	30%
Belly thickness, cm	3.15[a]	3.00[a,b]	2.84[a,b]	2.71[b]
Belly firmness score, degrees	27.3[a]	24.4[a,b]	25.1[a,b]	21.3[b]
Adjusted belly firmness score, degrees	25.9[a]	23.8[a,b]	25.4[a,b]	22.4[b]
Iodine number	66.8[a]	68.6[b]	70.6[c]	72.0[c]

Means within a row lacking common superscripts differ (P <.05) Source: Shurson

Effect of Formulating G-F Diets on a Digestible Amino Acid Basis, with Increasing Levels DDGS, on Overall Growth Performance

	0% DDGS	10% DDGS	20% DDGS	30% DDGS
Initial wt., lbs	49.7	50.3	49.7	49.7
Final wt., lbs	252	253	251	250
ADG, lbs	2.00	2.00	1.99	1.99
ADFI, lbs	5.76	5.58	5.55	5.45
F/G	2.88	2.80	2.79	2.75

Xu et al. (2006) unpublished
Data from 32 pens, 8 pens/treatment Source: Shurson

Wheat Middlings

	% As Fed	Factor of Corn
Cr. Protein	15.9	1.9
M.E., Mcal/lb	1.38	0.9
N.E., Mcal/lb	0.84	0.7
Calcium, %	0.12	4.0
Total phosphorus, %	0.93	3.3
Avail. Phosphorus, %	0.38	9.5

Wheat Middlings

	% As Fed	Factor of Corn
SID Lysine, %	0.43	2.0
SID Tryptophan, %	0.15	3.8
SID Methionine, %	0.21	1.4
SID TSAA, %	0.48	1.6
SID Threonine, %	0.35	1.8

Dried Bakery Product

	% As Fed	Factor of Corn
Cr. Protein	10.8	1.3
M.E., Mcal/lb	1.68	0.9
N.E., Mcal/lb	-	-
Calcium, %	0.13	4.3
Total phosphorus, %	0.25	0.9
Avail. Phosphorus, %	-	-

Dried Bakery Product

	% As Fed	Factor of Corn
SID Lysine, %	0.17	1.0
SID Tryptophan, %	0.08	2.0
SID Methionine, %	0.15	1.0
SID TSAA, %	0.35	1.2
SID Threonine, %	0.24	0.9

Meat and Bone Meal

	% As Fed	Factor of Corn
Cr. Protein	51.5	6.2
M.E., Mcal/lb	1.01	0.6
N.E., Mcal/lb	0.84	0.8
Calcium, %	9.99	333
Total phosphorus, %	4.98	17.8
Avail. Phosphorus, %	4.48	114.3

Meat and Bone Meal

	% As Fed	Factor of Corn
SID Lysine, %	1.86	10.9
SID Tryptophan, %	0.17	4.3
SID Methionine, %	0.54	3.6
SID TSAA, %	0.79	2.6
SID Threonine, %	1.11	4.0

Whey-Sweet

	% As Fed	Factor of Corn
Cr. Protein	12.1	1.5
M.E., Mcal/lb	1.45	0.9
N.E., Mcal/lb	1.30	1.2
Calcium, %	0.75	25.0
Total phosphorus, %	0.72	2.6
Avail. Phosphorus, %	0.70	17.8

Sweet - Whey

	% As Fed	Factor of Corn
SID Lysine, %	0.74	4.4
SID Tryptophan, %	0.14	3.5
SID Methionine, %	0.14	0.9
SID TSAA, %	0.81	2.7
SID Threonine, %	0.57	2.0

Growth Performance of Growing Pigs Fed Crude Glycerol

	Diet[2]				
Item	0	5	10	SEM	*P*-value
Replicates, pen[3]	8	8	8		
Start BW, lb	17.4	17.6	17.2	0.4	0.06
End BW, lb	292.4	294.8	292.2	5.1	0.92
ADG, lb	2.0	2.0	2.0	0	0.93
ADFI, lb	5.1	5.2	5.3	0.1	0.66
G:F,	0.39	0.38	0.38	0.01	0.12

Source: Lammers et al., 2008

Effect of Crude Glycerol on Carcass Characteristics

	Diet[2]				Sex			*P*-value		
Item	0	5	10	SEM	Barrow	Gilt	SEM	Diet	Sex	D x S
No. of Pigs	30	29	31		44	46				
Initial BW, lb	17.6	17.6	17.4	0.4	17.4	17.6	0.4	0.80	0.78	0.69
Final BW, lb	292.6	294.8	292.6	4.4	301.4	283.8	4.4	0.93	0.01	0.92
10th-rib BF, in	0.74	0.83	0.82	0.03	0.87	0.72	0.03	0.14	0.01	0.13
LM area, in^2	7.53	7.60	7.22	0.14	7.44	7.46	0.11	0.12	0.92	0.33
Fat free lean, %	52.0	51.8	50.6	0.8	51.9	51.1	0.6	0.37	0.34	0.78
Lean gain, lb/d	0.8	0.8	0.8	0.0	0.8	0.8	0.0	0.37	0.30	0.70
Carcass lean, %	55.7	54.7	55.7	0.5	55.5	55.2	0.4	0.26	0.48	0.32

Source: Lammers et al., 2008

Take Home Messages

1. The feeding program must be integrated into the total production system
2. What gets measured gets managed
3. Alternative ingredients represent a way to manage feed costs, offering more options and therefore more control over the future
4. Using alternative ingredients brings increased risks, but also increased rewards when markets are right
5. While the midwest has used corn and soybean meal as the basis for practical diets in the past, other regions of the world have used a diversity of ingredients with great success.

Thank you again
to the Iowa Pork Producers Association
for supporting a renewed program in
swine nutrition at
Iowa State University