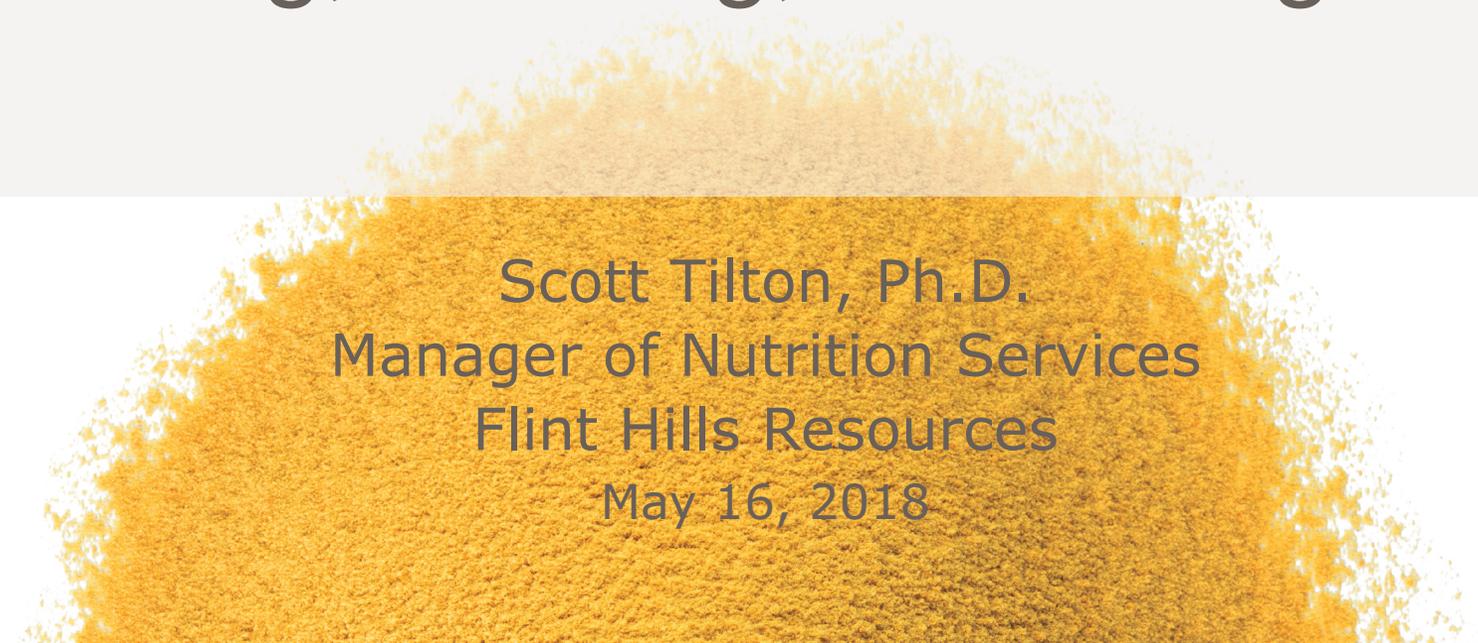




# Ethanol Co-Products of the Future. Finding, Defining, & Creating Value



Scott Tilton, Ph.D.  
Manager of Nutrition Services  
Flint Hills Resources  
May 16, 2018

# Flint Hills Resources is investing in Fairmont ethanol plant



Flint Hills Resources announced Wednesday, January 19, 2017 that it will invest in its Fairmont ethanol plant to install new technology to produce a high-protein animal and fish feed ingredient from a portion of the plant's distillers grains.

The technology was developed by Fluid Quip Process Technologies specifically for the dry-mill ethanol industry.

The feed produced by the product will be used in the aquaculture, pet food, poultry and other industries and will be marketed under the name NexPro™ Protein Ingredient.



# Definition of an Expert

One who knows more and more about less and less until he knows absolutely everything about nothing.

- [rudyh.org/dictionary-fun-funny-quotes-quotations.htm](http://rudyh.org/dictionary-fun-funny-quotes-quotations.htm)

Someone who thinks they knew how to do something but actually just screwed everything up.

- [www.urbandictionary.com](http://www.urbandictionary.com)

Always listen to experts. They'll tell you what can't be done and why. Then do it.

- Robert Heinlein

**One with the special skill or knowledge representing mastery of a particular subject.**

- Merriam-Webster

An idiot

- [www.urbandictionary.com](http://www.urbandictionary.com)

Someone who goes into a serious explanation of doing something fairly simple or unimportant.

- [www.urbandictionary.com](http://www.urbandictionary.com)

An expert is a person who has made all the mistakes that can be made in a very narrow field.

- Niels Bohr

If the world should blow itself up, the last audible voice would be that of an expert saying it can't be done.

- Peter Ustinov

# Outline

- Finding Value
  - Future Customer Needs
  - Technology evaluation
- Defining Value
  - Regulatory activities
  - Formulation modeling
- Creating Value
  - Nutrition research
  - Confirming product values
  - Marketing product

# Finding Value

“Those that fail to learn from history are doomed to repeat it.”

Winston Churchill

# Finding Value – Customer Focus

- Value is created when a product meets a customer need, rather than producing a product that needs a customer
- Who is your customer?
  - Feed Mill
  - Integrator
  - Export
  - Resale/Trading
  - Wet/Dry
- What are the target species served?
  - Ruminants
  - Poultry
  - Swine
  - Other Species

# Finding Value

- Increase total co-product revenue
- Increase DCO recovery
- Create one or more product(s) with increased value
- Maintain or minimize decline in value for residual product

# Technology Analysis

- Some considerations
  - Products produced
    - Volume
  - Utility requirements
  - Labor requirements
  - Maintenance requirements
  - Analytical costs
  - Marketing costs
  - Plant reliability
  - Determining value

# So, A Little History

USDA ERS estimates 1 bushel of corn yields 2.7 gal ethanol, and 17.5 lbs DDGS.

[www.ers.usda.gov/data-products/us-bioenergy-statistics/documentation/](http://www.ers.usda.gov/data-products/us-bioenergy-statistics/documentation/)

	2008*	2012*	2017**
Ethanol Yield, gal/bu	2.78	2.82	2.84
Corn Oil, lb/bu	0.11	0.53	0.45
DDGS lb/bu	15.70	15.20	14.15

We can debate what the right numbers for evaluation are, but for today's examples I will be using 3.00 gal/bu, with 0.75 lbs corn oil/bu and 13.52 lbs of DDGS at 12% moisture

\* Ethanol Producer Magazine, May 15, 2013

\*\* [blog.thejacobsen.com/2017/ddgs-output-remains-elevated-on-strong-ethanol-production](http://blog.thejacobsen.com/2017/ddgs-output-remains-elevated-on-strong-ethanol-production) (March-August data)

# Defining Value

"You must look within for value, but must look beyond for perspective."

Denis Waitley

# New Separation Technology

- Today's hypothetical example
- Oil increase from 0.75 to 1.00 lbs/bu
- Protein yield of 3.8 lbs/bu @ 93% DM
- Residual Fiber yield of 9.23 lb/bu vs 13.52 at 88% DM
- Lost water sold of 0.24 lb/bu

# Your Energy Ethanol Plant

## Current Process

Product	Tons	Value
DDGS	270,400	\$40,560,000
DCO	15,000	\$7,500,000
Total	285,400	\$48,060,000

## Potential New Process

Products	Tons	Value
Fiber	184,600	\$23,075,000
Protein	76,000	\$26,600,000
DCO	20,000	\$10,000,000
Total	280,600	\$59,675,000

Assumes 120 million gallon plant at 3.0 gal/bu, therefore 40 million bu of corn/yr  
Prices – DDGS \$150/ton, Protein \$350/ton, DCO \$500/ton, Fiber \$125

# Evaluating Need for AAFCO definitions

## Corn oil and Protein products

- **Corn oil product fits**

- 33.10 \_\_\_\_\_ Distillers Oil, Feed Grade is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture and mechanical or solvent extraction of oil by methods employed in the ethanol production industry. ....

- **Protein product fits**

- 27.5 \_\_\_\_\_ Distillers Dried Grains is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture by separating the resultant coarse grain fraction of the whole stillage and drying it by methods employed in the grain distilling industry. The predominating grain shall be declared as the first word of the name.

## Fiber product

- **Fiber product MAY NOT FIT**

- 27.6. \_\_\_\_\_ Distillers Dried Grains with Solubles is the product obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain mixture by condensing and drying at least  $\frac{3}{4}$  of the solids of the resultant whole stillage by methods employed in the grain distilling industry. The predominating grain shall be declared as the first word in the name.
- $\frac{3}{4}$  of whole stillage
  - 9.23 lbs of fiber product (8.12 lbs DM)
  - 14.27 lbs of whole stillage (13.30 lbs DM)
  - $8.12/13.30 = 61\%$  of whole stillage

**May want to talk with DGTC and/or an AAFCO Representative for further clarification and next steps forward.**

# AAFCO Filing Process

- Set up meeting with AAFCO
  - Recommend use of consultant
- Develop plan for new ingredient
  - Be prepared to discuss
    - Process flow
    - Chemical/Product additions
    - Mechanical Processes
    - Target animal species

# AAFCO Filing Process

- Develop research plan to evaluate product efficacy and safety
  - Individual species testing
  - Data requirements beyond growth and efficiency
- Timeline of process
  - Simple definitions/process changes might process faster
    - May require multiple revisions and additional research/definition
    - Potentially plan timeline of construction and marketing based on feed ingredient approval

# Product Registrations/Permits

- State feed and tax registrations
- FSMA/HACCP plan revisions
- International registrations
- Harmonized tariff codes
- Trademarks

# Quality Analysis and Control

- Variability of the technology/process?
- Effect on toxins?
- Toxins affect on market access
  - Species specific toxin requirements

# Creating Value

“Embrace change. Envision what could be, challenge the status quo, and drive creative destruction.”

Charles Koch

# Technical Data to Support Sales

- Is there feeding data to demonstrate value in use for target species
  - Digestibility
  - Growth performance
  - Carcass value
  - Other

# Swine Digestibility



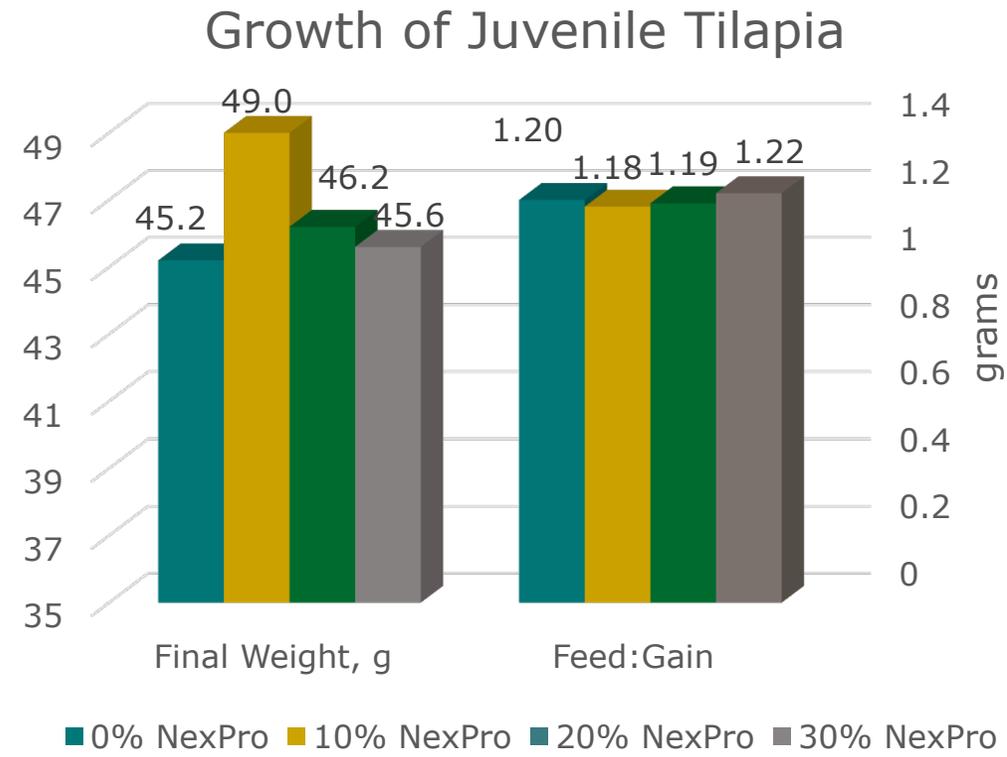
Typical Nutrient Content	
Dry Matter, %	93.0
Crude Protein, %	50.1
Crude Fat, %	3.2
Gross Energy, kcal/kg	4940
NDF, %	28.2
ADF, %	12.2
Lysine, %	1.98
Methionine, %	1.01
TSAA, %	1.88
Threonine, %	2.00
Tryptophan, %	0.42
Phenylalanine, %	2.49
Valine, %	2.83
Isoleucine, %	2.19
Histidine, %	1.33
Arginine, %	2.31

Nutrient	Apparent	SID
Digestible Energy, kcal/kg	3766	
Metabolizable Energy, kcal/kg	3504	
Lysine, %	56.0	61.4
Methionine, %	81.7	83.8
Threonine, %	61.8	69.7
Cysteine, %	67.2	72.7
Valine, %	68.9	74.0
Arginine, %	71.1	80.9
Tryptophan, %	74.8	80.6
Isoleucine, %	70.5	74.9



# Tilapia Digestibility & Growth

Ingredient	Dry Matter	Digestible Energy	Digestible Protein
DDGS	84.46	83.99	69.79
NexPro <sup>TM</sup>	87.15	88.90	98.28



# Are you ready to sell?

- Merchandising/Sales capability
  - Geography
  - Technical vs commodity sale
  - Species expertise



# Confirmation of value

## Flint Hills Resource Shadow Price Report

Plant: FST - InForma Prices  
Formula : 2040 - Swine Grower 165-220

Code	Name	Price	Minimum	Amount	Maximum	Low Price	Low Amount	High Price	High Amount
905	Vit/Min Premix	1,500.0000	0.0300	0.0300	0.0300	1,500.0000	0.0300	1,500.0000	0.0300
10003	Corn Yellow Dent 7.5% CP	124.0000		55.5318		122.9736	56.8270	184.8208	51.2938
20052	DDGS 8% Oil NRC	110.0000				109.0000	40.0000		
30200	SOYBEAN MEAL - 48%	385.0000		2.4892		326.5844	6.9017	390.5415	Rejected
60000	MONOCALCIUM PHOSPH	670.2000					0.4396		
61000	CALCIUM CARBONATE 38	100.0000		1.1283			1.1803	101.1782	Rejected
63000	SALT	50.0000		0.3671			0.3684	101.1799	Rejected
70000	Quantum Phytase 2500 D	5,000.0000		0.0132	0.0220		0.0140	21,175.8000	0.0131
75000	L-LYSINE HCl	2,400.0000		0.4163		2,221.5690	0.4936	4,282.9370	0.2794
75100	L-THREONINE 98.5%	4,800.0000				4,393.6360	0.0339		
75200	L-TRYPTOPHAN 98.5%	24,000.0000		0.0241		22,987.1900	0.0377	34,685.3100	Rejected
75300	METHIONINE DL	3,955.0000				101.1758	12.3555		
80000	Choice White Cross	585.0000				101.1758	12.3555		
990044	New Fiber Product	109.0000		40.0000			47.8097	110.0000	Rejected

# Summary

- Determine best technology solution for you to meet the needs of your customer
- Identify product needs/improvements
- Identify your organizations capabilities
- Evaluate all co-product streams
- Evaluate logistics and quality requirements
- Identify regulatory/permitting needs
- Identify research needs/capabilities

# Thank You

## NexPro™ Sales & Marketing Team

### **Dr. Scott Tilton**

Manager of Nutrition Services

[Scott.Tilton@fhr.com](mailto:Scott.Tilton@fhr.com)

316-828-6985

### **Mark Murphy**

Ingredients Business Manager

[Mark.D.Murphy@fhr.com](mailto:Mark.D.Murphy@fhr.com)

515-817-2944

### **Derek Balk**

NexPro Sales Manager

[Derek.Balk@fhr.com](mailto:Derek.Balk@fhr.com)

515-817-2936

### **Bret Befort**

Ingredients Merchandiser

[Bret.Befort@fhr.com](mailto:Bret.Befort@fhr.com)

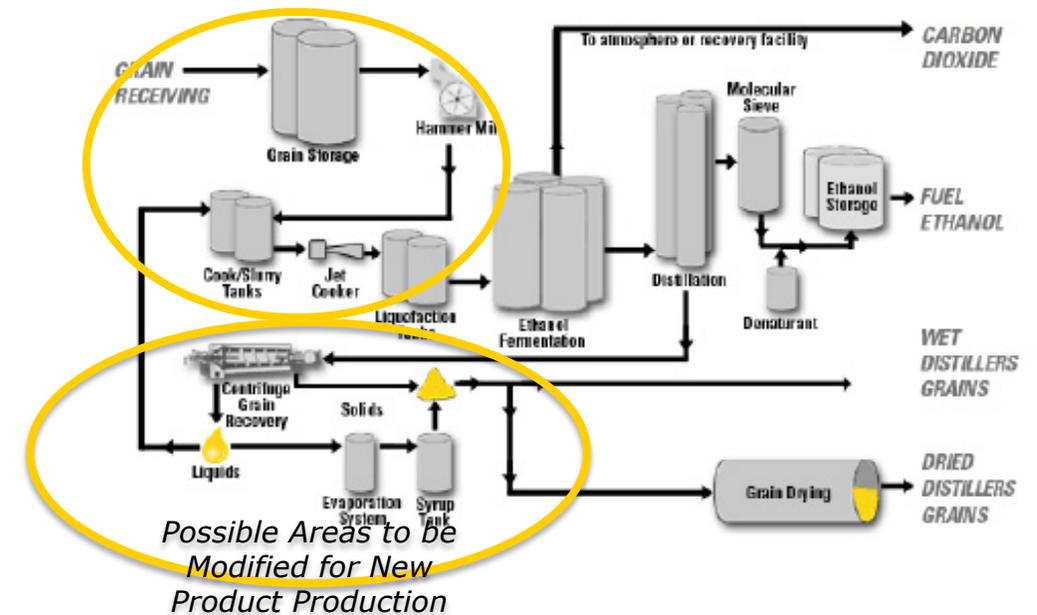
515-817-5089



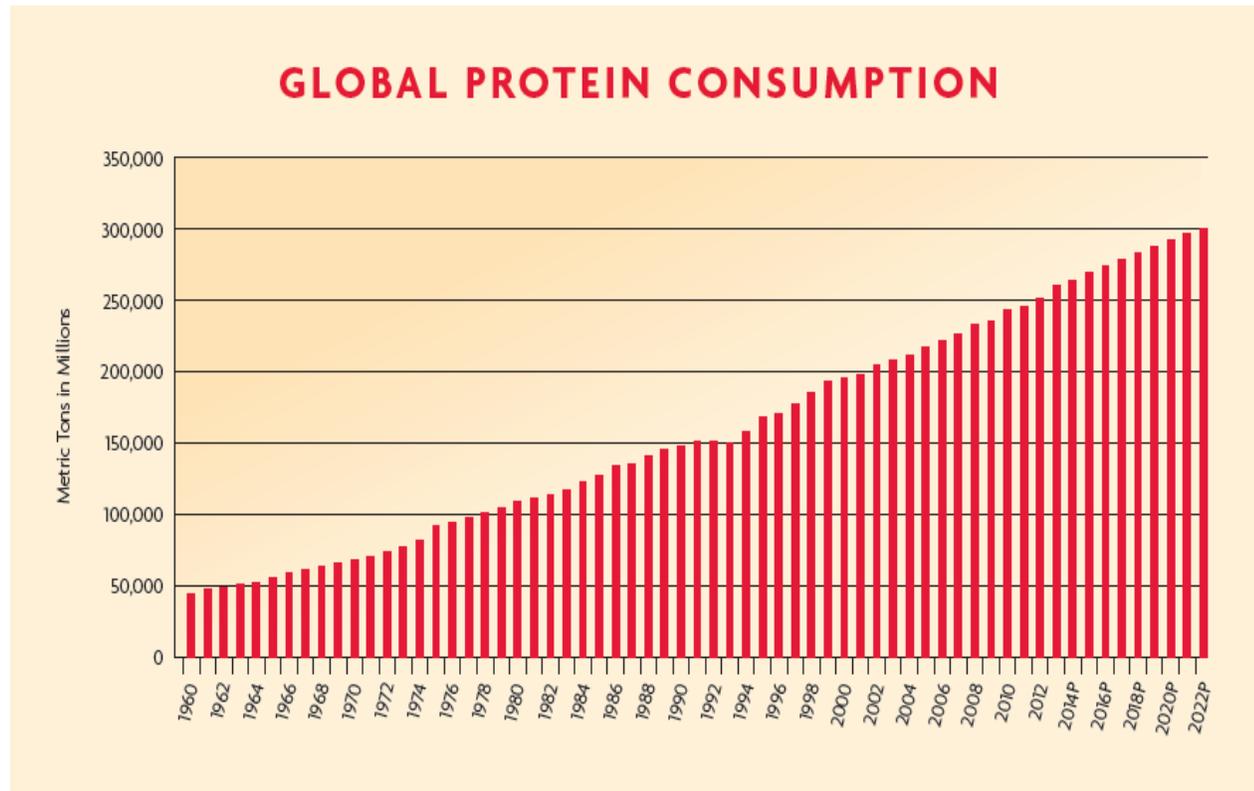
# Finding value

Large number of extremely interesting technologies available

- Not listing all
- Will use hypothetical product concepts



# Global protein trends



The world is eating more protein. Over the past 60 years, global protein consumption has grown by more than 450%.

Source: USDA FAS and CECD. Includes Beef, Veal, Pork, Broilers and Turkey

- Global animal protein consumption continues to increase
- Growth tends to be in species requiring higher dietary protein content
- DDGS is an “imperfect ingredient”

Source: Tyson Foods, Inc. Fiscal 2013 Fact Book

