



Growing the Bioeconomy Conference

Breakout Session I – Opportunities to Enhance Ethanol Co-products and Develop New Uses

September 9, 2008

Renessen LLC

- Formed in 1999 as a 50/50 joint venture between Monsanto and Cargill
- Development company originally focused on using biotechnology to develop feed and processing traits in crops
- Processing research in recovering nutrients from biotech crops started in 2000





Commodity corn

Separation

High Starch Fraction (HSF)

High Oil Fraction (HOF)

On site extractor

Food grade Corn oil

Ethanol production

Ethanol



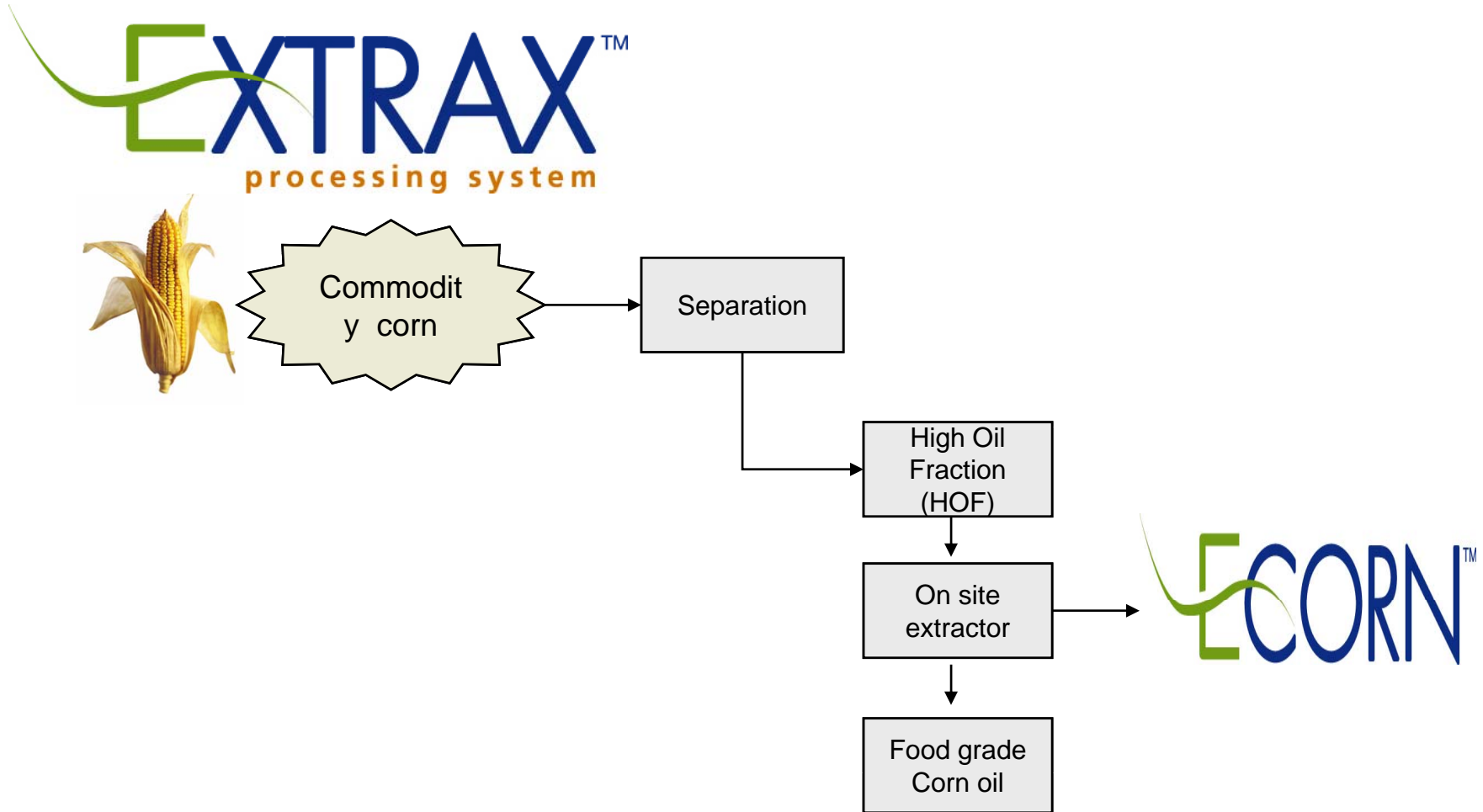
Start with commodity corn, separate it through a patented technology, and deliver the customer only the components of corn they desire

Development history



- **Developed as a recovery system for biotech corn oil**
 - Research started in 2000
 - Demonstration facility started in December 2006
- **Early biotech oil programs used soft kernel corn at very high oil levels**
 - Process flexibility on corn with a variety of hardness
 - Ability to handle oily material over long periods
- **2005 Process adapted for commodity corn and ethanol plant co-location**
 - Significant increase in scale of corn ethanol plants
 - Ideal use of highly concentrated starch material stream

Renessen is working with 10 of the top 11 swine producers in the U.S. in demonstrating Ecorn™



Ecorn™ is a new extracted meal product that replaces corn in swine rations

Nutrient composition, dry matter basis

- ME in Ecorn is similar to corn
- NDF and protein digestibility is higher than corn
- Increased high quality protein
- Low oil <1.5%
- Low moisture 10-12%

	Corn	Ecorn
Dry matter, %	86.74	89.48
Crude protein, %	8.97	13.69
Fat, %	3.25	1.05
NDF, %	6.84	13.41
ADF, %	1.63	3.00
Ash, %	1.16	2.91
Gross energy, kcal/kg	4,479	4,437

ECorn™ nutrient profiling commenced in the fall of 2006

Trials in Progress

ECorn in sow diets

ECorn in low energy swine 1

ECorn in low energy swine 2

ECorn Energy 120-200lbs

Nursery performance 2

Phosphorus and phytase

Cattle finishing U Nebraska

Trials completed

Metabolizable energy UI

Metabolizable energy SDSU

Energy 1

Energy 2

Grow/Fin proof of concept

Grower/finisher U Arkansas

Grow/Fin nutrient constraint

Phosphorus digestibility

Phytase optimization

Nursery performance 1

Nursery U Arkansas

Stainining as MOA

Viscosity

In vivo fiber digestibility

In vitro fiber digestibility

Dairy rations 1

Dairy rations 2

Poultry energy

Scope of commercial feeding trials

Trials conducted	11
Pork systems	10
Head completed	26,100
Head currently on trial	4,100
Addtl Head scheduled	1,200
Cooperating Processers	6

ECorn™ value relative to corn for current trials

<u>Trial</u>	<u>Phase 1</u>	<u>Phase 2</u>	<u>Phase 3</u>	<u>Phase 4</u>	<u>Phase 5</u>	<u>Phase 6</u>
4	96%	97%	96%	97%	98%	98%
5	96%	98%	100%	102%	103%	104%
6	103%	103%	102%	102%	102%	102%
7	98%	98%	99%	99%	100%	100%
8		104%	104%	104%	104%	103%
9*	95%	95%	96%	97%	96%	97%
11			103%	101%	100%	98%

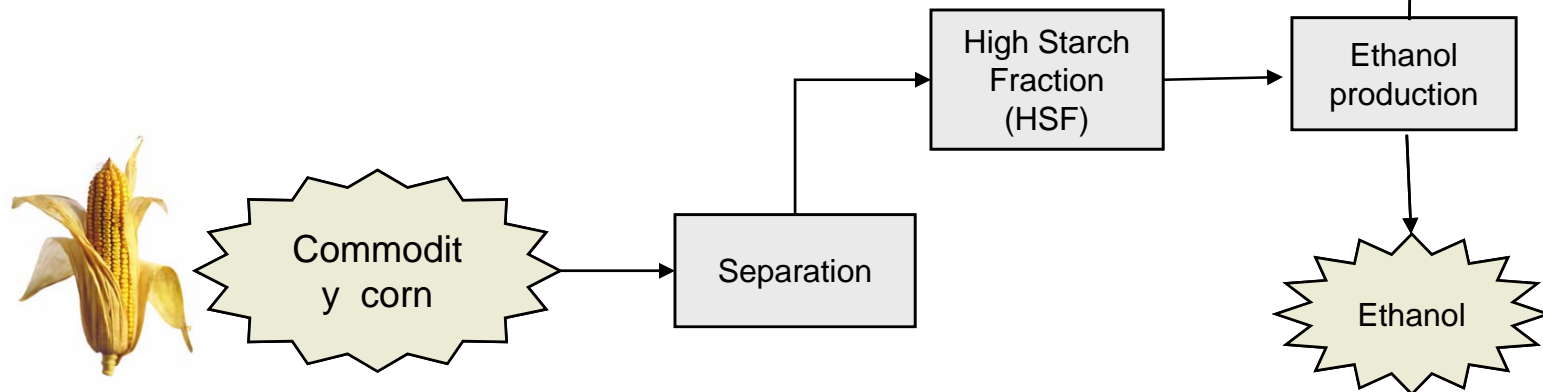
* Diets were not formulated to similar energy levels in Trial 9

- Value varies depending on nutrient constraints, alternative ingredients, corn specs, ingredient costs, etc

- Average value of ECorn™ for all current commercial trials is at 100%

Representative Trial – Overall Performance

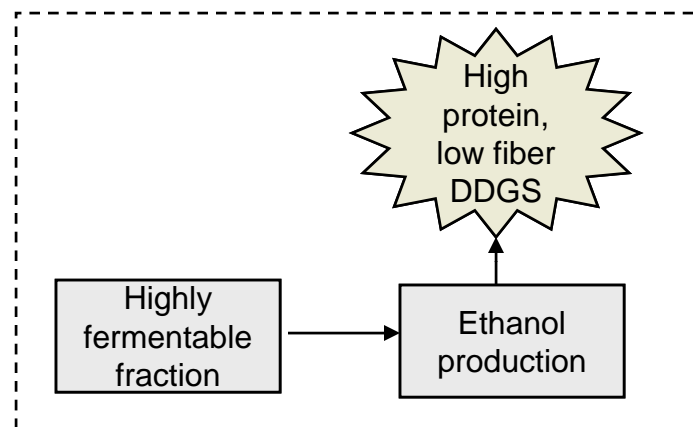
Measurement	Control	Ecorn™	SEM	P-value
Average Daily Gain	1.68	1.67	0.017	0.298
Average Daily Feed Intake	4.62	4.49	0.041	0.009
Feed to Gain Ratio	2.75	2.69	0.020	0.088
Cost/lb of Gain	.215	.216		



The Extrax™ Corn Processing System Produces Enhanced Distillers Grains (Epro™)

Enhanced DDG and DDGS

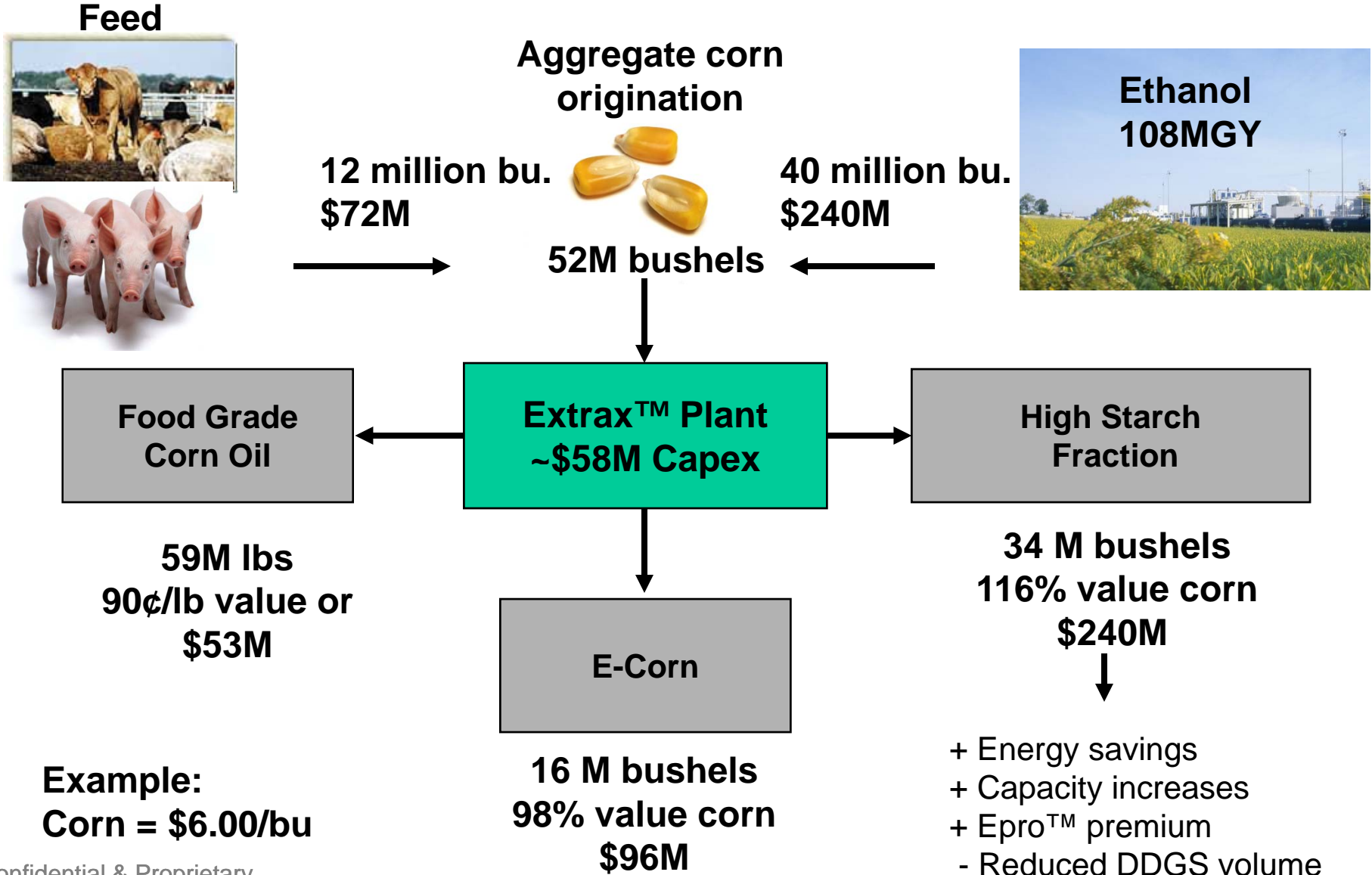
- High protein >35%
- Reduced fiber
- Low oil <8%
- Reduced phosphorous
- Improved handling characteristics
 - Lower angle of repose
 - Reduced fiber aides flowability
- Greater value density



DDGS composition dmb

	Oil	Protein	ADF	NDF
Typical DDGS	10%	35%	8%	30%
Renessen enhanced DDG(S)	6-8%	35-40%	7 - 11	15 - 25

Food, Feed, and Fuel system



Example:
Corn = \$6.00/bu