

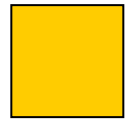
Utilizing the Growing Local Supply of Distillers Grains

December 11, 2002

Bob Kaiser, UW-Extension Dairy Agent



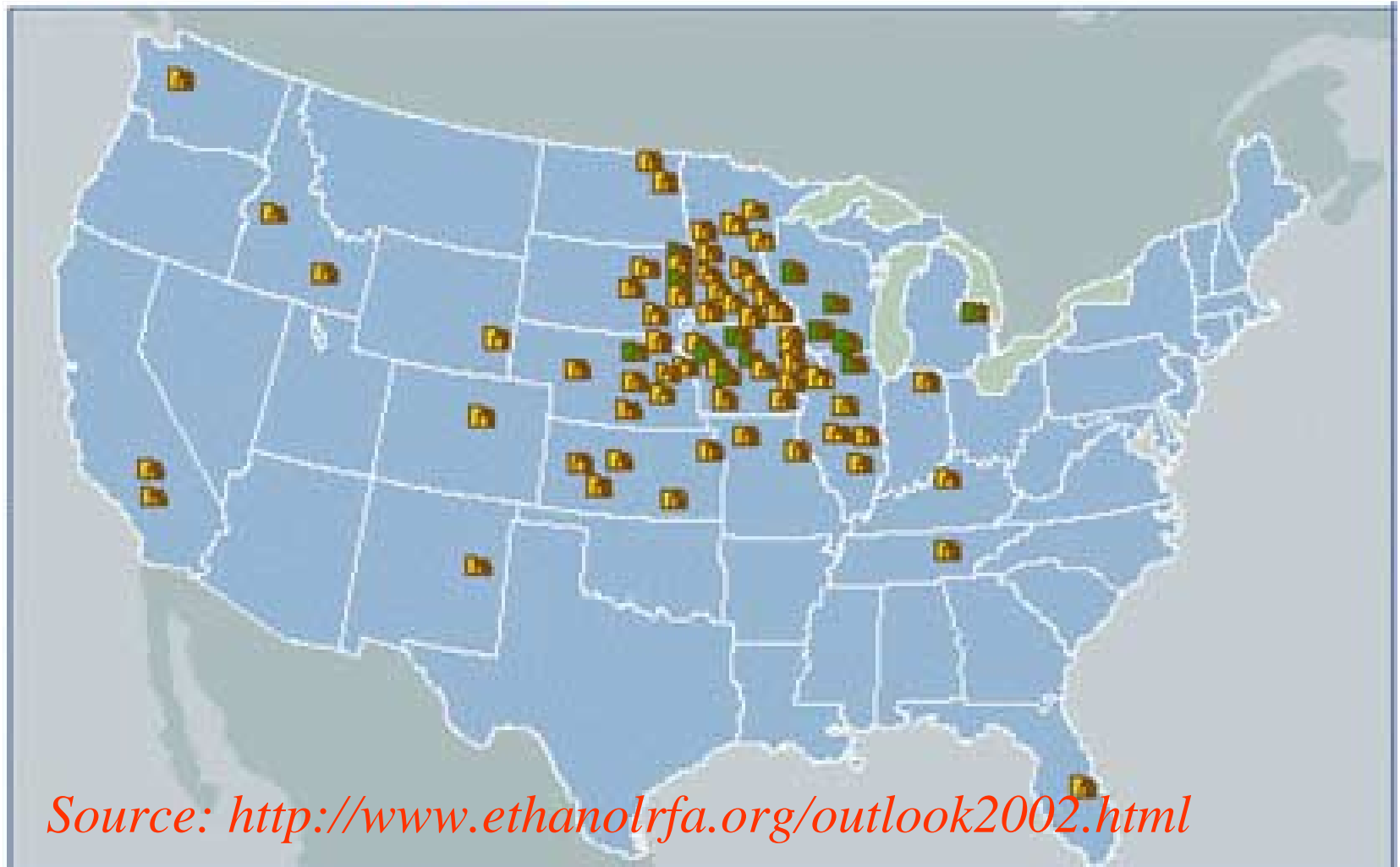
U.S. Ethanol Production Facilities



Operational



Under Construction



Source: <http://www.ethanolrfa.org/outlook2002.html>

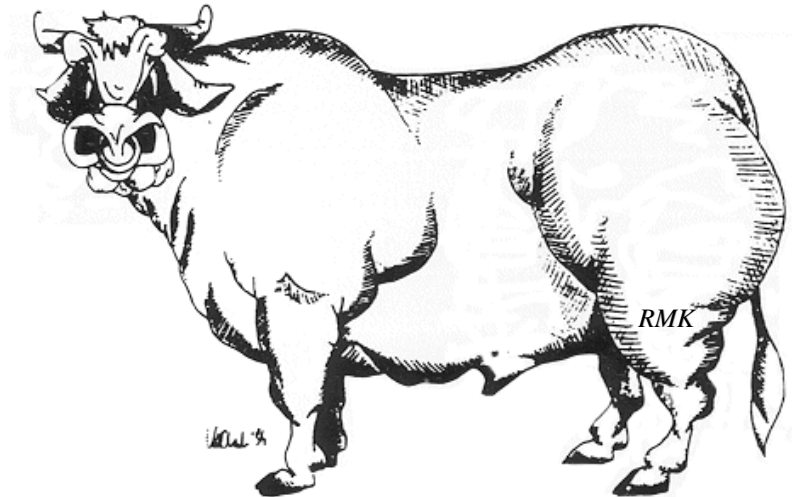
U.S. Ethanol and DDGS Production 2000 - 2010*

Year	Ethanol (bil./gal)	DDGS (mmt)	% Annual Increase
2000/01	1.8	2.8	
2003/04	2.9	5.3	23
2006/07	4.0	8.3	16
2010/11	5.0	9.4	3

U.S. Grains Council

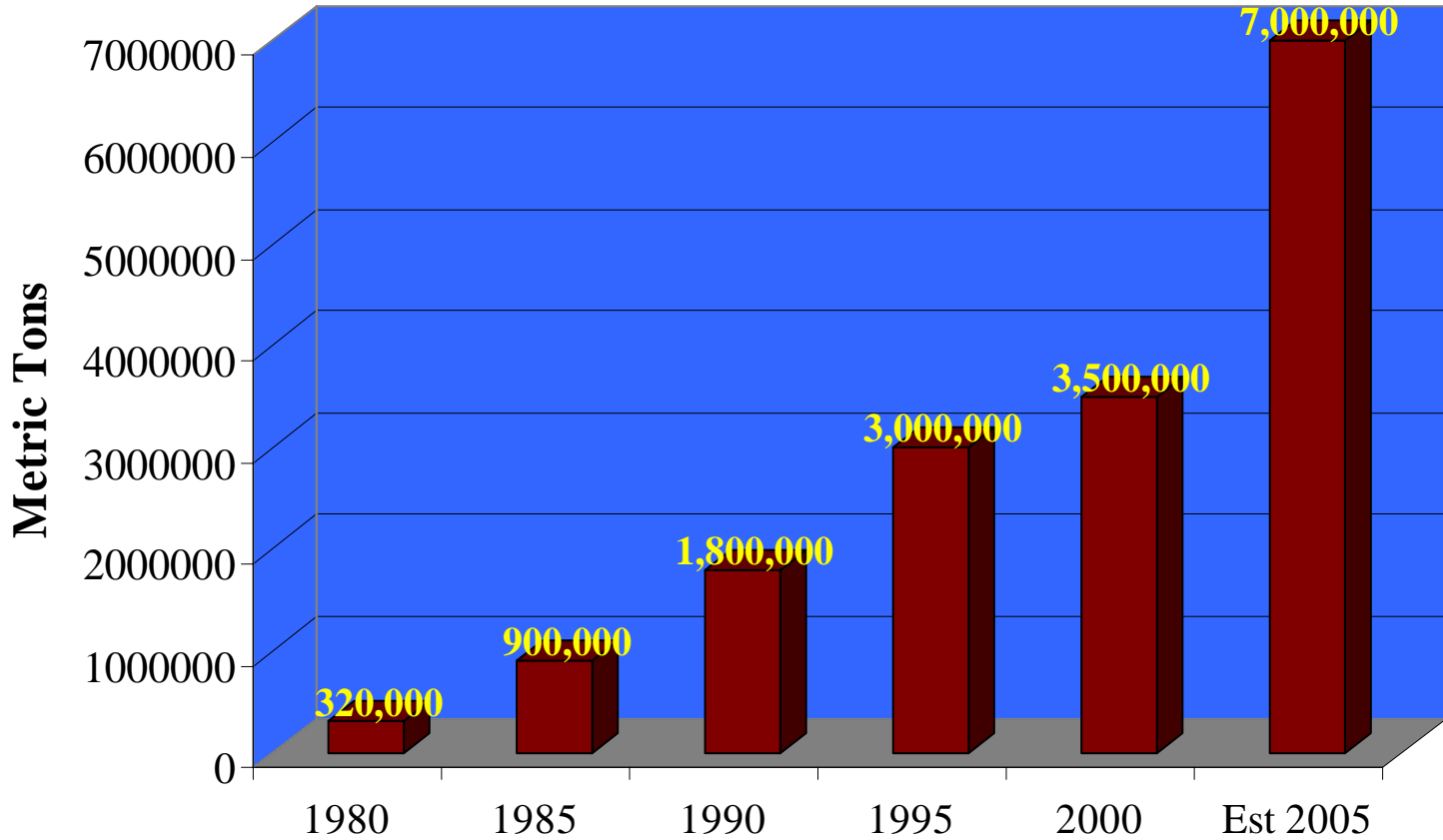
Ethanol / Distillers Grains Status Report

- MTBE phase-out
- Renewable Fuels Standard (pending)
 - 5 billion gallons of renewable fuels mandated by 2012
- Dramatic increase in ethanol and distillers grains production



*U.S. Grains Council
Renewable Fuels Assoc.*

North American DDGS Production



Steve Markham, CSC

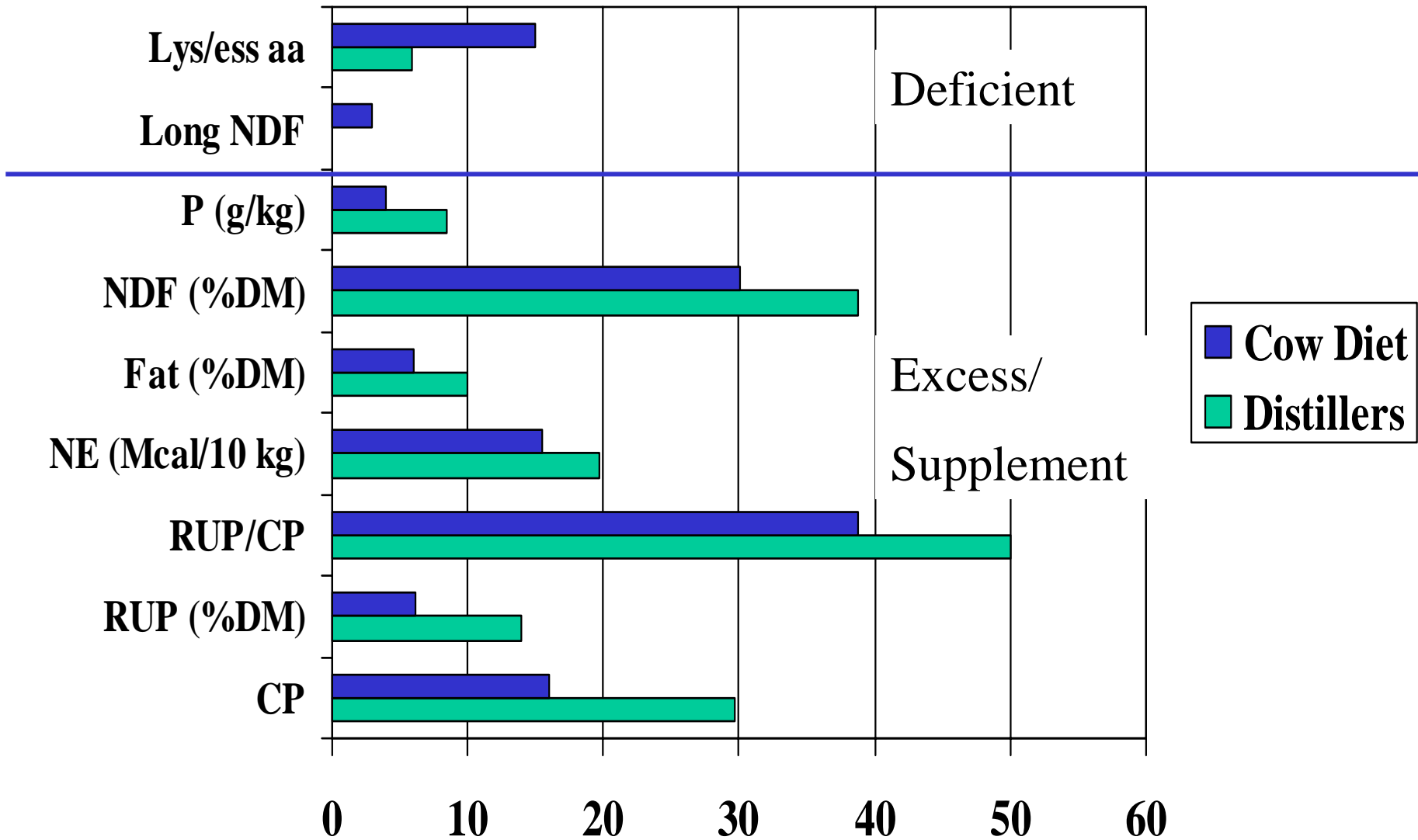
Mutually Beneficial Relationship?

Ethanol Production

Dairy Production



Distillers Grains vs. Lactating Cow Diet



Corn Dry Milling Process Overview

What's in a bushel of corn?



1 Bushel of
Corn

=



2.7 Gallons of
Ethanol

+



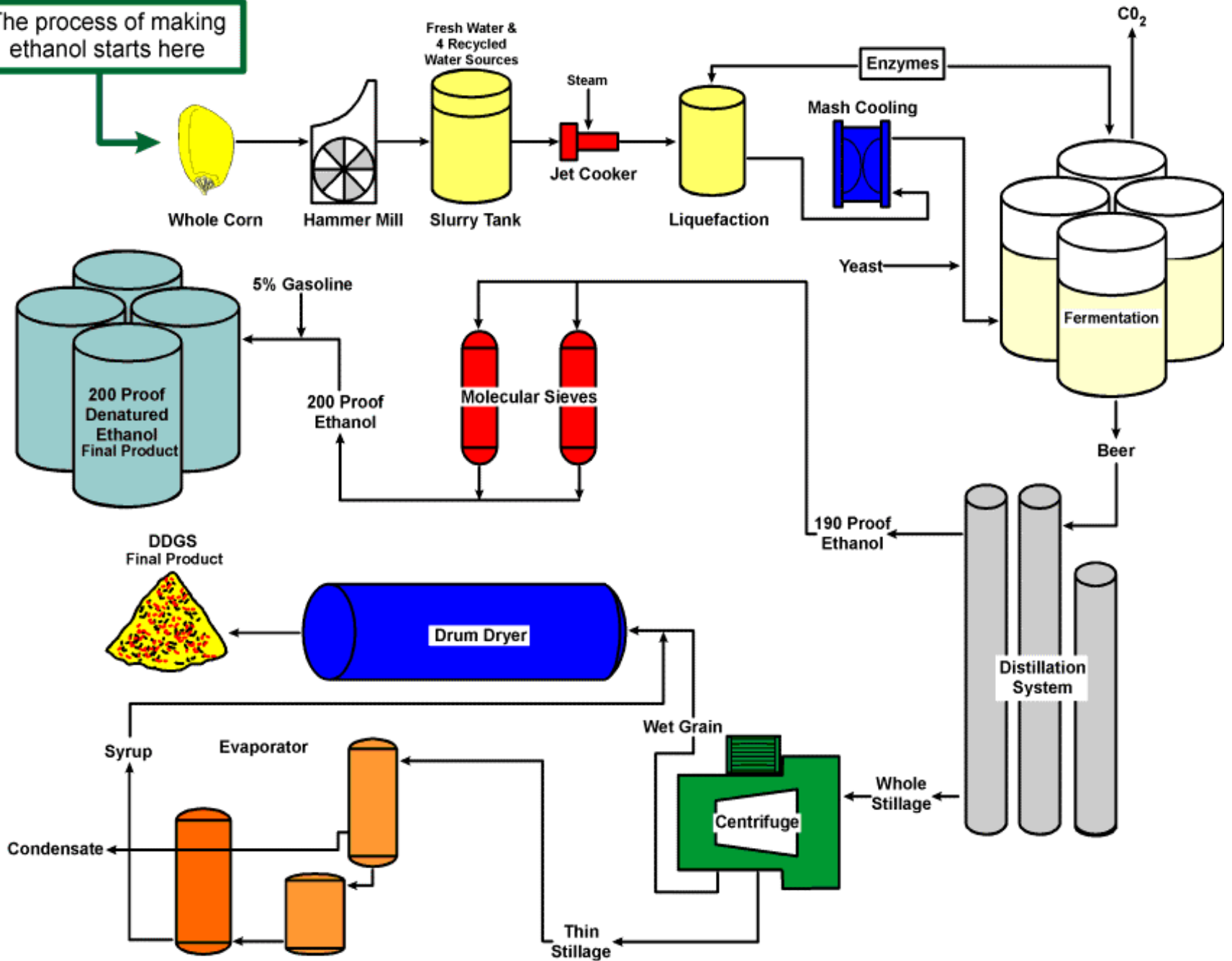
18 Pounds of
DDGS

+



18 Pounds of
CO₂

The process of making ethanol starts here



Definitions / Classification

- Whole stillage → centrifuged
 - Spent grain or cake (wet distillers grains)
 - 30% dry matter
 - Thin stillage (dissolved solids - grain, yeast)
 - 4.4% dry matter
- Thin stillage → multiple effect evaporators
 - Condensed distillers solubles or syrup (CDS)
 - 35% dry matter
 - Dried distillers solubles (DDS)

Definitions / Classification cont'd

- Wet distillers grains → drum dryers
 - Dried distillers grains (DDG)
- Blend of wet or dried distillers grains & CDS or DDS
 - Wet distillers grains with solubles (WDGS)
 - 30 – 50% dry matter
 - Dried distillers grains with solubles (DDGS)
 - 90 – 93% dry matter

Corn Dry Mill Distillery Conversion¹

	Corn	DDGS	WDGS
Dry Matter %	87 – 89	90 – 93	30 – 50 ²
Crude Prot. %	7 – 9	27 – 32	27 – 32
Ether Extract %	3 – 4	8 – 12	8 – 12
ND Fiber %	7 – 12	35 – 43	35 – 43
Phosphorous %	.25–.35	.69–.97	.69–.97
Starch %	60 – 65	0 – 3	0 – 3

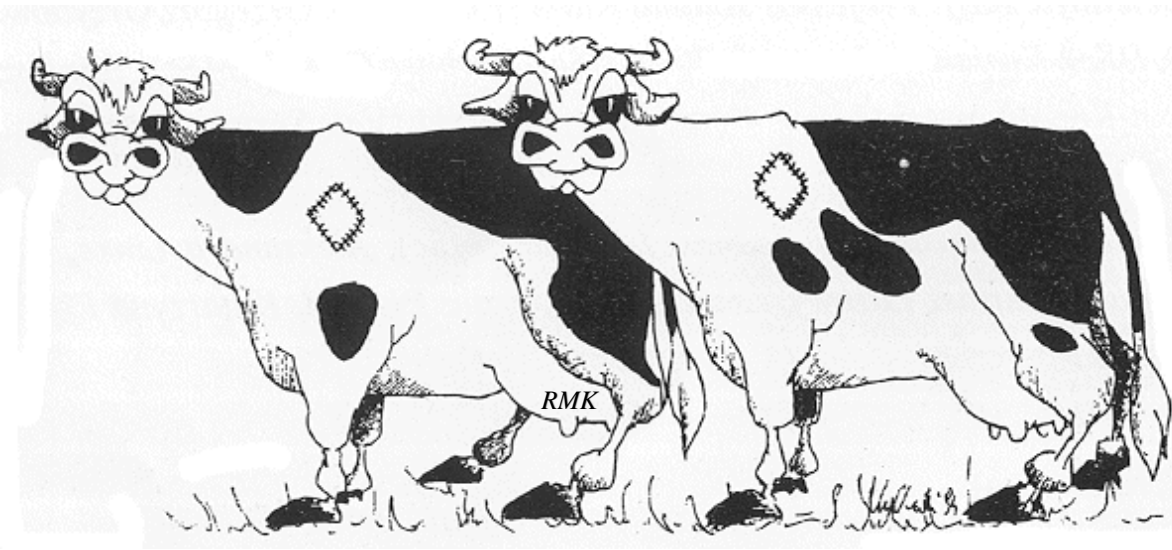
 3x Concentration →

¹DM basis

²Ranges reported in literature

Characteristics of Wet or Dried Distillers Grains w/Solubles

- Low in starch
- High fat
- High protein
- High fiber
- High phosphorous



Nutrient Composition of DDGS

8 Ethanol plants sampled: 5 MN, 2 SD, 1 NE

Item	NRC	Mean	Range
Dry Matter %	90.2	92.7	81.9 – 96.9
Crude Prot. %	29.7	30.1	25.9 – 36.3
Ether Extract %	10.0	10.5	4.3 – 18.7
ND Fiber %	38.8	48.8	38.9 – 61.5
AD Fiber %	19.7	15.5	5.4 – 23.1
Ash %	5.2	4.3	2.0 – 6.7

Protein Characteristics of DDGS

8 Ethanol plants sampled: 5 MN, 2 SD, 1 NE

Item	NRC	Mean	Range
Crude Prot. %	29.7	30.1	25.9 – 36.3
		-----% of CP-----	
Soluble CP		9.7	1.1 – 21.8
ADIP	5.0	8.0	0.8 – 18.5
RDP		46.5	31.5 – 59.8
RUP	50.8	53.4	41.2 – 68.4
		-----% of RUP-----	
IARUP	80.0	82.2	71.5 – 93.8

Causes of Variation in WDGS & DDGS Composition

- Grain source & quality
 - Corn, wheat, barley, rye, sorghum (milo)
- Production factors
 - Processing - particle size
 - Fermentation - extent
- Blending grains and solubles
- Drying temperatures
- Particle separation



DDG Analyses Compared to Solubles

<u>Item</u>	<u>DDG</u>	<u>Solubles</u>
Crude Protein %	23.0	29.7
Ether Extract %	9.8	9.2
TDN %	86	88
ND Fiber %	43	23
Phosphorous %	0.43	1.37
Ash %	2.4	7.8

Distillers Grains Research UW-Madison

	% Concentrate mix (as fed)				
	DG	DG + RDP	DG + Blood	High Protein	SBM
Corn	62.8	63.3	69.4	62.0	77.1
DDGS	33.4	31.6	24.0	16.5	0
Casein + Urea	0	1.8	0	0	0
SBM	0	0	0	12.8	15.2
Blood	0	0	2.1	1.3	0
Meat	0.3	0	0.4	3.3	0.4
Tallow	2.1	2.0	2.1	1.6	2.5

All diets were 44% alfalfa silage, 56% concentrate

Response of Distillers Diet to Casein + Urea

	DG	DG + RDP	High Protein
RUP	6.5	6.5	7.9
RDP	10.9	12.2	12.0
Milk (kg)	43.6	43.5	46.3*
Protein (g)	1258	1272	1341 ^t

DG + Blood Better Than DG and DG + Blood Appears Near Adequate in Lys and Met

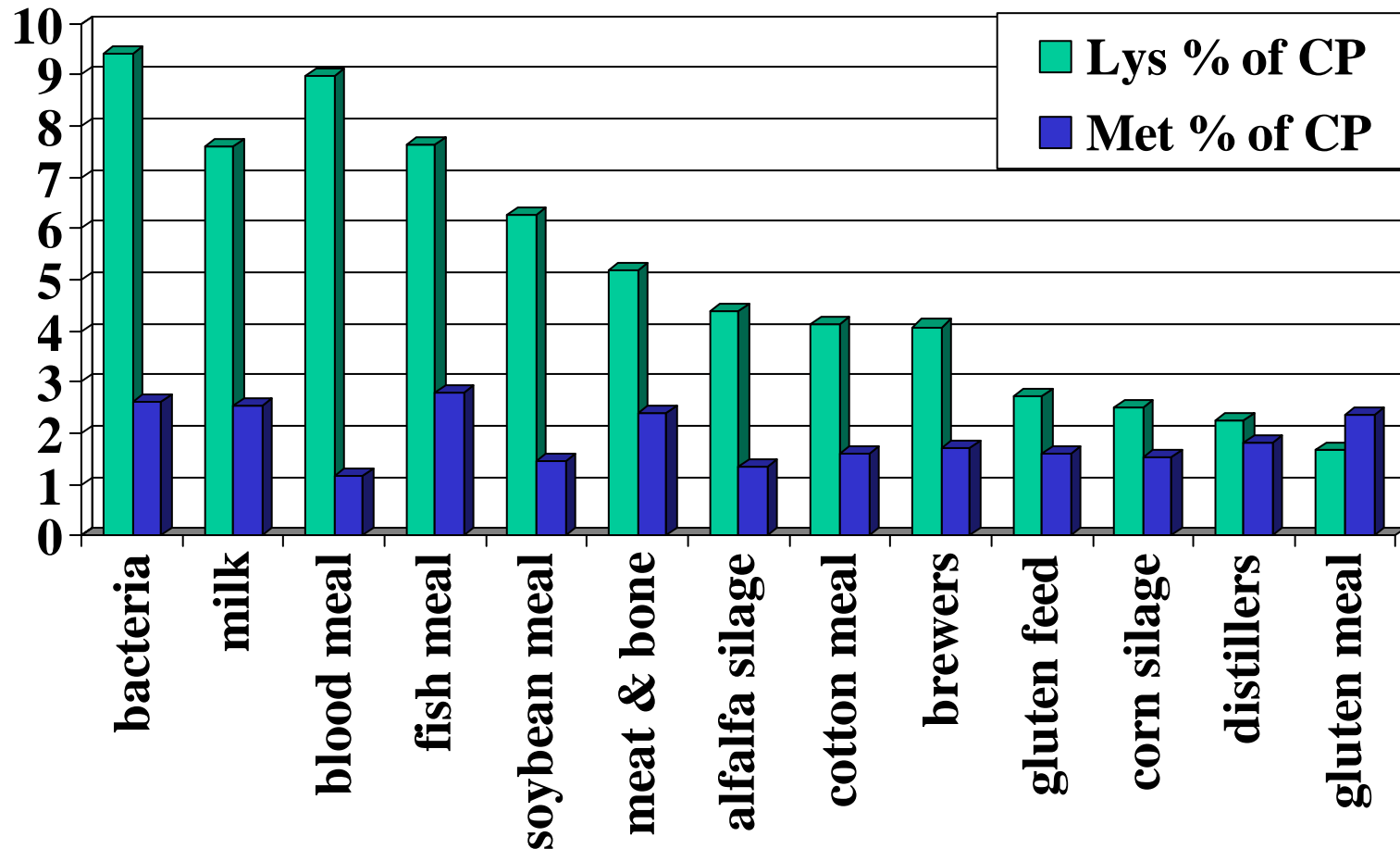
	DG	DG + Blood	DG + Blood & Met	DG + Blood & Met/Lys
Milk (kg)	43.6	44.4	44.5	44.5
Protein (g)	1258	1317	1336	1333
Protein (%)	2.89	2.97	3.01	2.99

Distillers Grains + Met / Lys Diet Slightly Outperformed by Soybean Meal Diet Why?

	DG + Blood	DG + Blood & Met/Lys	SBM
Milk (kg)	44.4	44.5	44.1
Protein (g)	1317	1333	1391
Protein (%)	2.97	2.99	3.18

DG + Blood diet limiting in something other than Methionine or Lysine

Lysine and Methionine Content of Milk vs. Feed Sources

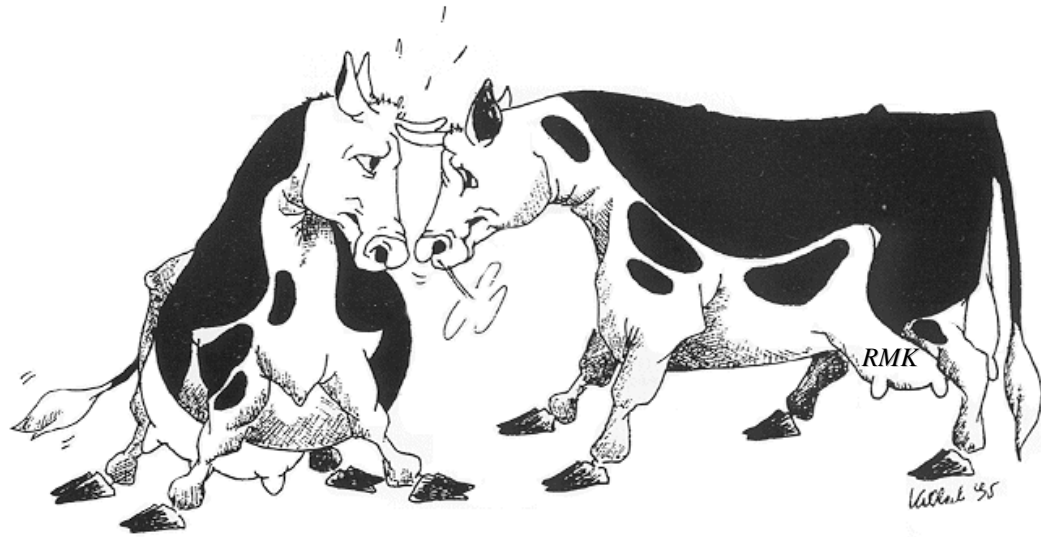


NDF Value of Distillers Grains on Low Fiber Diets

- Good response in milk fat % (UW-Madison trials)
- Increased feed efficiency in beef diets (Nebraska)
- But - fiber is not long!
In addition to adequate effective fiber, NDF from distillers will improve a “hot” diet
- Don't use distillers NDF to replace long forage NDF on 1:1 basis if forage NDF marginal

Feeding Guidelines: WDGS or DDGS

- Max. 20% of diet DM
- Use NRC model to limit distillers according to lysine
- Feed in combination w/other CP sources/ enhance lysine conc.
- Balance RUP / RDP
- Watch dietary fat if whole oil seeds fed



DMI vs. Diets High in Moisture Content

- 2001 NRC, page 7
 - *“Published reports on the relationship between dietary dry matter content and DMI are conflicting and no optimum DM content of the diet for maximum DMI is apparent.”*
 - Water per se does not limit DMI and because low pH and elevated organic acids are not a concern with WDGS, it does not seem likely that this product will adversely affect intake of dairy cows.

Nebraska Wet or Dried DGS Trial

	Corn Dried	Corn Wet	Milo Dried	Milo Wet
Intake (lbs/d)	54.7	57.1	57.1	55.3
4% FCM (lbs/d)	73.4	72.7	70.3	69.0
Protein %	3.4	3.3	3.2	3.2
Butter Fat %	3.7	3.6	3.5	3.5

All diets were 25% corn silage, 25% haylage, 15% distillers

Economics of Feeding Wet or Dried Distillers Grains w/Solubles

- Feed value similar on DM basis if DDGS not heat damaged
 - WDGS ↑ energy
- Supply and demand, market will set \$\$
- Handling and storage considerations
 - Wet = additional costs and ↑ potential losses



Typical Bag Filling Costs = \$5 - \$7/Ton



9 ft. diameter bag, nominal height <4 ft.

Lyle Lange, Lange Ag Systems

Value of WDGS Compared to DDGS

Simplistic Approach

Assumptions:

DDGS @ 91% DM is selling for	\$100/T
Drying costs (WDGS @ 30% DM to DDGS @ 91% DM)	\$ <u>23/T</u>
_____ (\$77/T @ 91% DM = \$84.62/T @ 100% DM)	\$ 77/T

Wet Distillers Grains w/Solubles

Dry Matter %	30	35	40
Value As Is Basis/T	\$25.38	\$29.61	\$33.85
Bagging Cost/T	\$ 6.00	\$ 6.00	\$ 6.00
Net Value/T	\$19.38	\$23.61	\$27.85

Your Comments or Questions!



UW
Extension

- Contact me at:

Monday &
Tuesday
888-698-3326

Wednesday -
Friday 920-386-
3790
robert.kaiser@ces.uwex.edu