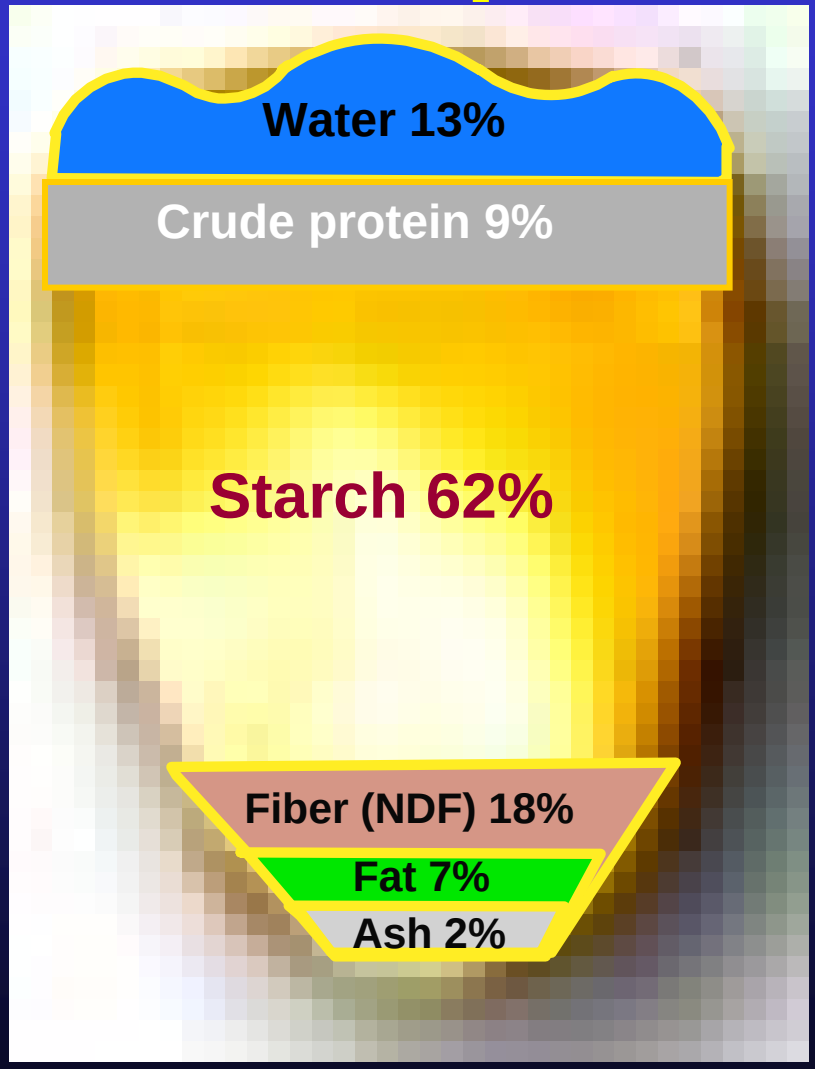
Using Corn Ethanol Byproducts in Beef Rations

Corn Composition



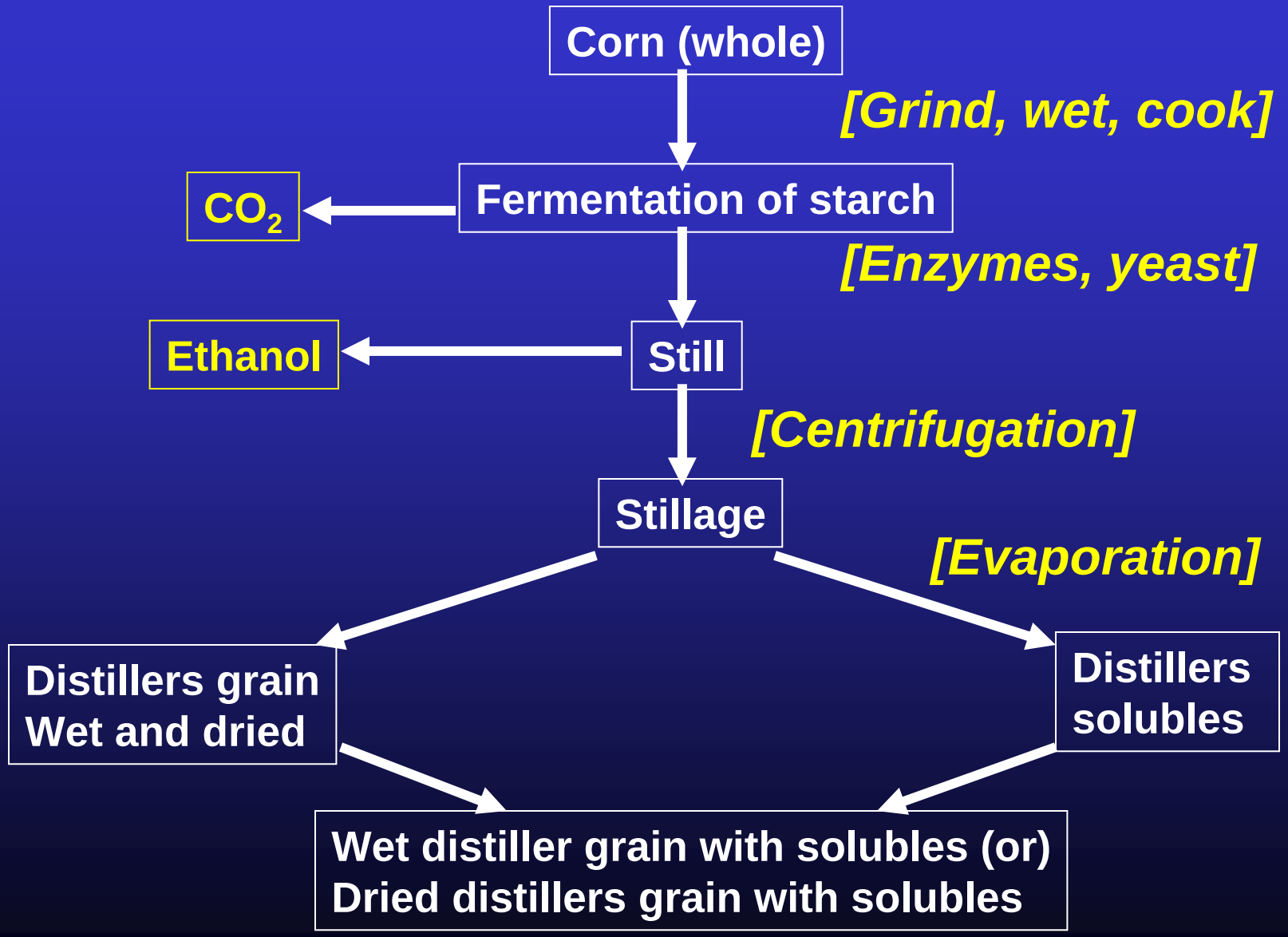
Dry Corn Milling

NDSU Animal and Range Sciences

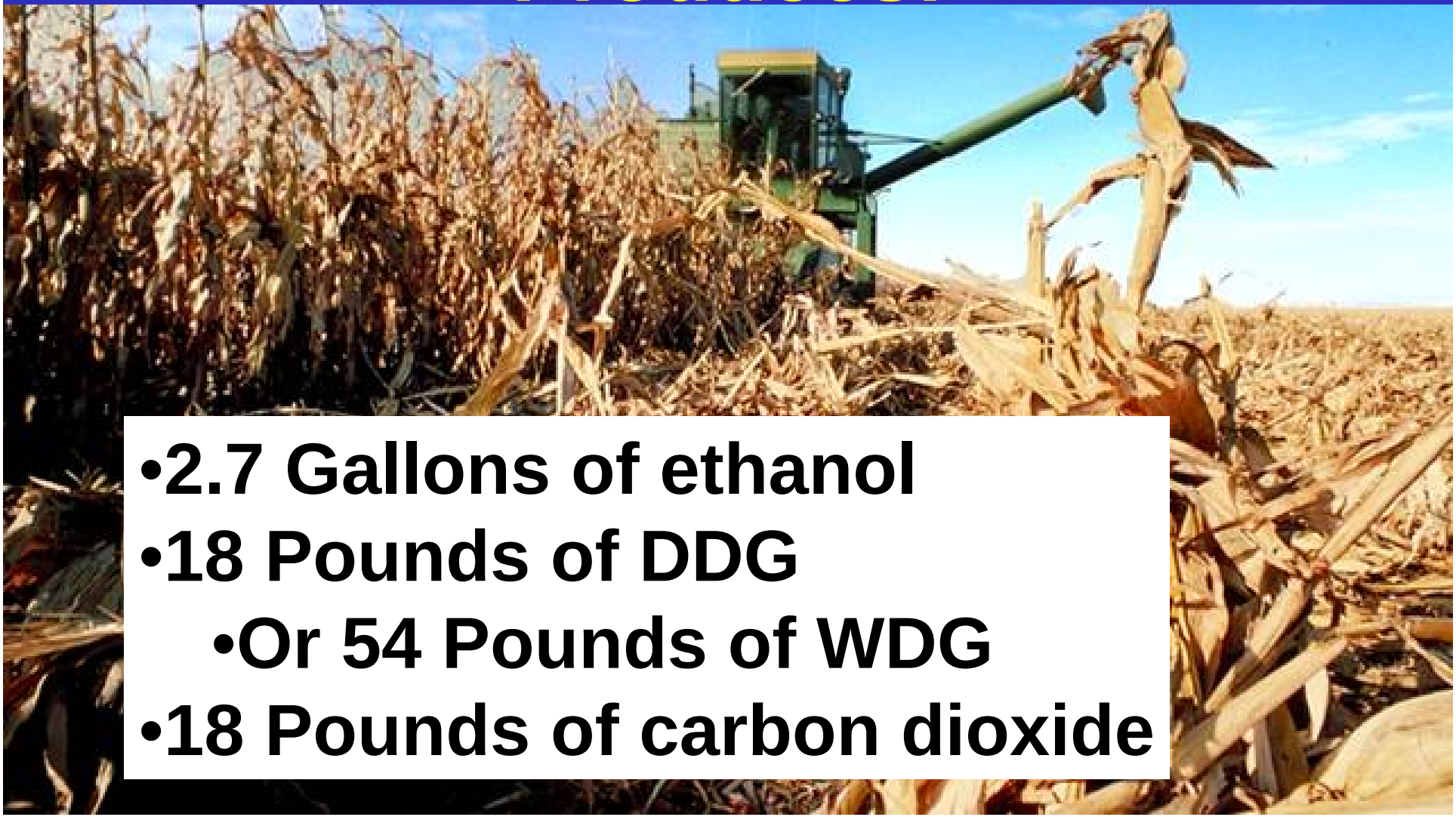
Corn Milling Procedures

- Dry milling
  - Corn is hammer milled without prior soaking in water
  - End products
    - Food grade: Corn grits, hominy, alcohol
    - Industrial grade: Ethanol, alcohol

Dry Milling Schematic

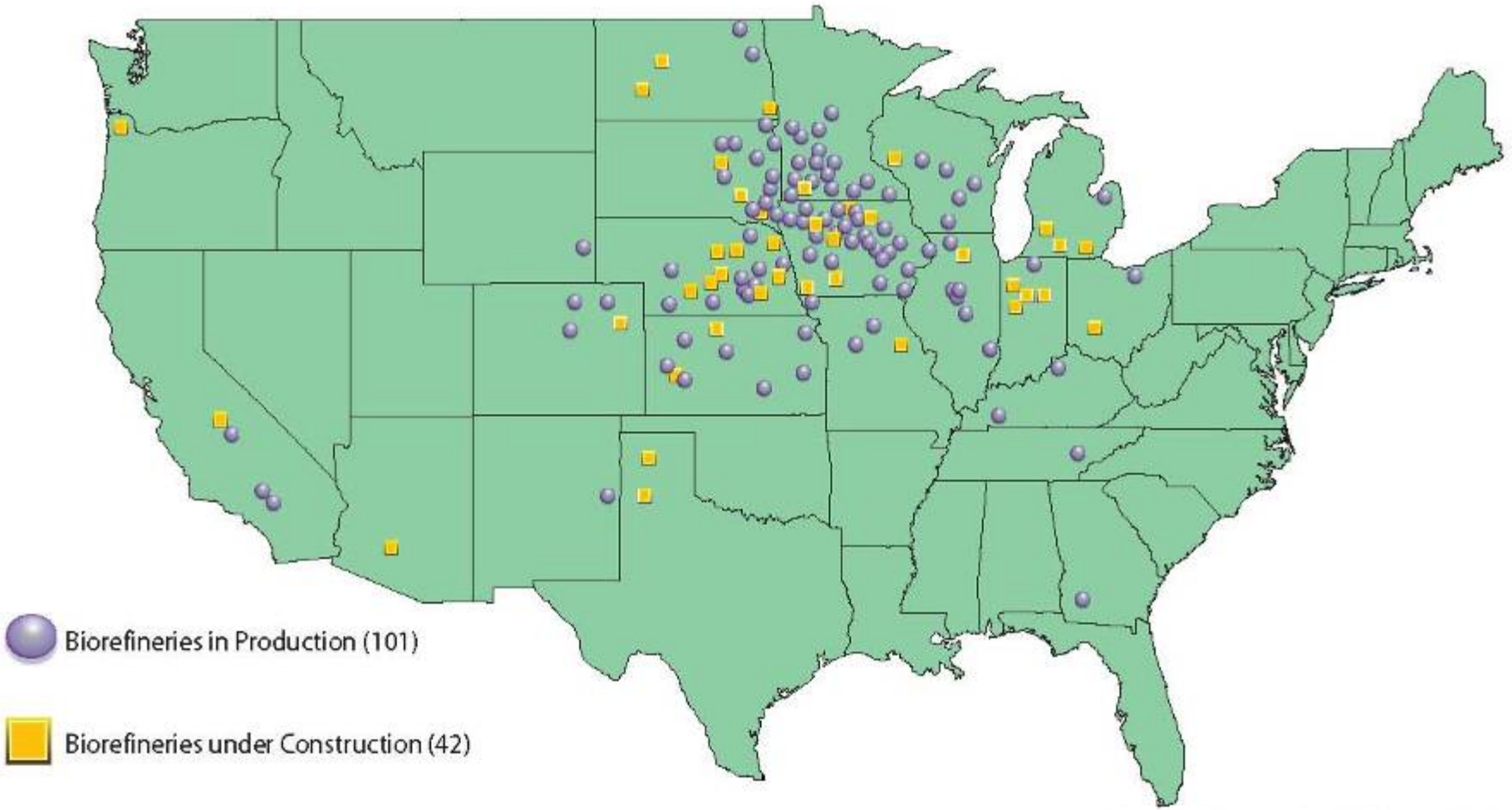


One Bushel of Corn Produces:



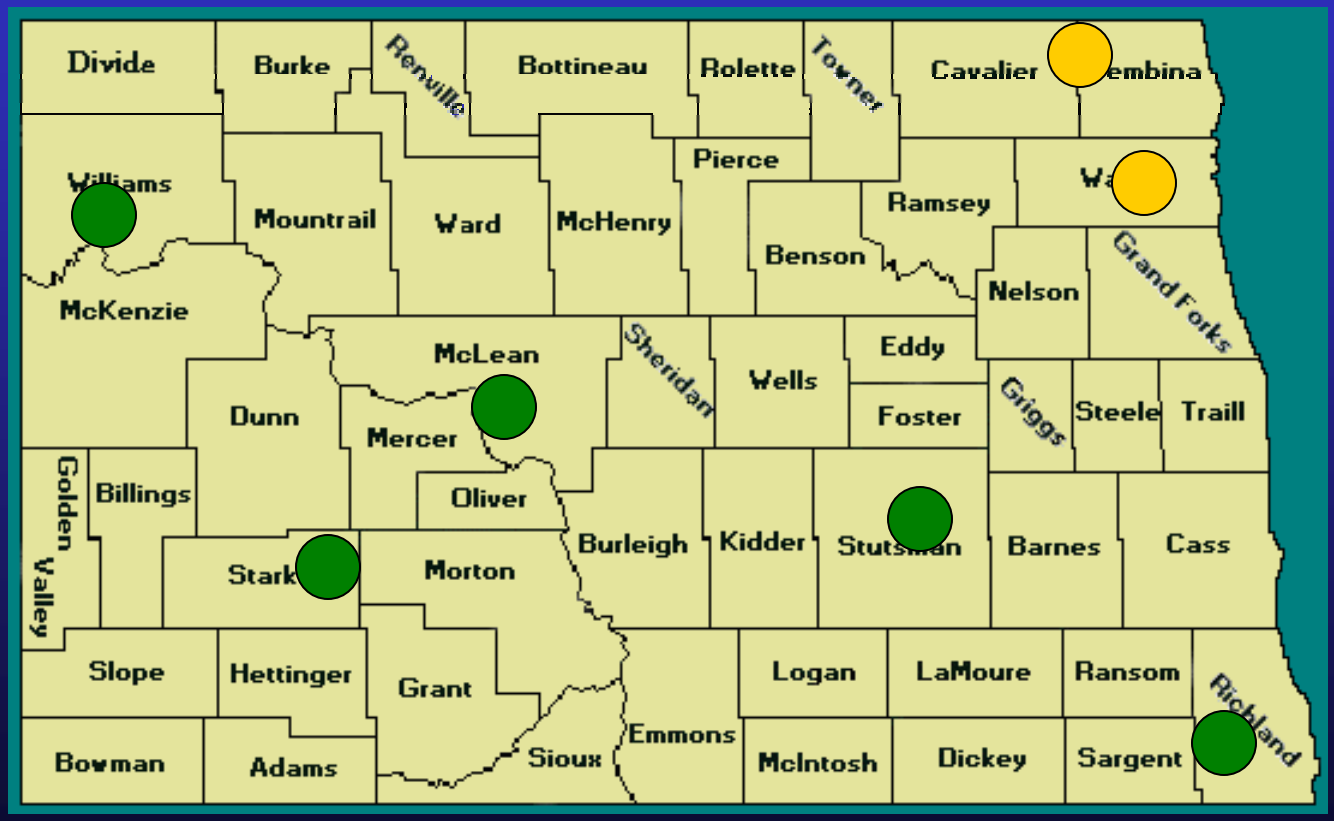
- 2.7 Gallons of ethanol
- 18 Pounds of DDG
  - Or 54 Pounds of WDG
- 18 Pounds of carbon dioxide

U.S. Ethanol Biorefinery Locations



Source: Renewable Fuels Association

North Dakota Ethanol Development



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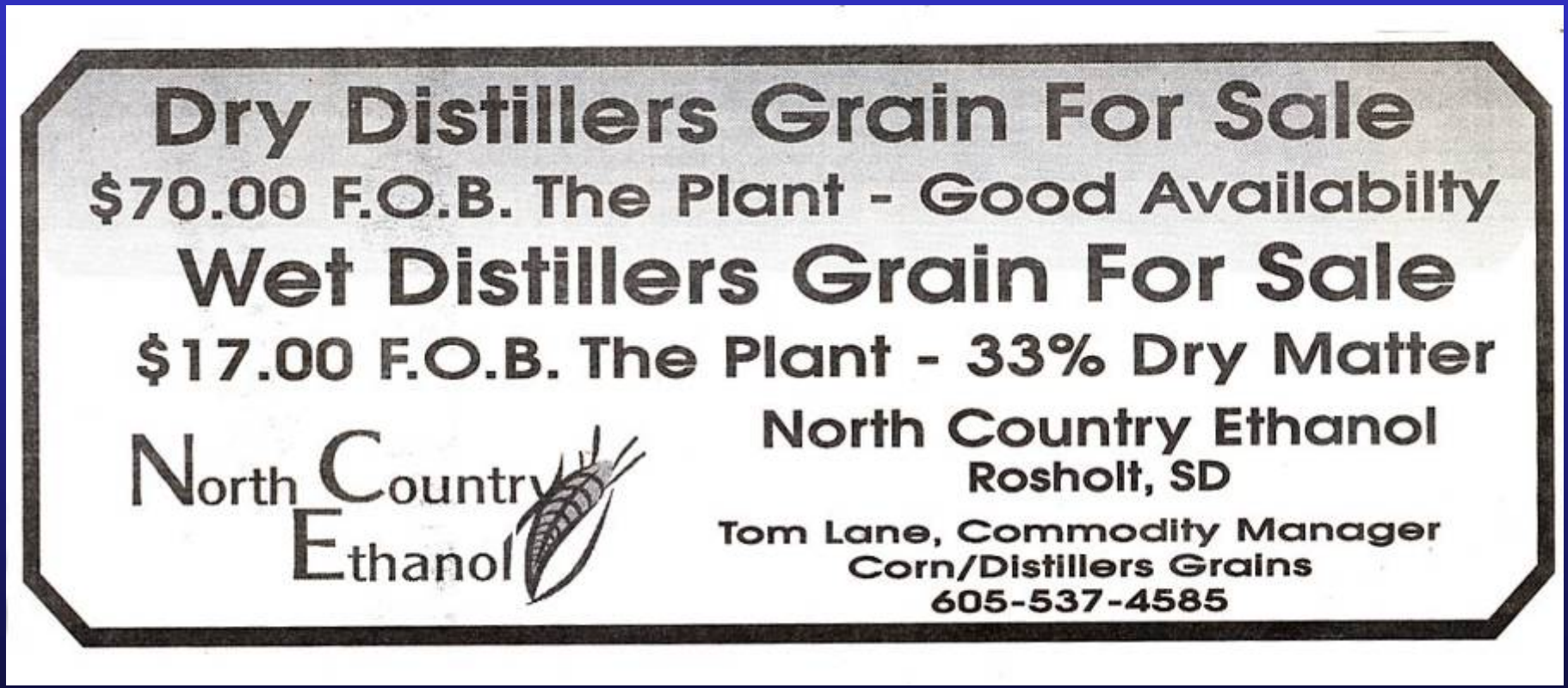
Planned

Operating

Contact Information for DDGS

- **Alchem, Ltd Grafton**
  1-888-488-2778
- **ADM Walhalla**
  1-888-541-1062
- **Blue Flint Ethanol Underwood**
  1-701-442-7505
- **Red Trail Energy Richardton**
  plant 1-701-974-3308
  Commodity Specialists 1-800-769-1066


Dry Distillers Grain For Sale
$70.00 F.O.B. The Plant - Good Availabilty
Wet Distillers Grain For Sale
$17.00 F.O.B. The Plant - 33% Dry Matter
North Country Ethanol
North Country Ethanol
Rosholt, SD
Tom Lane, Commodity Manager
Corn/Distillers Grains
605-537-4585

Corn Condensed Distillers Solubles

- Also referred to as ‘corn syrup’
  - Feed industry = CCDS
- Highly variable nutritional content
  - DM
  - CP
  - Fat
  - Energy
  - Minerals
- Sometimes being given away if freight is paid

Corn Condensed Distillers Solubles

- Contains (DM basis):
  - 20 to 30% CP
    - 20% UIP (highly degradable)
  - 80 to 93 NE_g (Mcals/100 lbs) (97TDN)
  - 9 to 15% fat
  - 1.30 to 1.45% P
  - 1.75 to 2.25% K
  - 0.37 to 0.95% S

Nutrient Content of CCDS

	Product A	Product B
Fat, % DM	4.2	17.4
CP, % DM	15.4	21.6

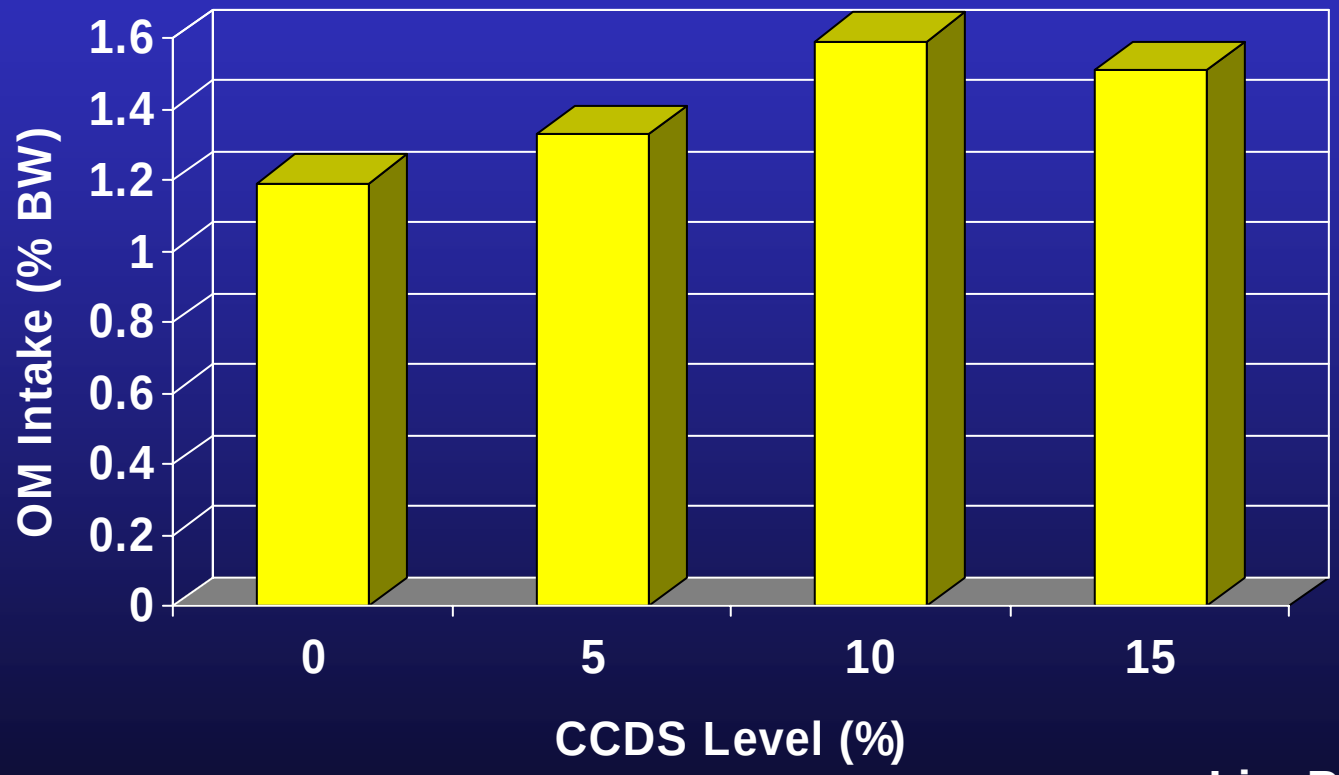
- Plant to plant variation
- Day to day variation within plant

Gilbery et al., 2006

Corn Condensed Distillers Solubles

- Liquid byproduct
- Need liquid handling capability
- Can freeze
- Best results when tanks are buried
- Excellent ration conditioner
  - Controls dust
  - Improves palatability

Effect of High Fat CCDS on Feed Intake in Forage Based Diets



Lin, P = 0.01

Gilbery et al., 2006

Tank Systems


BOTEC

Dried Distillers Grains Plus Solubles

- Contain:
  - 25 to 32% CP
    - 47 to 57% UIP
  - 60 to 70 NE_g (Mcals/100 lbs) (86TDN)
  - 8 to 10% fat
  - 0.4 to 0.8% P
  - 0.87 to 1.33 K
  - 0.37 to 0.46 S

Dried Distillers Grains with Solubles

Dried Distillers Grains Plus Solubles

- Feed at 10 to 15% of the diet as a source of supplemental protein
- Feed at higher levels as an energy source
  - Economics determine appropriate level
- Maximum recommended level = 40% of the diet
  - N and P will be above requirements and could cause nutrient management problems
  - Sulfur issues

Dried Distillers Grains Plus Solubles

- Can be used as a protein supplement for forage fed cattle
- Majority of the protein is escape or bypass protein
  - Rely on urea recycling to use the escape protein in DDGS
- Stalker et al. (2004)
  - No differences in animal performance with urea inclusion in supplements based on DDG

Handling DDGS

- Doesn't pellet well
- If you want to try pelleting
  - Add wheat midds, soybean hulls or other byproducts
    - 40% or more of the pellet?
- Storage
  - Will bridge and cause problems with conventional storage
  - Flat storage works best

Feeding Dried Distillers Grains on the Ground

- Concern
  - Feed waste
- Fat content may prevent some blowing when fed in meal form
- Feeding on used conveyor belts may be an option

Wet Distillers Grains

- Contain 25-35% DM (65-75% moisture)
- Contain 30 to 35% CP on a DM basis
- Contain .80 to .90 Mcal NEg/cwt
  - 100 to 115% value of corn
- 8 to 12% fat
- 0.5 to 0.8% P

Transportation and Storage

- Haul in end dump or live bottom trucks
- Will store 7-10 days in summer before mold, in winter freezing an issue
- Plants now selling modified wet at 50% DM which is more economical to truck
- Some success in bagging or packed pile in blends with stover, straw or hay to stockpiling for latter use

Ration Mixing

- Ration mixing is important in forage based diets
- Separation of DDGS from forages increases likelihood of sulfur related problems

Commodity Bay Storage

High corn prices create challenges for cowmen

Example Rations with DDGS

	600 lb steer 2.5 ADG	1300 lb cow 7 mon pg.5 ADG
Grass Hay (45)	8	
CRP Hay (35)		25
Oat Straw (25)		5
Corn (120)	3	
DDGS (90)	5	3
Salt/Min (500)	.35	.2
Cost/hd/day	$.68	$.68

Future Opportunities ????

	%DM	%CP	%TDN	$/T	$/CP	$/TDN	$/BU	
Canola Meal	0.9	0.41	0.69	$116.0	0.1571			
Corn	0.88	0.1	0.9	$125.0		0.0789	$3.50	
Barley	0.88	0.135	0.84	$126.3			$3.03	86.%
Oats	0.91	0.13	0.75	$116.3			$1.86	53.%
Barley Malt	0.89	0.14	0.74	$115.1				
DDGS	0.9	0.28	0.86	$173.0				
Wet DG	0.3	0.28	1.15	$72.63				
Peas	0.88	0.23	0.88	$158.1			$4.75	135.%
Screenings	0.86	0.14	0.7	$105.8				
Wheat Midds	0.88	0.14	0.78	$119.4				
Soy Hull	0.92	0.12	0.8	$121.9				
Hay	0.86	0.09	0.54	$63.53			with 10% waste	

	%DM	%CP	%TDN	$/T	$/CP	$/TDN	$/BU	
Canola Meal	0.9	0.41	0.69	$0.00	0.0000			
Corn	0.88	0.1	0.9	$125.00		0.0789	$3.50	
Barley	0.88	0.135	0.84	$116.67			$2.80	80%
Oats	0.91	0.13	0.75	$107.72			$1.72	49%
Barley Malt	0.89	0.14	0.74	$103.95				
DDGS	0.9	0.28	0.84	$119.32				
Wet DG	0.3	0.28	1.15	$54.66				
Peas	0.88	0.23	0.88	$122.22			$3.67	105%
Screenings	0.86	0.14	0.7	$95.01				
Wheat Midds	0.88	0.14	0.78	$108.33				
Soy Hull	0.92	0.12	0.8	$116.16				
Hay	0.86	0.09	0.54	$65.97			with 10% waste	

Harvested Stover

- Often too moist for storage
- Wait till field cured or late with cool temps
- Some headers don’t windrow much quantity
- May be difficult for some balers to bale
- Quality is less than when selectively grazed
- Porous bales do not keep well

Grazing Corn Residue

- Fence, water, shelter
- Grain>husk & leaf> stalk
- TDN 70 – 40 %
- CP 8 – 4 %
- Salt + Phos + Ca +Vit A + ? CP
- 20 to 60 days grazing per acre
- Mud & snow reduce access and create waste
- Once grain is gone, limit to mid gestation mature cows + CP
- Compaction concerns??

Summary

- Ethanol coproduct availability will continue to increase
- Ethanol coproducts are good sources of nutrients for beef cattle
- Pay attention to nutrient analysis and variability
- Transportation economics are important

Wheat Midds

The Make Up of Midds

- Range from 14 to 18 percent protein
  - Often guaranteed at 14% - usually higher
- Protein high in rumen degradability
- Highly digestible fiber
  - Extremely small fiber particle size –
  - so less effective in rumen,
  - not a forage replacement

- Energy level is less than oats – but higher than legume hay
- High in phosphorous and potassium
- Good source of trace minerals
  - Copper, zinc, magnesium & selenium
  - Low in calcium – would need to supplement

Table 2. Wheat Midds-Typical Analysis	
Dry matter	89 %
Crude Protein	16.5 %
Fat	4.5 %
Crude fiber	7.5 %
Neutral Detergent Fiber	32.0 %
Acid Detergent Fiber	9.9 %
Calcium	0.1 %
Phosphorus	.80 %
Total Digestible Nutrients	72.8 %
Net energy—Lactation	83.8 Mcal/100 lbs.

What are Wheat Midds?

- A co-product of milling flour
- Generally include screenings, bran, germ and flour remnants
- Higher levels of fiber, protein & minerals than wheat ~ but less starch

Availability of Midds

- **Dakota Growers Pasta Company** Carrington, ND 701-652-2855 $115/ton pellets - 14% CP guaranteed (usually 17-18% CP) few tons left

- **Minot Milling**
Minot, ND 701-852-8964
$95/ton pellet - 14% CP guaranteed (usually 15.2% CP) ~ contracted out until March

- **Noodles by Leonardo**
Cando, ND 701-968-4464
meal only (not pelleted), most sold to Hubbard Feeds, limited availability - call first

- **SunPrairie Grain**
Velva, ND 701-338-2013
Pellets, $120/ton pelleted
good supply on hand

Type of Product

- Loose Meal
  - Fine, dusty difficult to handle
- Pellets
  - Increased density
  - Easier to handle, haul, mix, store
  - Usually ¼ or ½ inch in diameter
  - Minimize handling to reduce crumbling
  - Costs about $4-7 a ton to pelletize

Storage

- They readily take on moisture, swell, soften, lose their ability to flow in high humidity
- Extended storage in warm, moist weather can result in bridging or spoilage
- Pellet deterioration, mold growth & insect activity common on hot humid conditions

Storage Continued

- Summer storage
  - Start small – experiment with your storage capabilities
  - Away from concrete floors or soil
  - Properly sealed bins with no leaks
  - Aerate the bin to dry – not just cool - the pellets
    - Do within first month of storage
  - Level the surface
    - Steep peak contains fines which interfere with moisture movement

Palatability

- Relatively palatable and readily consumed by all classes of cattle
- Since higher in fiber w/ reduced starch – digestive disturbances less of a concern
- Few problems with acidosis or bloat
  - May cause loose cattle

Feeding Midds to Beef Cows

- Well matched with low quality forage for gestating cows
- 5-6 pounds per day
- 40% NDF
  - Highly digested in the rumen
  - Does not cause decrease cow's forage consumption like high starch feedstuffs might

Example Rations with Midds

	600 lb steer 2.5 ADG	1300 lb cow 7 mon pg.5 ADG
Grass Hay (45)	9.5	15
CRP Hay (35)		
Oat Straw (25)		11
Midds (80)	9.5	5
DDGS (90)		
Salt/Min (500)	.35	.2
Cost/hd/day	$.65	$.72

Biodiesel Co-Products

Canola Meal

A protein supplement

- Alfalfa hay at $65.00/ton at 18% protein
  - .18 cents per pound of protein
- Canola meal at $121.00/ton at 40% protein
  - .15 cents per pound
- Soybean meal at $192.00/ton at 46% protein
  - .21 cents per pound of protein

Canola meal

- protein 39-40%
- 12% moisture 12%
- Fat 2-3%
- Fiber 11-12%
- TDN 69%

Canola meal in rations

- Calves 20% of the ration
- 25% of the grain mix for dairy cows
- 20% of the grain mix for beef cows

Canola meal

- $121.00 per ton for meal or pellets
- Availability is good, call in advance
- Produce 1,200 ton per day
- 7:30-4:30 pm pickup times

- ADM, Velva ND 701 338-2491

Example Rations with Canola Meal

	600 lb steer 2.5 ADG	1300 lb cow 7 mon pg.5 ADG
Grass Hay (45)	6	22
Corn Silage (25)	16	
Oat Straw (25)		10
Corn (120)	4	
Canola M (125)	2	2
Salt/Min (500)	.35	.2
Cost/hd/day	$.76	$.79

For More Information:

http://www.ext.nodak.edu/extpubs/beef.htm

Questions?

Philosophy

‘Life is a series of choices,

Be sure you read the road signs…

….Or Be Ready to Deal With Problems!!!’