Nutrition, facilities, and management of the Holstein steer

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An Iowa State alum and a North Dakota alum are standing next to each other in the men's room. The Iowa State grad finishes first and heads for the door. The North Dakota grad says, "At North Dakota State University, they teach us to wash our hands after we use the bathroom."

Unimpressed, the Iowa State alum says, "At Iowa State University, they teach us not to pee on our hands."

How are Holsteins different than native steers

- More docile
- Easily bored
  - More pen maintenance
  - Sort feed
- More bloats and metabolic problems
- More bullers
- More dust creation
- Wetter pens
- "Suicidal tendencies"/injuries

Eng, 2005

CARCASS TRAITS WITHIN ESTIMATED BREED TYPES (NATIONAL BEEF QUALITY AUDIT – 2000[a])

Trait	Breed type		
	Native	*Bos indicus*	Dairy
USDA yield grade	3.0[e]	3.0[e]	3.4[f]
USDA quality grade[b]	684[f]	662[e]	710[g]
Adjusted fat thickness, in	.51[f]	.51[f]	.31[e]
Hot carcass weight, lb	784.5[f]	767.8[e]	801.9[g]
Longissimus muscle area, in^2	13.2[g]	13.0[f]	11.7[e]
Kidney, pelvic, and heart fat, %	2.3[e]	2.2[e]	3.6[f]
Marbling score[c]	419[f]	381[e]	489[g]
Overall maturity[d]	166	168	168

[a]McKenna et al. 2002. JAS. 80:1212-1222
[b]600=Select[00], 700=Choice[00], 800=Prime[00]
[c]300=Slight[00], 400=Small[00], 500=Modest[00]
[d]100=A[00], 200=B[00]
[e,f,g]Means within a row lacking common superscript letter differ (P<0.05)


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Variables used in closeout comparisons

- In weight- 600 lb
- Shrunk out weight- 1250 lb
- ADG- 3.30 lb
- Feed/gain- 6.61 lb DMI/ lb gain
- Vet-med- $25/hd
- Yardage- $.40/hd/d
- Interest- 6%
- Trucking- $40/hd

			control	
Weights				
	Purchase wt	lb	500	600
	Shrunk sale wt	lb	1150	1131
Prices				
	Delivered purchase price	$/cwt	$64.00	$148.00
	Expected sale price	$/cwt	$64.00	$135.00
Gross Margin				
	Gross revenue	$/hd		$1,526.85
	Purchase cost	$/hd		$888.00
	Gross margin	$/hd		$638.85
Performance				
	Daily gain	lb	2.70	2.88
	Feed/gain	DM basis	6.75	6.77
	Out shrink	%	3.00%	4.00%
	Death loss	%	1.00%	1.02%
	Days on feed	d		201
Feed costs				
	Feed price (as-fed basis)	$/ton		225.53
	Feed price (DM basis)	$/ton		$283.61
	Feed cost	$/hd		$555.01
Other operating costs				
	Yardage			
	Rate	$/hd/d	$0.30	$0.40
	Amount	$/hd		$80.30
	Veterinary & medication	$/hd	$10.00	$25.00
	Marketing			
	Sales commissions	$/hd	$8.00	$5.00
	Transportation	$/hd	$5.00	$40.00
	Beef Checkoff	$/hd	$1.00	$1.00
	Options/Hedge cost	$/hd		
	Other input	$/hd	$0.00	$0.00
	Death loss	$/hd		$9.06
	Operating cost subtotal	$/hd		$160.35
	Interest			
	Interest rate	%	9.50%	6.00%
	Interest on cattle	1.00	1.00	$30.01
	Interest on feed	0.50	0.50	$9.28
	Interest on other operating	0.50	0.50	$2.53
	Total interest	$/hd		$41.83
Total operating costs, excluding animal purchase			$/hd	$757.19
Net return to labor, managment, & fixed costs				
	Expected	$/hd		($118.34)

Energy requirements

		NE_g Req., Mcal/cwt	ADG, lb
1)	Feedlot	55-68	2.4-4.5
2)	Backgrounding	45-55	1.8-2.4
3)	Stocker	30-45	1.0-1.8

1) Blend of fast and slow digesting grain types
2) 5-15% dietary roughage
3) Processing is recommended when corn is expensive
4) Corn can be fed whole
5) Small grains need to be processed
6) Co-product feeds

-hominy, potato products, distillers grains, brewers grains, food processing waste, out-of-condition human foodstuffs

Roughage in feedlot rations

- Used as a management tool to keep cattle on feed
- An expensive ingredient in the diet
  - Bulky
  - Low energy
  - Logistics of getting it into the ration
  - Expensive





Effects of corn silage level on profitability

	Corn silage level, % DM				
	15[a]	30[a]	45[a]	55[a]	30[b]
Corn, % DM	40	25	10	0	0
ADG, lb	3.30	3.20	3.07	2.88	2.96
Feed/gain	6.61	6.70	6.96	7.16	6.89
Return to management, $/hd					
		46.16	49.33	56.92	108.72

[a]Rations contained 40% distiller's grain with soluble (DMB)
[b]Ration contained 65% distiller's grain with soluble (DMB)
[c]All rations contained 5% supplement
[d]Linear relationship (P<.01) for ADG and feed/gain
[e]Means from Nebraska study 2013 adjusted to a base of the standard animal- 3.3 lb ADG and 6.61 feed/gain ratio

Nebraska, 2013

Performance summary of cattle fed different grain sources

	ADG, lb	DMI, lb/d	Feed/Gain
Barley	3.26^{c}	20.2^{bc}	6.22^{a}
Corn	3.12^{b}	20.0^{b}	6.45^{ab}
Milo	3.04^{a}	21.0^{c}	6.95^{c}
Oats	3.30^{abc}	20.1^{ab}	6.12^{a}
Wheat	2.95^{a}	18.8^{a}	6.39^{ab}

^{abc}(P<.05)

Owens, 1995

Grains

Faster	Slower
Wheat Barley Rolled high moisture corn Steam flaked corn High moisture whole-shelled corn	Dry cracked corn Reconstituted milo Steam flaked milo Dry shelled corn Dry rolled milo Ground corn
	

Effects of corn particle size on steer performance

	Whole	Cracked	Fine Ground	50:50 Whole: Cracked	50:50 Whole: Fine Ground
ADG, lb	2.75	2.97	2.96	3.06*	3.06*
DMI, lb/d	16.2	17.3	17.1	16.5	17.3
Feed/Gain	5.89	5.82	5.89	5.40*	5.70*

Nebraska, 1987
* P<.05

EFFECT OF WHOLE AND DRY CORN ON CATTLE PERFORMANCE

	Whole	Whole and dry rolled	Dry rolled
ADG, lb/d	3.01[a]	3.08[a]	2.92[b]
DMI, lb/d	18.0	17.9	17.5
Feed/gain	6.03[b]	5.86[a]	5.99[b]

[ab](P<.05)

Colorado

Two trial summary of benefit of blending grains

Blend	Benefit, $/hd
50% whole:50% cracked	65.76
50% whole:50% fine	35.33
50% whole:50% rolled	20.53
Average	40.54

Disadvantages/challenges of earlage

- Requires 50% more storage
- Requires additional equipment (snapper head for chopper)
- Limited marketability in commercial markets
- Harvest moisture level window is narrow (35-40%)
- Proper ensilement is critical
  - ½ inch cut
  - Proper packing
  - Oxygen exclusion

Beef produced per acre with different forms of corn

	Dry	High moisture	Corn/cob meal	Earlage	Earlage
DM yield, lb/ac	7571[1]	8123 (+7.3%)	9180 (+13)	9749 (+22.5)	9749 (+22.5)
NE_g of feed, Mcal/lb[2]	.70	.71	.62	.52	.57 (Rust estimate)
NE_g, Mcal/acre	5300	5768	5691	5069	5557
NE_g,Mcal/hd/d[3]	12.7	12.7	12.7	12.7	12.7
Steer-days	418	455	449	408	447
Beef produced, lb/acre	1253	1363	1346	1223	1341

[1]Assumed 160 bu/acre; [2]NRC, 1984 and Preston, 2010; [3] 770 lb steer gaining 3.1lb/d

Crude protein requirements

- A. **Dietary levels**
- **1) Feedlot – 11.5 to 13%**
- **2) Receiving – 12 to 14%**
- **B. Effects of weight and rate of gain on protein requirements**

Weight, lb	Protein, %	ADG, lb	Protein, %
300	15.0	1.0	9.5
500	13.5	2.0	11.4
700	12.0	3.0	13.5
900	10.5		
1100	10.5		
1300	10.5		

Crude protein requirements

- C. Non-protein nitrogen usage-Urea
- 1) Can supply most of supplemental protein up to 12% CP in the diet
- 2) BCRTC – ½ of supplement from urea and ½ from SBM
- 3) Can be added up to 1% of diet DM
- D. Bypass or escape protein
- 1) IUP levels, more concerned with untraditional feedstuffs
- -feather meal, heat-treated SBM, blood meal, meat and bone meal,
- 2) DIP levels, need to supply sufficient ruminally available nitrogen to optimize microbial efficiency
- -NPN, SBM, CSM

Mineral and vitamin nutrition for cattle

Formulate to meet NRC guidelines

Feeding systems for Holstein steers

- High Plains system
  - 250-350 lb steers are fed a single diet until harvest (85-92% concentrate)
- Two-phase feeding program
  - Common amongst farmer-feeders
  - Feed high roughage diets from 350-700 lb
    - 40-60% corn silage
    - 30-50% hay/haylage
    - Pasture
  - Finish on a 70-90% concentrate diet

Feeding systems for Holstein steers

- Steer stuffer/self-feeder
  - Feed whole corn and pellets
  - Fill feeders once or twice a week
  - More diligent in health check
  - Approximately 30-40% of pens develop "stall out"
  - Tends to work better with shorter feeding periods
    - Lighter harvest weights
    - Heavier in-weights
- The optimum system depend on feed availability and prices

Advantages of various feeding systems

High Plains	Two-phase	Steer stuffer
Most predictable	Utilize more roughage	Best feed conversion efficiency
Better health management	More beef produced /acre	Less labor
	Less metabolic problems	Less manure

Design a feeding program that fits your labor, land, facility and equipment resources

Whole corn and pellet program vs a more conventional finish ration

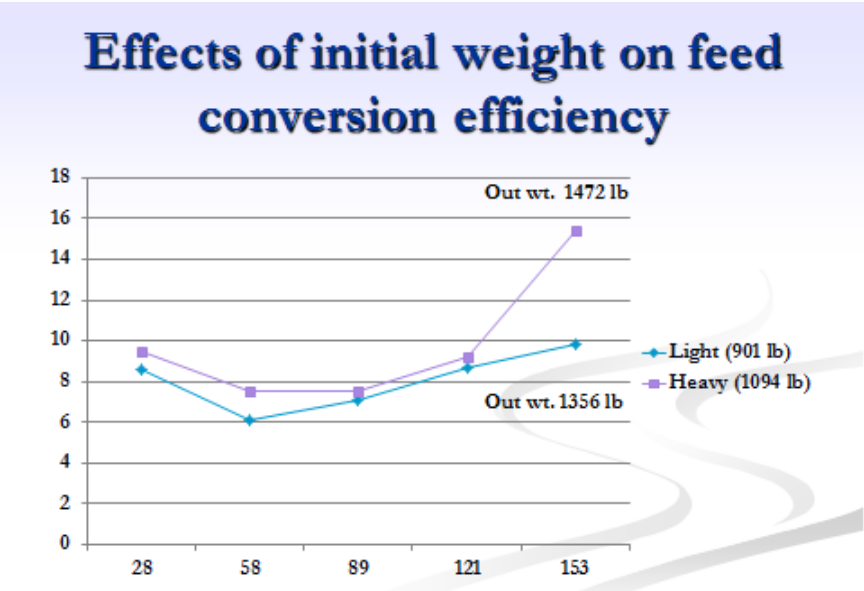
	ADG, lb			Feed/gain	
Trial	Hay, 2 lb/ hd/d	No roughage		Hay, 2 lb/ hd/d	No roughage
1	2.47	2.02		6.93	7.21
2	3.08	2.57		5.95	5.86
3	3.54	3.17		6.30	5.93
4	2.32	2.02		7.91	7.79
5	2.57	2.54		8.98	8.43
6	3.21	2.98		6.51	6.13
7	4.11	3.58		6.17	6.09
Average	3.04±.64	2.70±.58 (12.5%)		6.96±1.1	6.77±1.0 (3.0%)

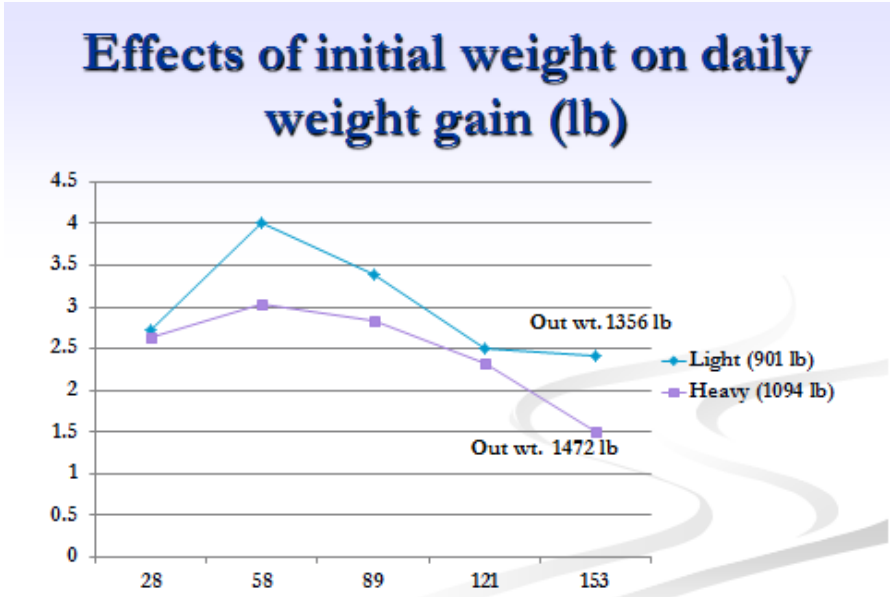
ADM Alliance Nutrition

Effects of placement of fleshy calves on pasture

	1100 lb harvest wt	1200 lb harvest wt	1100 lb harvest wt	1200 lb harvest wt	Prob.$_{trt}$	Prob.$_{end}$
Grazing, # days	0	0	149	149	---	---
ADG, lb	---	---	.86		---	---
Performance in feedyard						
DOF	236	278	158	200	---	---
ADG, lb	2.88	2.73	2.79	2.53	.09	.002
DMI, lb/d	16.9	16.8	20.6	20.9	.73	.17
Feed/gain	5.85	6.17	7.80	8.26	.33	.0001
Ribeye area, in^2	10.4	11.2	10.8	10.5	.36	.48
Quality grade	11.5	11.8	11.7	12.2	.45	.39
Calc. YG	2.5	2.3	2.6	2.6	.63	.001

Feeding heavy Holstein steers





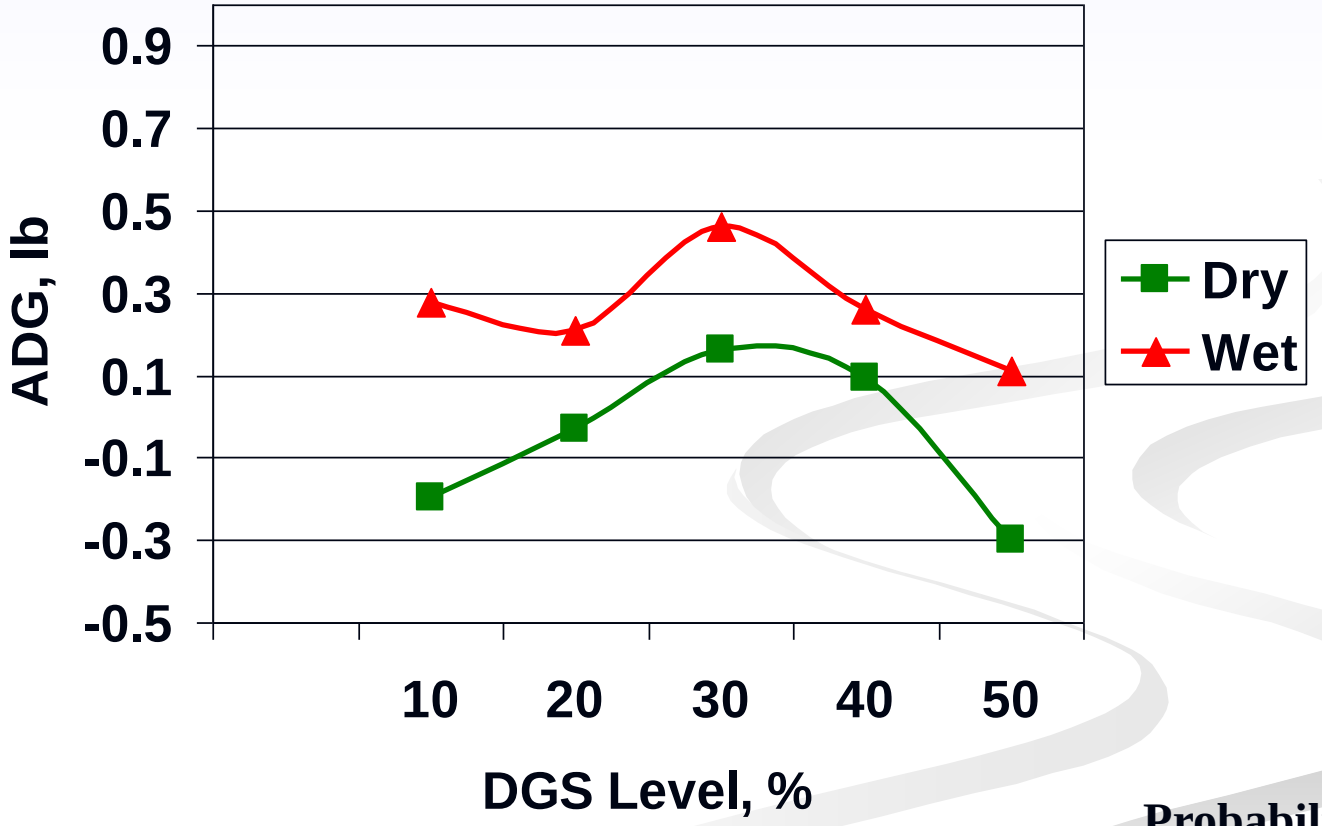
72 Holstein steers
Light- 71% Choice with a 11.6 in^2 ribeye area
Heavy- 77% Choice with a 12.5 in^2 ribeye area


74474

Co-product feeds commonly fed in Michigan feedlots

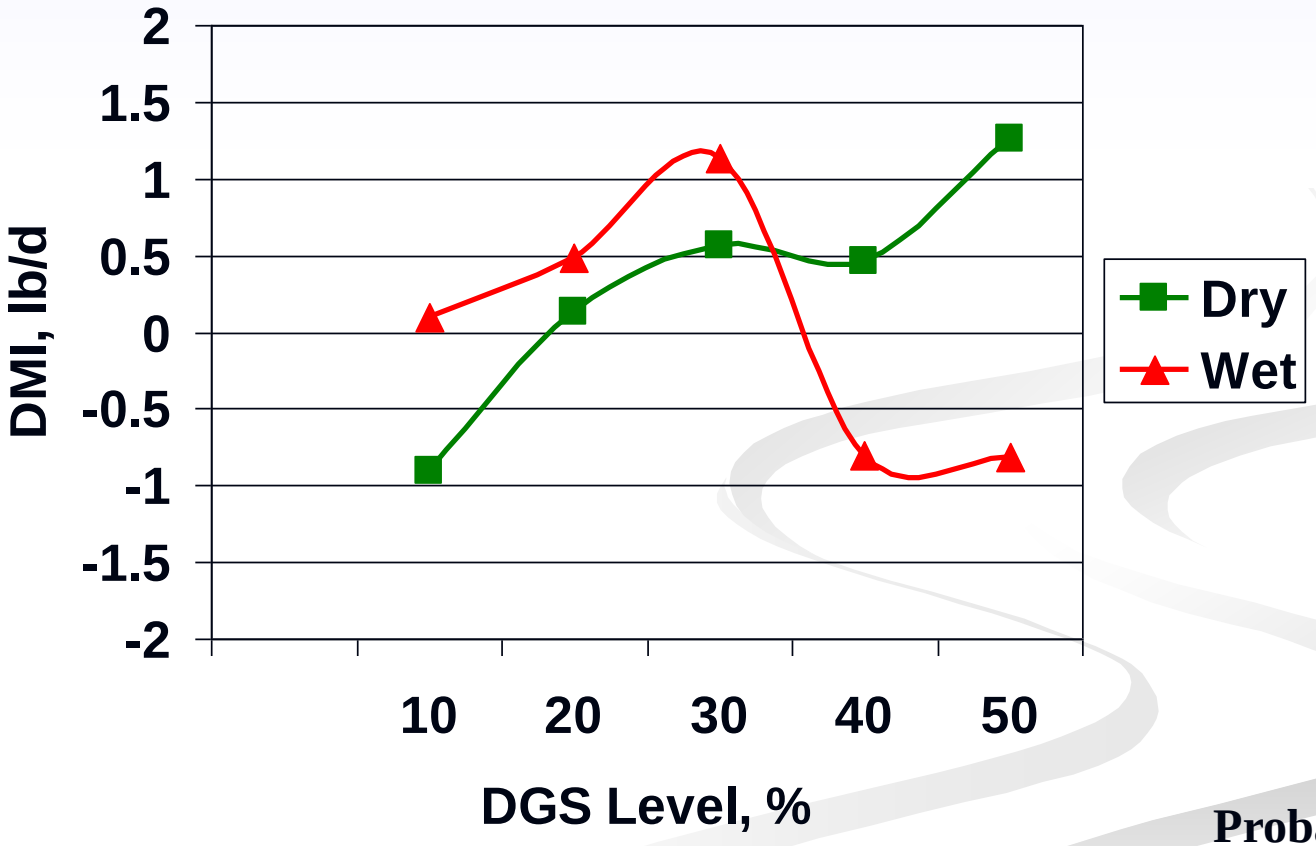
- Animal fat
- Bakery waste
- Beet pulp
- Brewers grains
- Carrots
- Corn gluten feed
- Distiller's grain
- Hominy feed
- Husklage
- Potato co-products
- Sweet corn waste
- Wheat co-products
- Whey

Expected Change in ADG



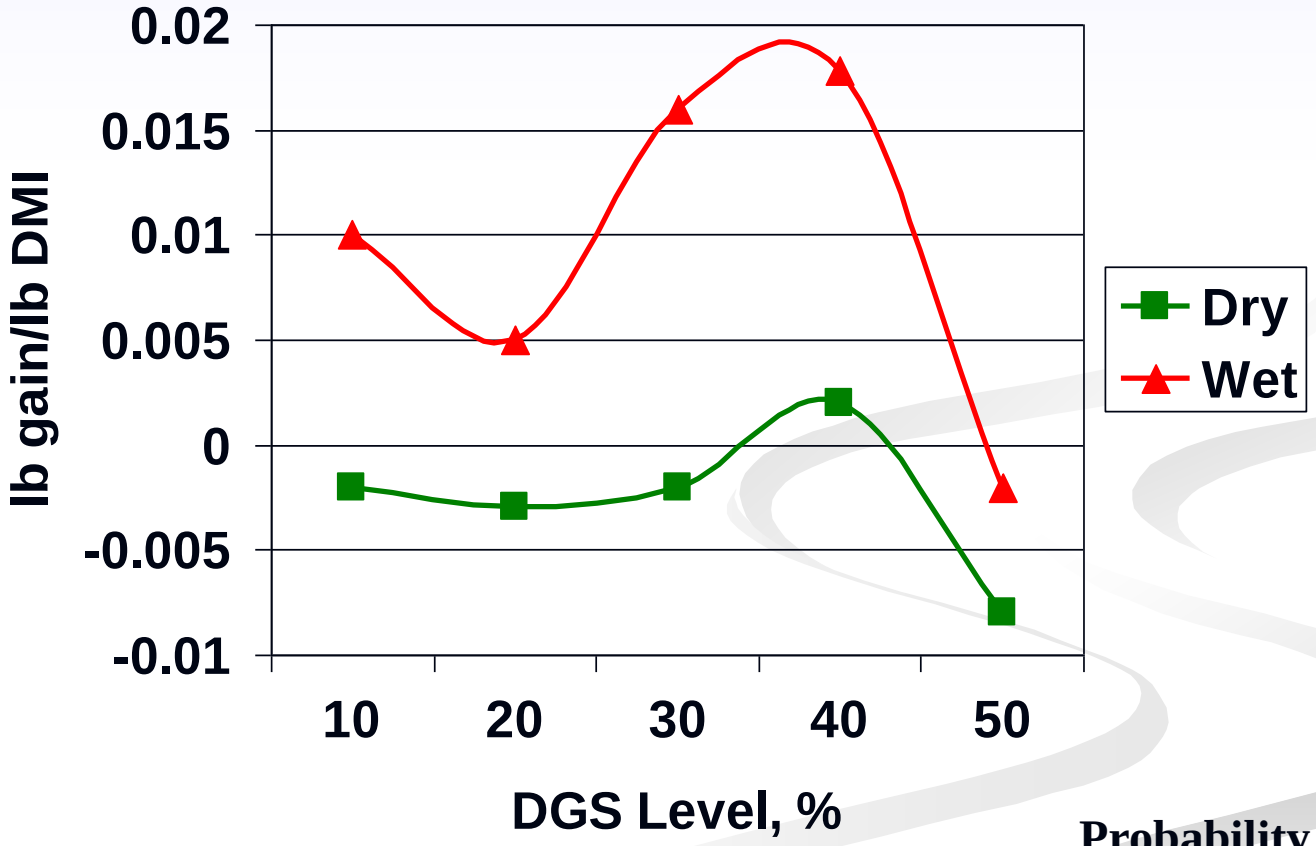
	Probability
Wet vs. Dry	.13
Level	.64
Interaction	.71

Expected Change in DM Intake



	Probability
Wet vs. Dry	.19
Level	.17
Interaction	.45

Expected Change in Feed Efficiency



	Probability
Wet vs. Dry	.001
Level	.76
Interaction	.70

Feeding recommendations for distiller's grain with soluble

- **Protein source (1-3 lb/d)** **6-15%**
- **Energy source (4-9 lb/d)** **20-40%(maybe more)**
- **Mineral balance (Ca:P),**
  - **Add limestone**
  - **Ca:P> 1.1**
- **Does not replace all roughage sources**
- **Monitor S content of DGS**
  - **Maximum allowable level = .4%**
  - **Feeding 40 % DGS that has 1% S is risky!!!!**
- **Polioencephalomalacia (thiamine deficiency)**
- **Sulfur toxicity**

Feeding recommendations for distiller's grain with soluble

- Can be high in other macro- and micro-minerals (K, Na, Se, etc.)
- Prefer wet over dry DGS
- Value relative to corn (DM basis)
  - Wet 110-120%
  - Dry 100%
- Adjust nutrient management plans
  - P
  - Potential runoff

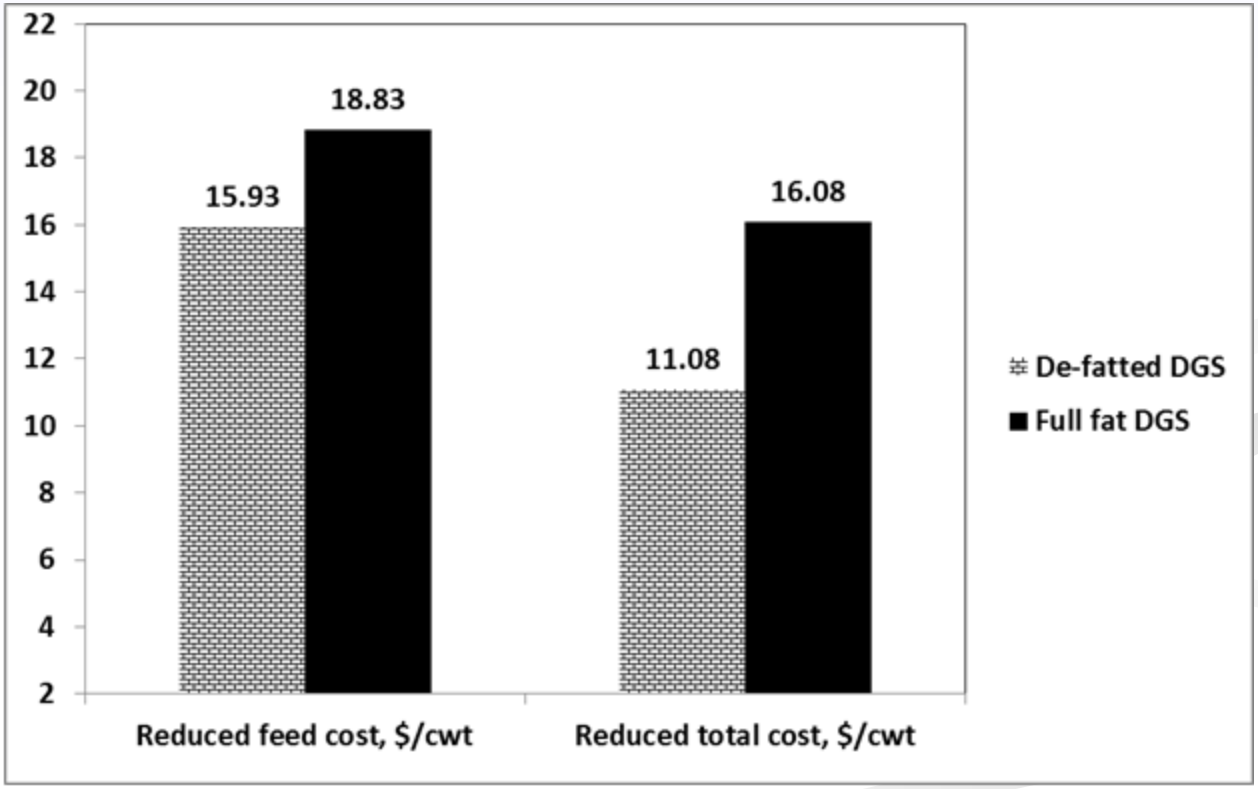
Meta-analysis of feeding distiller's grain with soluble diets

	Control	30% DDGS	30% WDGS	30% MDGS	30% MDGS
No. pens		66	350	85	85
DGS, $/ton as-is	---	250	74	125	92
Price relative to corn, %		90	80	80	60
ADG, lb	3.30	3.67	3.69	3.68	3.68
Feed/gain	6.61	6.39	5.96	6.23	6.23
Return to management, $/hd					
		70.99	109.70	137.19	150.56

Comparison of low-fat versus full-fat distiller's grain

Location/year	#/trt	Pens /trt	DGS, % of diet DM	DGS fat, % DM	Diet fat, % diet DM	Wt. gain, lb	ADG, lb	DMI, lb/d	Feed/gain
Kansas, 2008	203	8	0	0	3.8	302	2.55	20.1	7.87
Kansas, 2008	203	8	13	4	3.9	288	2.44	19.7	8.06
Kansas, 2008	204	8	13	12	4.8	307	2.60	20.6	7.94
Nebraska, 2011	24	4	0	0	3.6	406	3.41	24.4	7.19
Nebraska, 2011	24	4	35	6.7	4.7	408	3.41	24.4	7.19
Nebraska, 2011	24	4	35	12.9	6.9	445	3.71	24.4	6.58
Minnesota, 2011	16	16	0	0	3.6	515	4.37	22.7	5.27
Minnesota, 2011	16	16	35	5.1	3.5	498	4.22	21.5	5.11
Minnesota, 2011	16	16	35	10.9	6.0	517	4.38	22.4	5.13
Nebraska, 2013	45	5	0	0	4.4	586	3.28	20.8	6.36
Nebraska, 2013	45	5	40	9.2	6.1	646	3.61	20.5	5.69
Nebraska, 2013	45	5	40	11.8	7.2	657	3.67	20.8	5.67
Pair-wise test of difference from control (ration without DGS)									
						De-fatted	.02	-.48	-.16
						Full fat	.19	.05	-.34
						Observed significance level	.04	.10	.30

Comparison of low-fat versus full-fat distiller's grain



Meta-analysis of studies comparing high levels of distiller's grain with soluble to conventional feedlot diets

- Number of studies
  - With corn =9
  - Without corn =5
- All studies fed 100-200 mg thiamine/hd/d
- Conventional diets had at least 80% corn
- DGS diets- 47-85
  - With corn = 47-78
  - Without corn = 48-85

Predicted values from meta-analysis of feeding higher levels of distiller's grain with soluble (difference from conventional diet)

	ADG, lb	DMI, lb/d	F/G	HCwt, lb	Bfat, in.	Marbling	Choice, %	YG
50	.07	-1.19	-0.03	.0	-.01	-14.6	-9.0	.0
55	-.18	-1.41	-.05	-3.9	.00	-11.0	-9.2	.0
60	-.33	-1.76	.13	-10.9	.00	-12.3	-9.5	.1
65	-.38	-2.04	.18	-15.3	.00	-18.6	-9.7	.1
70	-.33	-2.23	.08	-16.9	-.01	-29.8	-9.9	.1
75	-.17	-2.34	-.15	-15.9	-.02	-46.0	-10.1	.1
80	-.09	-2.36	-.51	-12.1	-.04	-67.1	-10.4	.0
Mean[1]	3.57	22.4	6.36	778	.48	522	78	3.0
$Prob_L$	.14	.27	.96	.99	.71	.16	.94	.43
$Prob_Q$	.14					.12		

[1]Control mean of all studies

Predicted values from meta-analysis of feeding higher levels of distiller's grain with soluble without corn in the diet (difference from conventional diet)

	ADG, lb	DMI, lb	F/G	HCwt, lb	Bfat, in.	Marbling[2]	YG
50	-.83	-.56	2.50	-55.4	-.07	-73.4	-.54
55	-.53	-.15	1.67	-33.1	-.01	-57.0	-.20
60	-.33	-.12	1.00	-17.2	.04	-46.2	.06
65	-.23	-.44	.49	-5.5	.08	-41.0	.25
70	-.23	-1.14	.16	2.0	.09	-41.5	.38
75	-.33	-2.19	-.01	5.2	.09	-47.5	.42
80	-.53	-3.61	-.02	4.1	.08	-59.2	.40
Mean[1]	3.59	22.7	6.33	818	.47	538	3
$Prob_L$	.20	.33	.12	.10	.14	.92	.05
$Prob_Q$	.19	.27	.16	.13	.16		.06

[1] Control mean of all studies

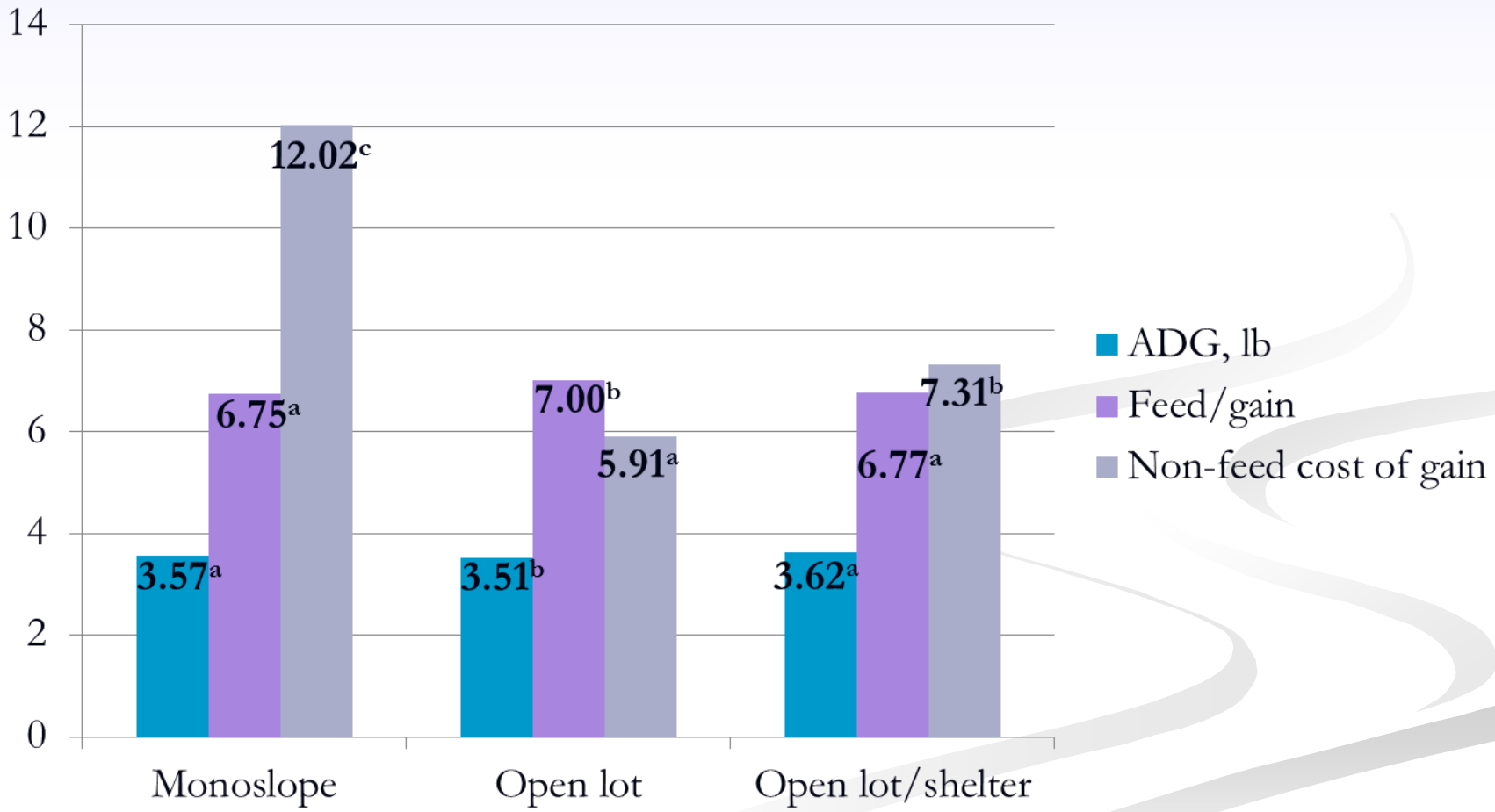
[2]Percent choice went from 80.3 % to 22.2% in two trials that fed 60% DGS

Facilities at Opportunity Farms, Lennox South Dakota

Opportunity Farms in Lennox, South Dakota 2012

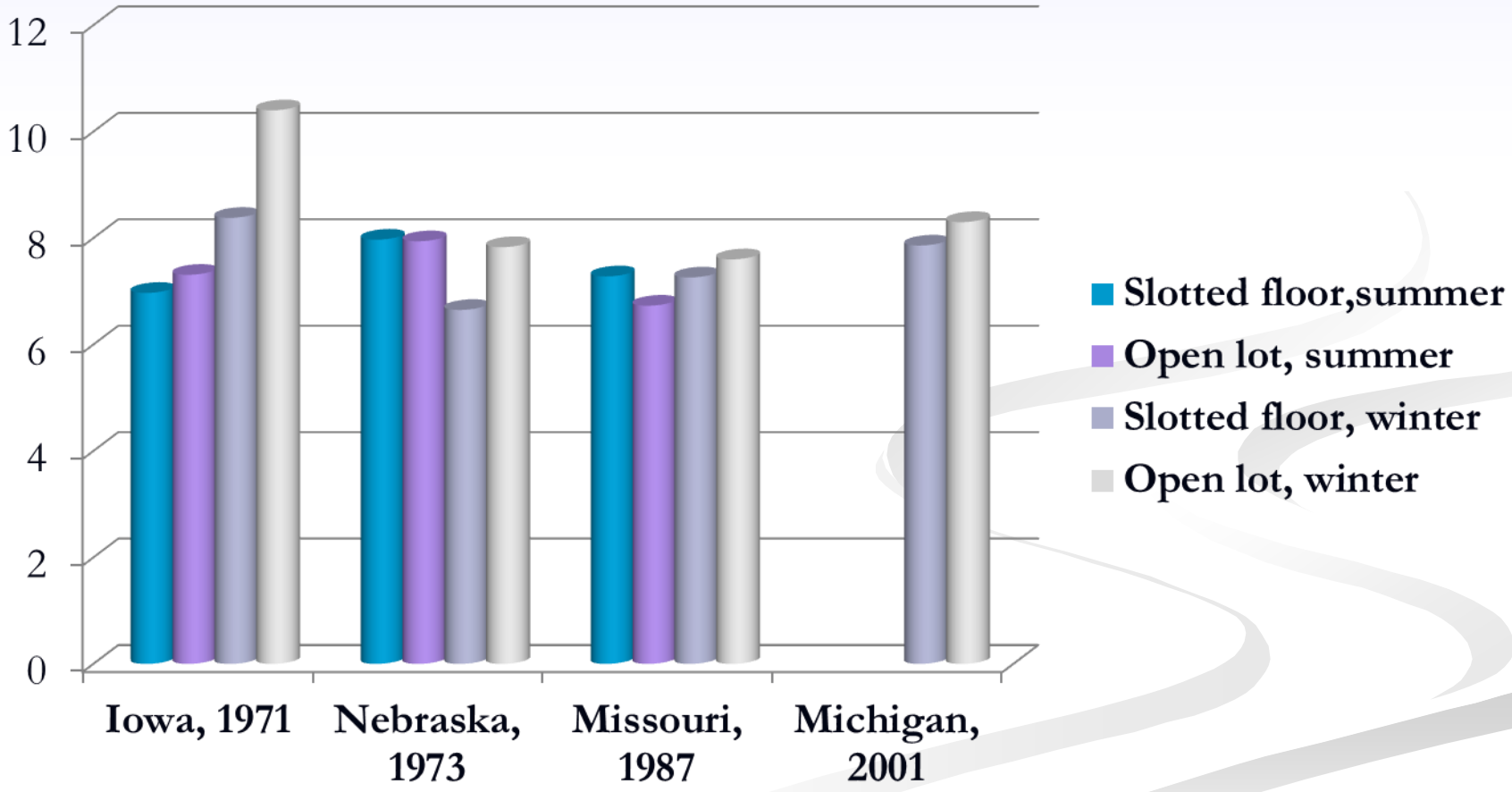
- Three types of facilities
  - Open lot with mounds; 275 ft^2/hd
  - Partially covered open lots with mounds(covered feed alley, feedbunk,water and 20 feet of pen); 235 ft^2/hd
  - Confinement (monoslope); 45 ft^2/hd
- 80 head per pen; 4 pens/facility type

Facility effects on performance and non-feed costs



Opportunity Farms, Lennox, South Dakota 2012

Effect of housing type on feed conversion efficiency



Estimated costs for new facilities

- Open lot with mounds $200-300/hd
- Flat floor confinement $500-600/hd
- Deep pit (slotted floor) $1000-1200/hd

Summary of monetary benefits from improved management

	Added benefit, $/hd	
	Moderate implant	Aggressive implant
Implant	21.65	83.54
Reimplant	12.77	75.61
Beta-agonist	25.49	25.49
Lower health cost by 10%	9.72	9.72
Blend grains in ration	40.52	40.52
Increase corn silage in the ration by 15% when feeding 40% DGS	46.16	46.16
Add DDGS to ration	70.99	70.99
Total benefit	227.30 (205.65)	352.03 (268.49)

Numbers in parentheses represent the total benefit without the value from initial implant

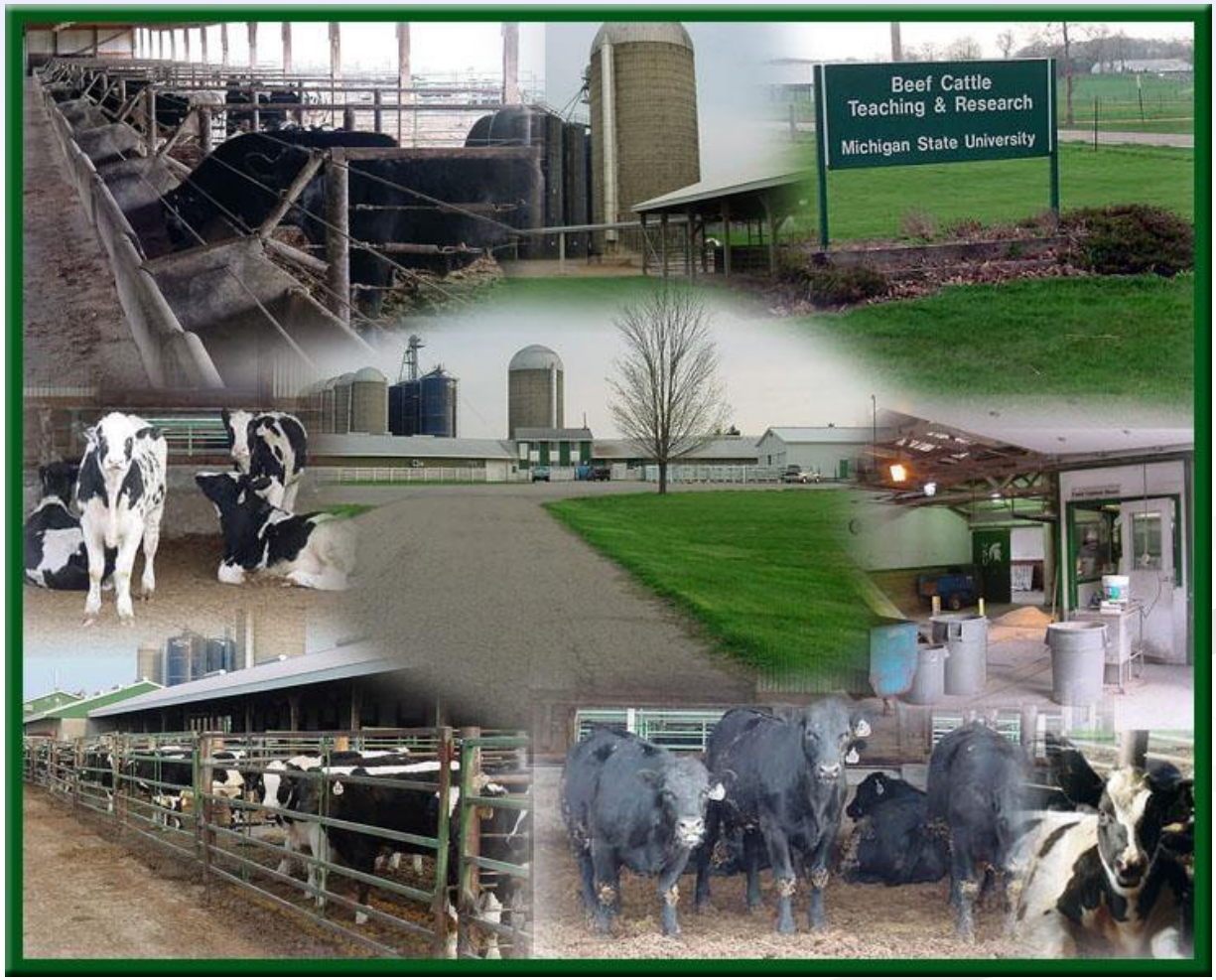
Comments from a feedlot manager in MI

- Calves raised by third party for 14 weeks
- Receive a Synovex S implant at 15 weeks
- Receive an Encore implant ~ 500 lb
- Put on Pulmotil on week 15 for 14 days
  - Reduced health costs by 70%
  - $8-10/hd
- On full feed of finish ration by 16 weeks (400-425 lb)

Comments from a feedlot manager in MI

- Finish ration-
  - Recent past- 42% corn screenings, 42% corn, 12% pressed beet pulp, 3-4% supplement
  - Current- 72% corn, 20% DGS, 5% straw, 3-4% supplement
- Feeding Zilmax
- Clean up cost- $1.00/cwt

Thank You



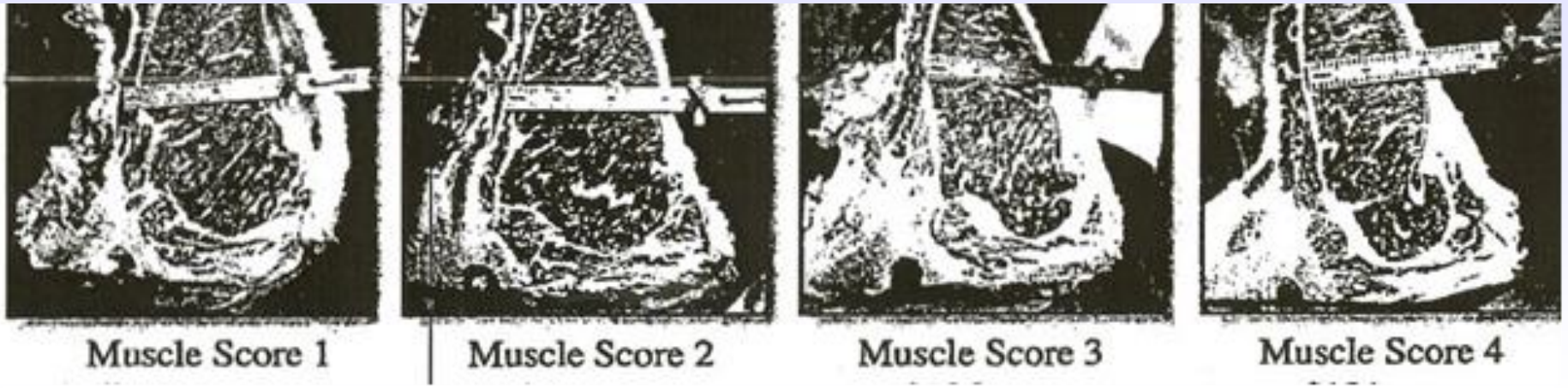
Questions?

Comments from a marketing agent in MI- August 2, 2013

- Holstein steer markets
  - JBS- Plainwell, MI
  - Tyson, Joslin, IL
  - Green Bay Dressed Beef- Green Bay, WI
- Basis in contracts- (five area price)
  - Calf-feds- $6-7/cwt
  - Yearling- $8-9/cwt
- Clean up cost- $2-3/cwt (discounts for outs, primarily muscle score and age)

Comments from a marketing agent in MI- August 2, 2013

- Green Bay Dressed Beef
  - Fewer discounts- generally for bulls and stags only
- JBS-$15/cwt discount for carcasses < 700 and > 1000 lb



≥12.5 in^2 ribeye area	11.6-12.4 in^2 ribeye area	10.4-11.5 in^2 ribeye area	9.1-10.3 in^2 ribeye area
		Poor round conformation, shallow loin,shallow ribeye, ribeye too small for carcass size	Very poor round confirmation, sunken loin, triangular or very small ribeye
JBS			
0	0	-$5/cwt	-$10/cwt
Tyson??? (unverified)			
+$4/cwt 0	-$1/cwt 0	-$4/cwt 0	-$8/cwt -$4/cwt

Corn silage in Holstein steer diets (430 - 1100 lb)

Corn:Corn silage	60:40	75:25	90:10
Days on feed	229	202	194
DM intake, lb/d	16.2	16.5	16.6
Daily gain, lb/d	2.95[a]	3.25[b]	3.5[c]
DM feed/gain	5.9[a]	5.4[a,b]	5.2[b]

Alfalfa haylage fed from 430-500 lb; corn silage fed from 500-1100 lb

[a,b,c] P<0.05

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Seventeen trial summary of the effects of corn silage levels on cattle performance

	Corn silage level, % DM							
	10	20	30	40	50	60	70	80
ADG, lb[a]	2.52	2.49	2.43	2.36	2.28	2.17	2.05	1.91
DMI, lb/d	15.3	15.7	16	16.1	16.2	16	15.6	15.1
Feed/Gain	6.06	6.32	6.58	6.84	7.1	7.36	7.62	7.88

[a]Average initial weight 512 lb

Minnesota, 1974

How are Holsteins different than native steers

- Calf-fed are more efficient and yearlings less efficient
  - More gut mass and higher maintenance requirement
  - Older yearling steers can be very inefficient especially with whole corn diets
- Less muscle
  - Smaller ribeyes
  - More elongated shape
- Less carcass fat
  - More internal fat
    - Marble better
    - KPH
  - Less backfat
- More predictable performance
- Highly variable basis (cash-futures)

Marketing

- Two major challenges
  - Basis- difference between cash and futures
    - Challenging for risk management
  - Discounts
    - Ribeye size, carcass weight, age, etc.

Forage

- When 0-2 lb of long hay is fed, cattle will crave fenceposts and boards
- Small amounts of long forage are able to stimulate cud-chewing, which is good
- Fresh bedding, like straw, will be consumed as a forage source; fresh bedding can decrease grain consumption

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