Feedlot Systems Comparison

Dan Loy
Extension Beef Specialist

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Outline—Feedlot Systems

- Cattle comfort issues
- Types of systems
  - General characteristics (advantages and disadvantages)
  - Performance comparisons
  - Cost comparisons
  - Environmental Considerations
  - Bedding and manure management

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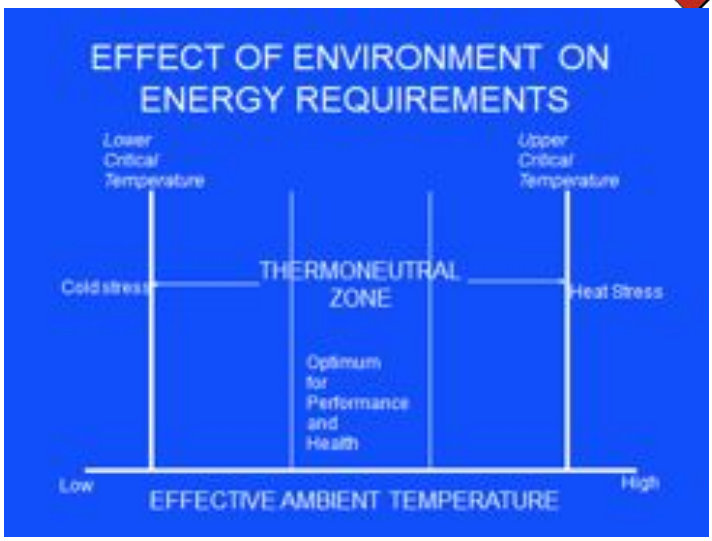
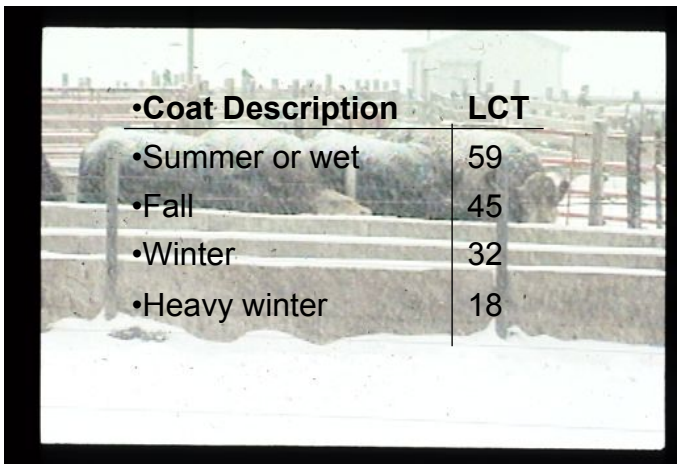


Lower Critical Temperature



•Coat Description	LCT
•Summer or wet	59
•Fall	45
•Winter	32
•Heavy winter	18

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Effective Temperature

	Temperature				
Wind Speed	-10	0	10	20	30
Calm	-10	0	10	20	30
5	-16	-6	3	13	23
15	-25	-15	-5	4	14
30	-46	-36	-26	-16	-6

Maintenance Requirements increase .7% for each degree of cold stress.

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Effects of Mud on Performance

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Mud depth	Intake reduction
4-8 inches	5-15%
12-14 inches	15-30%

Plus: reduced insulation value of hair coat and increased energy cost for walking

NRC (1981, 2001)

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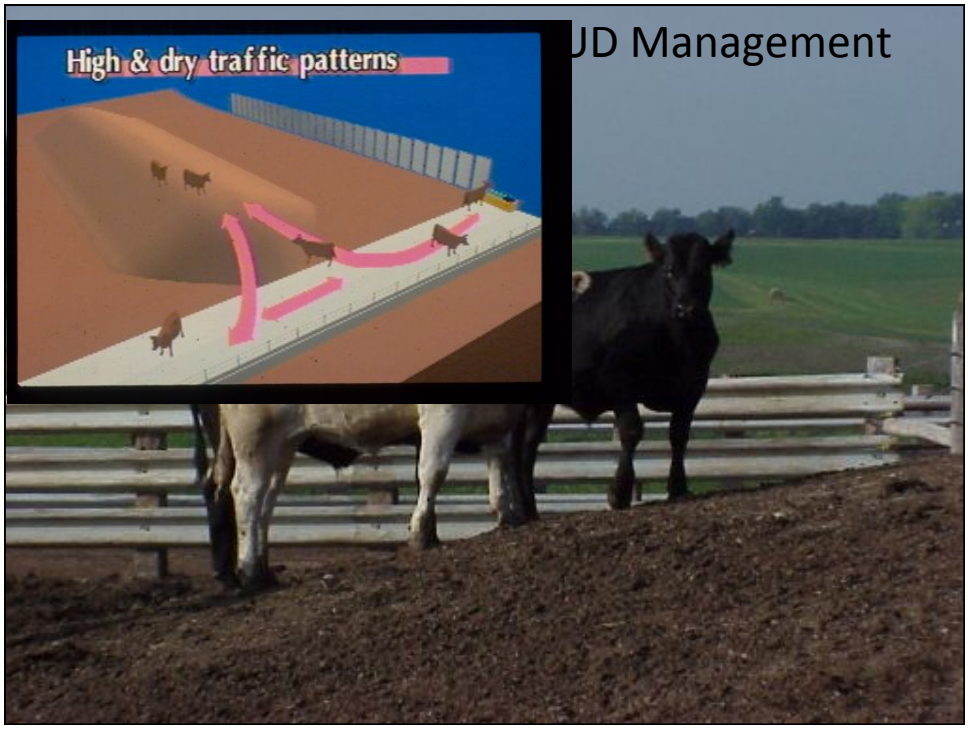

JD Management

Heat Stress

- Affected by effective ambient temperature
  - *Air temperature*
  - *Solar radiation*
  - *Air movement*
  - *Contact surfaces*
  - *Precipitation*

Heat Stress Solutions

#1 - Shade, #2 - Sprinklers

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Predictable Environment

ISU Beef Feedlot Systems Manual (PM-1867)

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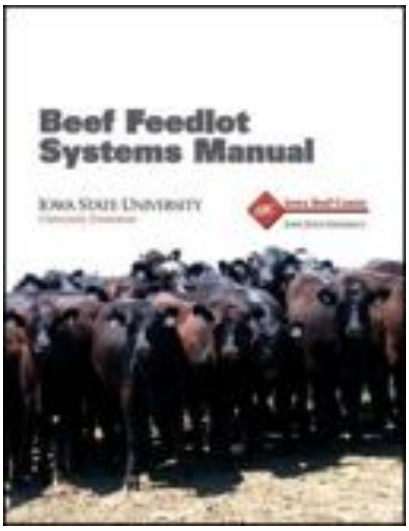

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Five Systems Analyzed

- Earthen lot with no shelter…windbreak only
- Earthen lot with a shed for shelter
- Concrete lot with a shed
- Total confinement with solid concrete floor
- Total confinement with slatted floor

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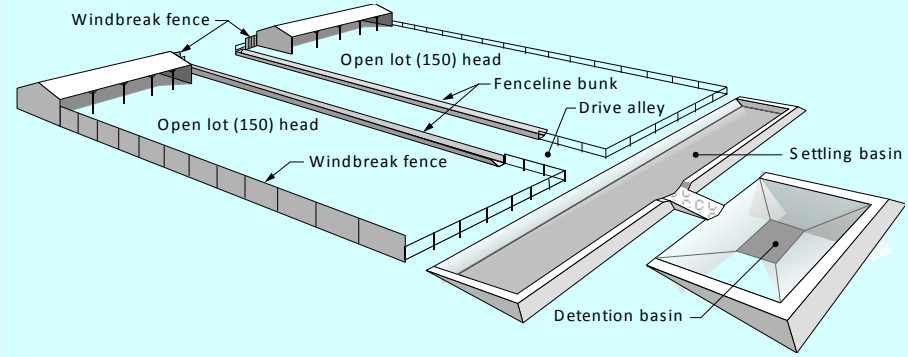
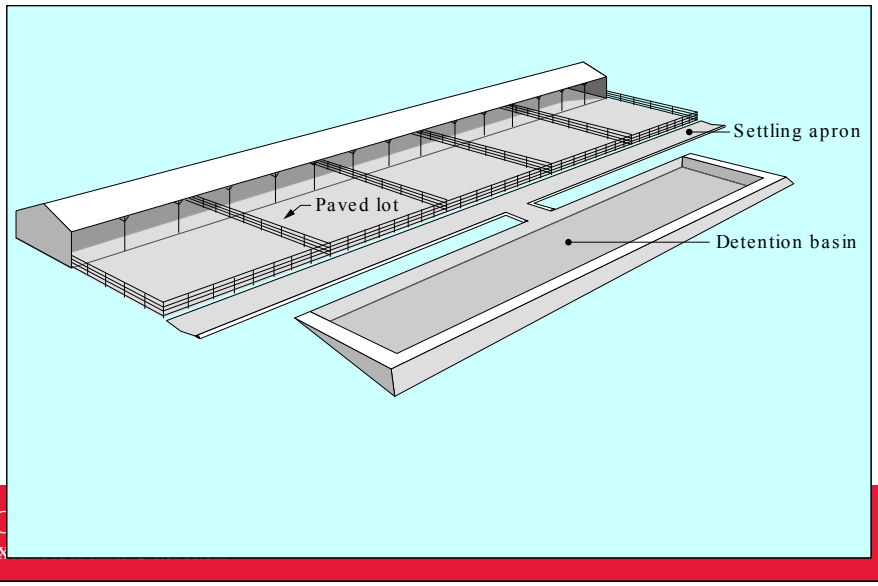
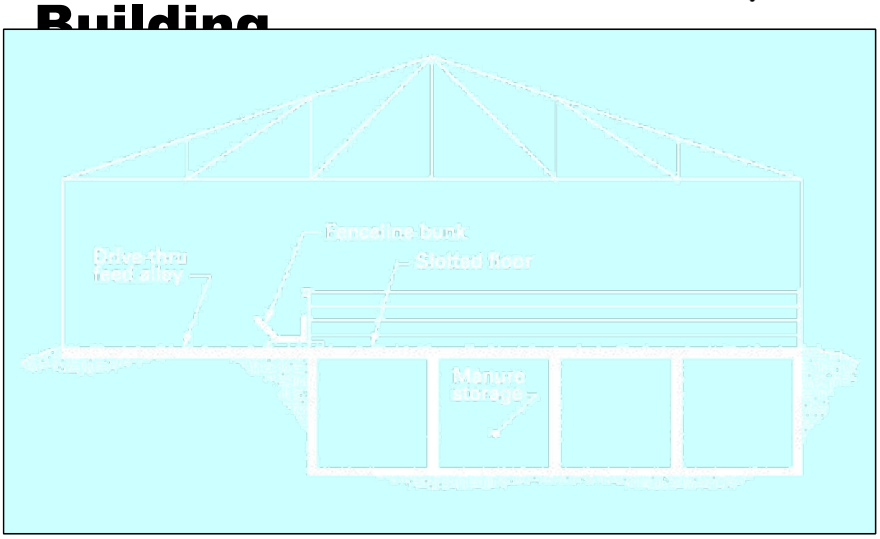
Earthen Lot with Shed



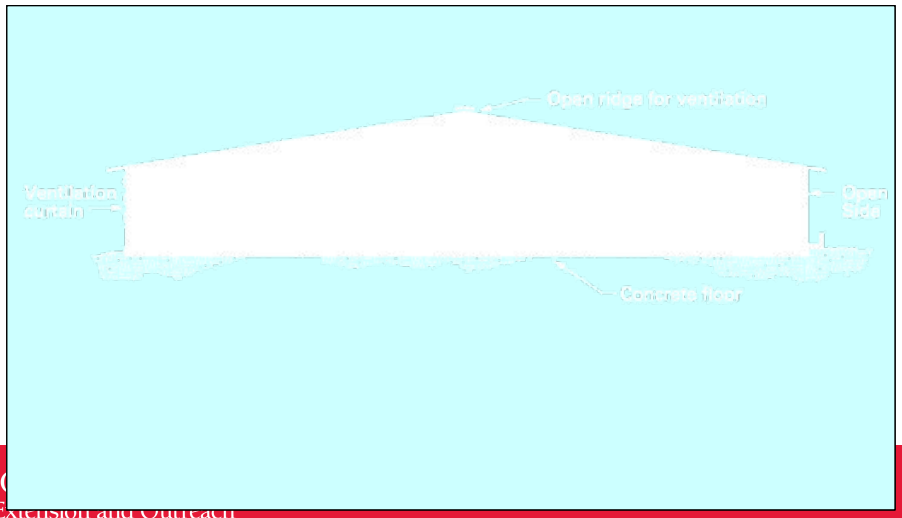
Concrete Lot with Shed



Complete Confinement Building



Complete Confinement Building with Solid Floor



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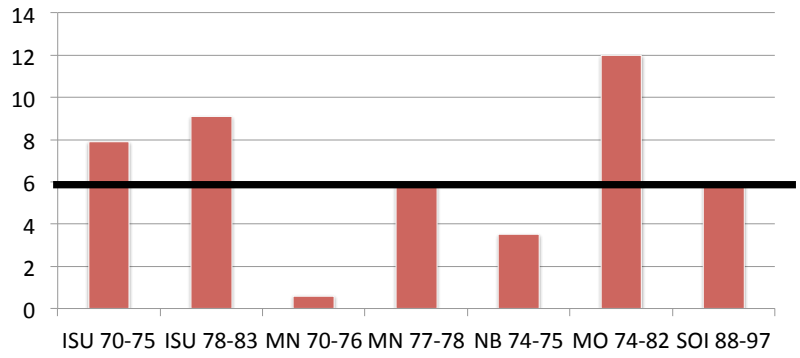
Change In Feed Intake Open Lot vs. Confinement



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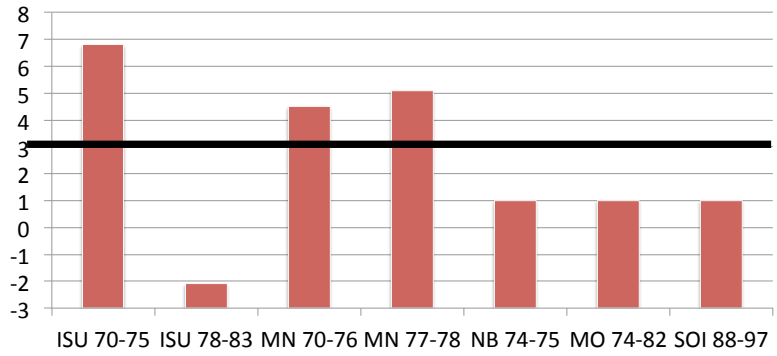
Change In Feed/Gain Confinement vs. Open Lot



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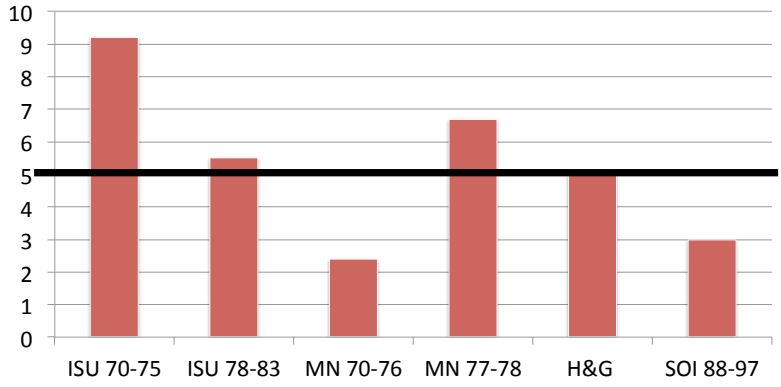
Change In Feed/Gain No Shelter vs Shelter



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Assumptions Common to All

- Fencing Costs = $10/foot
- Bunk Costs = $20/foot
- Concrete cost costs = $200/yd^3
- Earth volumes for settling basin and detention basin construction = volume of liquid to handle

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Assumptions Common to All

- 150 head per pen
- 1 foot of bunk space per head
- 1 gate per pen
- 1 waterer per pen
- 100% of rainfall runs off
- Environmental control facilities designed per DNR regs (for once a year pumping)

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Earthen Lot Assumptions

- 12 ft concrete apron along length of bunk
- 150 sq ft concrete pad around waterer
- 3 Ton/yr-hd solid manure each year
- Lot with windbreak
  - 250 sq feet per head lot space
  - 30 sq feet per head mound space
  - Windbreak = $15/ head

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Earthen Lot Assumptions

- Lot with shed
  - 225 sq ft/head outside, 25 inside
  - No concrete inside building
  - Building cost = $6.50/sq ft

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Concrete Lot Assumptions

- 20 sq ft/head inside, 30 outside
- No feed alley
- No roof water gets on lot
- 4.5 ton/yr/hd solid manure
- Weekly scraping or oftener

Complete Confinement Building

- Total roof means no liquid manure to haul
- Total solid concrete floor
- 3 ton/yr/hd solid manure
- Solid hauling cost = $1.50/ton
- 5 lb. bedding/day. Bedding cost = $30/ bale

Complete Confinement Building with Slatted Floor

- No solid manure to haul
- Liquid manure = 2727 gal/ space/hd/yr
- Hauling cost = $0.15/gal

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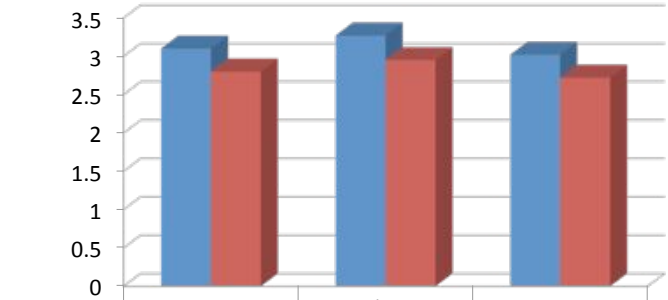
ADG Assumptions



	Open	OL/S, PC	Conf
Yearlings	3.1	3.27	3.02
Calves	2.8	2.95	2.72

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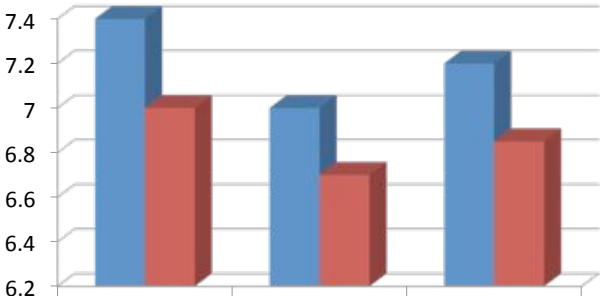
F/G Assumptions



	Open	OL/S, PC	Conf
Yearlings	7.4	7	7.2
Calves	7	6.7	6.85

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Rations

- Flexible feed storage
  - Modified Distillers
  - Ground hay
  - Dry corn
  - Supplement

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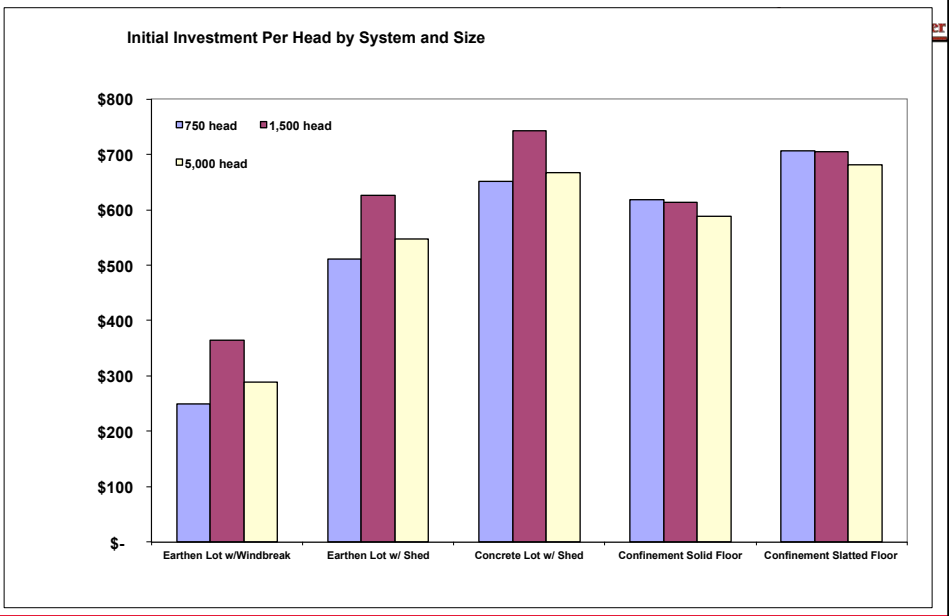
Economic Analysis

- Initial investment
- Annualized costs
- Cost per head
- Yardage
- Environmental structures costs



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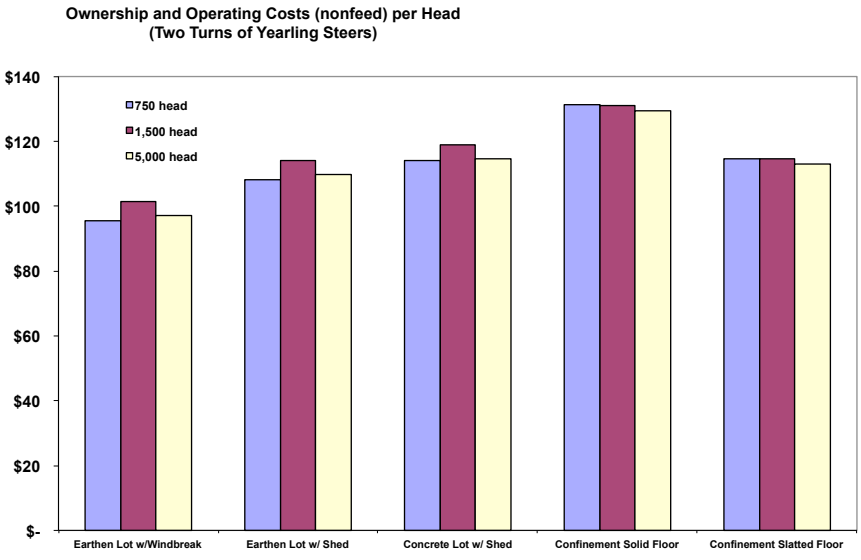

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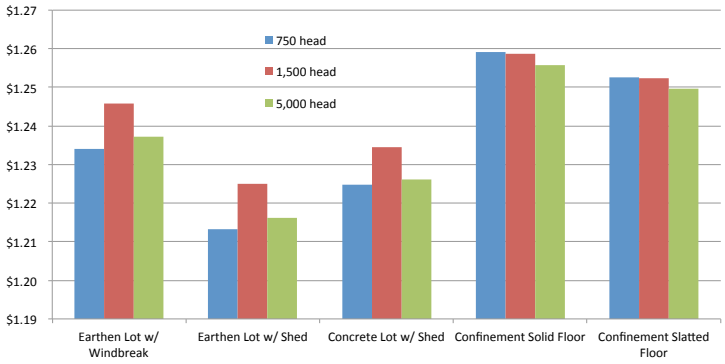
Cost of gain with 2 turns of yearlings



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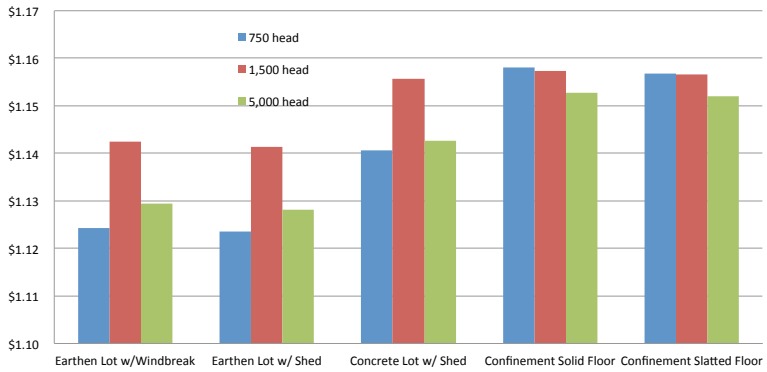
Cost of gain with one turn of calves



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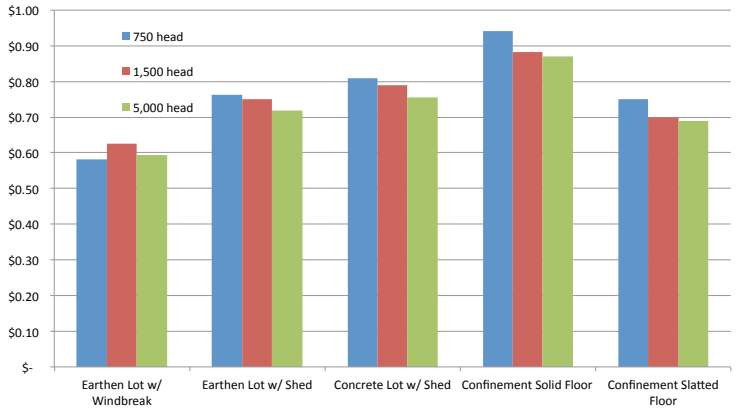
Breakeven Yardage Charge at 85% Capacity



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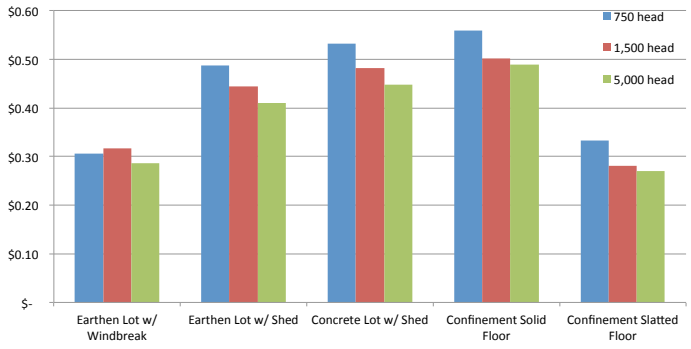
Breakeven Yardage Charge minus Manure Value (85% Capacity)



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Initial Investment

- Earthen lot with windbreak has lowest initial investment
- Adding a shed doubles the costs
- Concrete with shed comparable to earthen lot with shed when environmental structures included
- Confinement highest investment

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Overhead and Operation

- Earthen lot advantage for small lot
- Earthen lots without shed or concrete lot were lowest cost for large lot
- Confinement had higher costs
- Yardage ranges from $.50-90/head/day

Cost of Gain

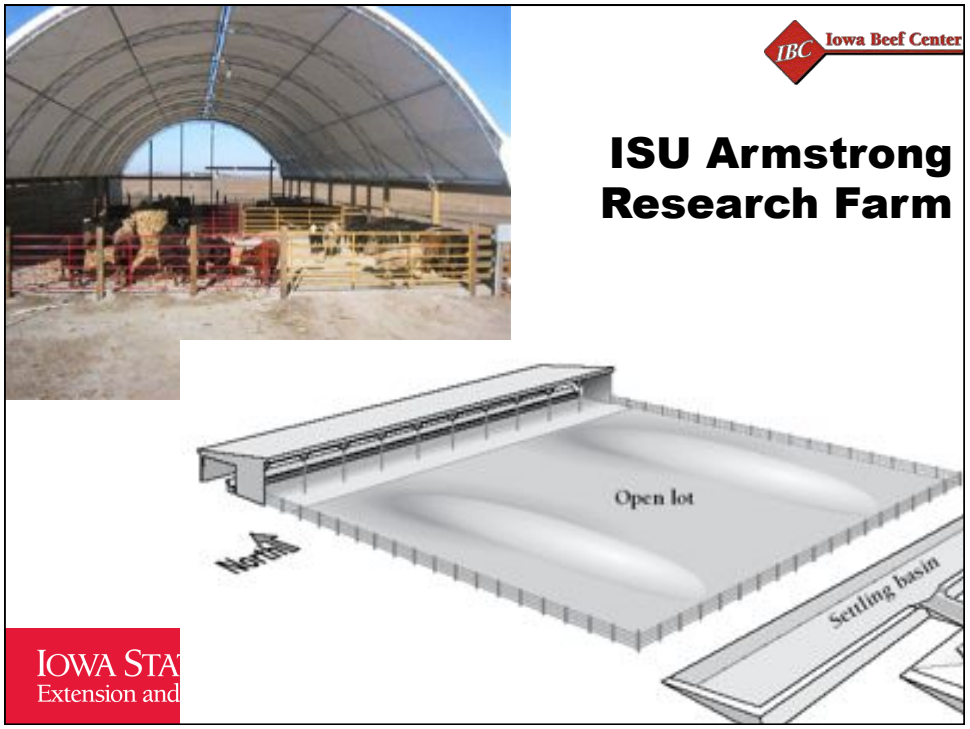
- Incorporates animal performance
- Yearlings and calves similar
- Small lot - earthen or concrete lots
- Large lots - concrete lot
- Confinement has higher cost of gain

Environmental Structures

- Not needed on confinement
- Lowest for concrete lot with shed
  - 60-80% the cost of earthen lot structures
- Relative cost of structures
  - $140 was largest initial investment
  - Maximum annual cost less than $6/head

Size of Feedlot

- Subject to assumptions
  - Many costs were linear
- 750 head lot
  - Already capturing most economies of scale
  - Environmental savings may be short lived. Are you a Medium CAFO?
- 5000 head lot
  - Economies of scale
  - Environmental and overhead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ISU Armstrong Research Farm
Open lot
Settling basin
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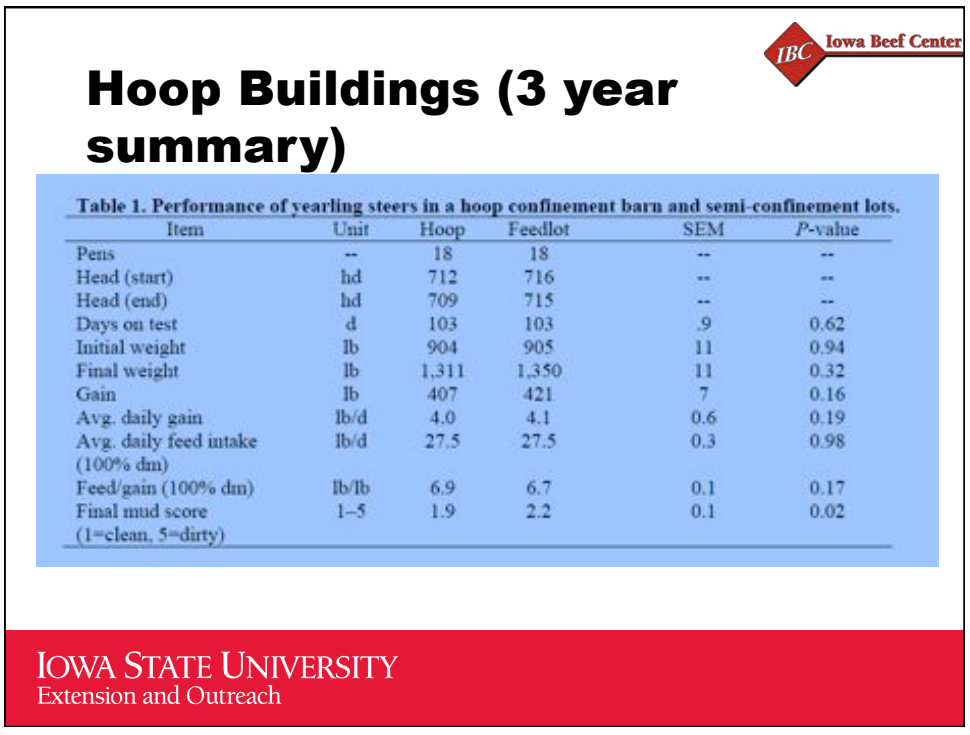
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Hoop Buildings (3 year summary)
Table 1. Performance of yearling steers in a hoop confinement barn and semi-confinement lots.
Item | Unit | Hoop | Feedlot | SEM | P-value
Pens | -- | 18 | 18 | -- | --
Head (start) | hd | 712 | 716 | -- | --
Head (end) | hd | 709 | 715 | -- | --
Days on test | d | 103 | 103 | .9 | 0.62
Initial weight | lb | 904 | 905 | 11 | 0.94
Final weight | lb | 1,311 | 1,350 | 11 | 0.32
Gain | lb | 407 | 421 | 7 | 0.16
Avg. daily gain | lb/d | 4.0 | 4.1 | 0.6 | 0.19
Avg. daily feed intake (100% dm) | lb/d | 27.5 | 27.5 | 0.3 | 0.98
Feed/gain (100% dm) | lb/lb | 6.9 | 6.7 | 0.1 | 0.17
Final mud score (1=clean, 5=dirty) | 1–5 | 1.9 | 2.2 | 0.1 | 0.02
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Hoop Buildings (3 year summary)

Table 2. Carcass characteristics of yearling steers in a hoop confinement barn and semi-confinement lots.

Item	Unit	Hoop	Feedlot	SEM	*P*-value
Hot carcass	lb	813	818	6	0.59
Yield	%	62.0	60.6	--	--
Fat thickness	in.	0.43	0.43	0.01	0.92
Kidney/pelvic/heart fat	%	2.4	2.4	0.01	0.99
Ribeye area	$in.^2$	13.2	13.1	0.1	0.38
Marbling score[1]		1031	1027	.5	0.61
Choice or better	%	75.4	74.3	2.7	0.78
Yield grade, 1 and 2	%	63.4	62.9	2.7	0.94

[1]Marbling score scale: slight = 900, small = 1000, and modest = 1100.

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SDSU Opportunities Farm

	Open	Partial	Monoslope
DMI (lb.)	24.5	24.5	24.3
ADG (lb.)*	3.55	3.67	3.62
F/G*	6.90	6.67	6.71

Holland, et. al. (2011). 6,615 cattle fed 2004-2011.

Shelter provided 1.8% increase in ADG and 2.8% improvement in F/G (year round). Most performance responses were in cattle closed out in the 1st and 2nd quarters.

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Deep bedded vs open lots (closeout comparison)

- 997 pens fed 2007-2009. LOL/Purina closeouts.

	Open Lots	Deep Bedded
DMI, lb.	22.4	22.5
ADG, lb.	2.89	3.02
F/G	7.94	7.46

Pastoor et. al. (2012).

4.5% improvement in ADG, 6.3% improvement in FE to bedded housing

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Mats for Slats? (progress report—3reps)

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	Rubber mats	Concrete slats	P>F
DMI, lb.	20.8	20.2	.54
ADG, lb.	3.08	2.86	.41
F/G	6.76	7.04	.42

Euken et. al. 2013 *(in press)*

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Manure Applicator Certification

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If you have a combined total of more than 500 animal units of livestock in confinement (liquid or dry manure) at one site:

You must be certified to handle or apply the manure and file a manure management plan. Certification sessions are held in January-February. Contact your Extension Ag Engineer for details, http://www.agronext.iastate.edu/immag/mac.html

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Key to Competitiveness with Confinement

Injecting liquid manure as a crop nutrient source.

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